INDIA

KYOTO-PROTOCOL AND THE STEEL INDUSTRY

Joint India/OECD/IISI Workshop, New Delhi (India), 16-17 May 2006

Presentation by Prof. Dieter Ameling, President of German Steel Federation, Chairman Steel Institute VDEh.

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Kyoto-Protocol and the Steel Industry

Prof. Dieter Ameling
President of German Steel Federation
Chairman Steel Institute VDEh

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Kyoto Protocol and the Development of global Energy Consumption

- Burden Sharing Agreement of the European Union
- Climate Protection in the Steel Industry
- CO₂ Emissions Trading in the European Union
The Kyoto Protocol and EU Burden Sharing of Greenhouse Gas Reduction

- Kyoto Protocol has come into force on 16th Febr. 2005.
- Industrial countries, Eastern Europe and Russia obliged themselves to reduce greenhouse gas emissions (CO₂, CH₄, N₂O, HFC, PFC, SF₆) by 2008/12 against 1990 by 5%.
- United States didn’t ratify the protocol.
- European Union as a whole committed itself to reduce GHG emissions by 8%. EU member states have redistributed their targets. Germany: 21% instead of 8%.
- Kyoto-Protocol allows flexibility by Joint Implementation (Art. 6), Clean Development Mechanism (Art. 12) and emission trading between states (Art. 17)
- Emission Trading of companies isn’t part of the Protocol!
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Distribution of the Global Crude Steel Production 2005 according to the Kyoto Protocol

- Crude steel production in million t:
  - 800
  - 700
  - 600
  - 500
  - 400
  - 300
  - 200
  - 100
  - 0

Countries with Kyoto-CO₂-Obligation:
- 28% (incl. Russia)
- EU25 16.5%
- Remaining countries 72%

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World Energy Consumption in Billion t Coal Unit

- 1980: 10.4
- 2000: 14.0
- 2020: 19
- 2050: 27

Categories:
- Renewables and others
- Hydro power
- Nuclear power
- Natural gas
- Oil
- Coal

Source: DWI
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CO₂ Emissions in China

Emissions in million t:

<table>
<thead>
<tr>
<th>Year</th>
<th>Others</th>
<th>Transport</th>
<th>Industry</th>
<th>Power generation and distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>3307</td>
<td>462</td>
<td>984</td>
<td>3414</td>
</tr>
<tr>
<td>2010</td>
<td>532</td>
<td>1080</td>
<td>3414</td>
<td>3414</td>
</tr>
<tr>
<td>2020</td>
<td>592</td>
<td>383</td>
<td>1080</td>
<td>3414</td>
</tr>
</tbody>
</table>

Source: IEA

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CO₂ Emissions of the World by Region

The contribution of the CO₂ reduction of the world by the EU is less than 1%

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td>21860</td>
<td>22835</td>
<td>24536</td>
<td>27516</td>
<td>37000</td>
</tr>
<tr>
<td>Former USSR</td>
<td>18%</td>
<td>20%</td>
<td>21%</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>Europe without former USSR</td>
<td>14%</td>
<td>9%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>North America</td>
<td>24%</td>
<td>16%</td>
<td>24%</td>
<td>31%</td>
<td>19%</td>
</tr>
<tr>
<td>Asia</td>
<td>22%</td>
<td>10%</td>
<td>27%</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>Chinese share of total emissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: DNW, own calculations, forecast IEA, 2006
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CO₂ Emissions Absolute and per Capita in selected Countries and Regions (2004)

Emissions in million t CO₂

USA  Germany  Japan  EU 15  EU 25  China  World

2009/05/04

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Kyoto Limitation or Reduction Commitment
1990 - 2008/12

Burden-Sharing:
- Reduction
- Increase (maximum)

USA*)
EU
Japan
Canada
Russia*)
Australia

+) no ratification

Million t CO₂ equivalent

-500 -400 -300 -200 -100 0 100
Change of Course in International Climate Change Policy

- Going alone on national and European level harms the international competitiveness of industry.
- Climate change policy must be organised globally and include all countries.
- Absolute emission restrictions like in the Kyoto Protocol are internationally not enforceable.
Kyoto-Protocol and the Steel Industry

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Greenhouse Gas Emissions in the EU15
Target 2008/2012 vs. Actual 2004

- Germany bears 76% of the total burden (262 million t)
- Germany has already reduced 240 million t CO₂
- Largest gap:
  - Spain 87.2 million t
  - Italy 96.8 million t
Has European Union Overstrained?

- It is doubtful, if European Union as a whole is able to fulfill its obligation in the first Kyoto period.
- Notwithstanding EU has announced to commit itself to reduce GHG emissions between 15 and 30 percent in the next decade.
- Reduction potentials must be considered. Energy intensive industry in Germany and EU has exhausted its potentials.

### Compliance with Kyoto Greenhouse Gas Emission Targets

<table>
<thead>
<tr>
<th>Reduction targets:</th>
<th>Actual figure 1990:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8%</td>
<td>EU15: -345</td>
</tr>
<tr>
<td></td>
<td>△ 76%</td>
</tr>
<tr>
<td>-21%</td>
<td>D: -262</td>
</tr>
<tr>
<td></td>
<td>4254</td>
</tr>
<tr>
<td></td>
<td>1248</td>
</tr>
</tbody>
</table>

**Degree of compliance at the end of 2004:**

- Rest 286: EU15: -59 = 17.1 %
- Rest 22: D: -240 = 92%
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Utilization of Carbon in the Blast Furnace as a Chemical Raw Material

Mass reaction:*)
Fe₂O₃ + 2C = 2 Fe + CO + CO₂

Demand for 1t hot metal (95.3% Fe):
- Chemical reaction: 333 kg C
- 4.7% C in [Fe]: 47 kg C
- Thermal energy + losses: 34 kg C
- Total demand: 414 kg C/t HM

414 kg C △ 465 kg Coke

*) Scientific expertise: Prof. R. Scholz, TU Clausthal, 8.1.2004
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Climate Change

Voluntary Commitment of the Steel Industry in Germany
within the Commitment of the BDI Federation of German Industries

to the Government of 9.11.2000

Reducing the specific CO₂ emission per t of crude steel by 22%

Index CO₂ emission 1990 - 2013

- Base 1990
- Spec. CO₂ emission of crude steel production with external power
- Spec. CO₂ emission of crude steel production without external power
- Target

-14.7%
-18.8%
Δ CO₂ = -22%

Source: RWI CO₂-Monitoring 1995

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CO₂ Emissions Trading in the European Union

- Power and Heat generation and installations of industry (steel, mineral oil, chemical industry, mineral industry, pulp and paper) get absolute CO₂ emission caps.
- Within these caps they get allocated allowances for every single tonne of CO₂.
- The operators are committed to surrender allowances to the extent of their emissions every year.
- If they don’t have enough allowances they have to buy them from the market.
- Member states determine in „national allocation plans“ the total amount of allowances.
- The first trading period is from 2005 by 2007.

CO₂-Budgets and Allocation Basis of the Steel Industry in the European Union
(Baseline period and first trading period)
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The Principle of Opportunity Costs

€/MWh

This must be earned on the long run

If price doesn’t allow to earn at least this, production doesn’t take place

Fuel and other variable costs

CO₂ allowance

If price doesn’t allow to earn at least this, production doesn’t take place

This must be earned on the long run

Source: EnBW, 08. 2003

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Price Development of CO₂ Emission Allowances boosts Power Prices

Source: EEX, Stahl-Zentrum
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Electricity Cost Burden Through Emissions Trading

Additional gains ("windfall profits") for electricity sector 5.27 billion €

Lead to

Additional costs for power consumers 5.27 billion €

Other consumers 3.0 billion €

Therein energy intensive industry 1.24 billion €

Therein steel industry 150 million €

Industry 2.27 billion €

Source: VIK, own calculations

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Consequences of EU CO₂ Emissions Trading

Blast furnace
Iron ores, coke, additions
Coal, oil, natural gas
Hot blast, O₂
Hot metal
Oxygen
Scrap

Oxygen converter-

Continuous caster

Crude steel production: 5 million t

To produce additional 5 million t crude steel in Germany 8.5 million t of CO₂ certificates are needed. Existing reserves for new plants allow only 3 million t.

5.5 million t have to be bought.

Costs amount to ~140 million € per annum with 25 €/t CO₂.

Growth in Germany is not possible.

The integrated steel works is constructed in Brazil.

Emissions trading shifts jobs
The answer is no!

… it is only bureaucratic air quality control
… it is a measure of decarburisation of the industry
… it is a brake to slow down economic growth
… it is a distortion of free competition
… it is absurd with respect to global energy consumption