Key Modelling issues and challenges facing ETS design & implementation

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European Commission, DG CLIMA
Introduction

Decoupling GDP from greenhouse gas emissions (GHG), 1990-2030

Reducing the EU fuel import bill with our 2030 proposal (import expenditure, in € billion)
The European Union Emissions Trading System is...

- ...the world's first multi-country cap-&-trade scheme;
  31 countries under a single cap

- ...over 11 years old.
  in operation since 2005

- It covers around half of EU greenhouse gas emissions
  sectors: power, industry, intra-EU aviation
  gases: all CO₂ + N₂O & PFC emissions from certain processes
EU Climate Policy
2030 Framework for Climate and Energy

-20 % Greenhouse Gas Emissions

20% Renewable Energy

20 % Energy Efficiency

10 % Interconnection

≤ - 40 % Greenhouse Gas Emissions

≥ 27 % Renewable Energy

≥ 27%* Energy Efficiency

15 % Interconnection

* To be reviewed by 2020, having in mind an EU level of 30%
2020 targets established in Climate & Energy Package (2008)

- **Greenhouse Gas Emissions**: -20%
- **EU-ETS Sectors**: -21%
- **non-ETS Sectors**: -10%

21:10 split is least-cost way of reaching target
Modelling & EU-ETS

2020 targets established in Climate & Energy Package (2008)

Why different years?

ETS pilot phase from 2005 provides better data for policymaking
Modelling & EU-ETS

2020 targets established in Climate & Energy Package (2008)

- Greenhouse Gas Emissions:
  - 20% below 2005
  - 10% below 1990

- EU-ETS Sectors: -21%

- non-ETS Sectors: -10%

Country-specific targets for non-ETS based on GDP/capita
Modelling & EU-ETS

2030 targets established in Climate & Energy Framework (2013)

- **Greenhouse Gas Emissions**
  - vs 1990: \( \leq 40\% \)
  - vs 2005: also EU INDC

- **EU-ETS Sectors**
  - vs 2005: 43%

- **non-ETS Sectors**
  - vs 2005: 30%
Modelling & EU-ETS

2030 targets established in Climate & Energy Framework (2013)
in line with below 2°C Pathway
(2050 Low Carbon Economy Roadmap)

<table>
<thead>
<tr>
<th>GHG reductions compared to 1990</th>
<th>2005</th>
<th>2030</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>-7%</td>
<td>-40 to -44%</td>
<td>-79 to -82%</td>
</tr>
<tr>
<td>Sectors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power (CO2)</td>
<td>-7%</td>
<td>-54 to -68%</td>
<td>-93 to -99%</td>
</tr>
<tr>
<td>Industry (CO2)</td>
<td>-20%</td>
<td>-34 to -40%</td>
<td>-83 to -87%</td>
</tr>
<tr>
<td>Transport (incl. aviation, excl. maritime) (CO2)</td>
<td>+30%</td>
<td>+20 to -9%</td>
<td>-54 to -67%</td>
</tr>
<tr>
<td>Transport excl. aviation, excl. maritime</td>
<td>+25%</td>
<td>+8 to -17%</td>
<td>-61 to -74%</td>
</tr>
<tr>
<td>Residential and services (CO2)</td>
<td>-12%</td>
<td>-37 to -53%</td>
<td>-88 to -91%</td>
</tr>
<tr>
<td>Agriculture (Non CO2)</td>
<td>-20%</td>
<td>-36 to -37%</td>
<td>-42 to -49%</td>
</tr>
<tr>
<td>Other Non CO2 emissions</td>
<td>-30%</td>
<td>-71.5 to -72.5%</td>
<td>-70 to -78%</td>
</tr>
</tbody>
</table>

Source: PRIMES, GAINS

Greenhouse Gas Emissions ≤ 40 % vs 1990
CUTTING EMISSIONS

FASTER EMISSION CUTS AFTER 2020

ADDITIONAL EMISSION REDUCTION
556 MILLION tonnes CO₂
## Modelling issues & challenges

<table>
<thead>
<tr>
<th></th>
<th>Auction</th>
<th>Free Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guaranteed environmental benefit</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Incentive for least-cost mitigation action</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Raises revenue</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>(e.g. for other climate action)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protects against carbon leakage</td>
<td>✗</td>
<td>Sector-specific</td>
</tr>
</tbody>
</table>

So who should receive free allowances?
Modelling issues & challenges

Auctioning vs. free allocation

- **Pass through**
  - (most sectors)
  - *best to auction*

- **No Pass through**
  - (some sectors)
  - *free allocation can help*

ETS Allowance Cost

Other Costs
Modelling issues & challenges

Macroeconomic modelling estimates effect of free allowances...

with Pass through
Best to Auction
(free allocation makes no difference)

without Pass through
Free allocation can help
against carbon leakage

<table>
<thead>
<tr>
<th>Free allocation</th>
<th>No</th>
<th>Sectors other than Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous metals</td>
<td>-2.8%</td>
<td>-3.3%</td>
</tr>
<tr>
<td>Non-ferrous metals</td>
<td>0.6%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Chemical Products</td>
<td>-0.1%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>Non-metallic minerals</td>
<td>-2.5%</td>
<td>-2.8%</td>
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<td>Chemical Products</td>
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<td>0.0%</td>
</tr>
<tr>
<td>Non-metallic minerals</td>
<td>-4.5%</td>
<td>-0.6%</td>
</tr>
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Source: European Commission Impact Assessment Modelling (GEM-E3 model)

...but models do not tell us where pass-through exists in real life
Modelling issues & challenges

**Auctioning vs. Free Allocation**

- **Auction share** shall not decline \( \rightarrow 57\% \) of all allowances
  - In principle, 100% auctioning in power sector

- **Free allocation**
  - harmonised across EU
  - benchmarks based on principle "one product – one benchmark"
    (10% best performing installations in the EU producing the product)
  - higher share of free allowances for firms **exposed to risk of carbon leakage**
Lessons Learned
10+ years of learning-by-doing

End of Phase I
- new cap
- banking of allowances
- centralised allocation & verification

Structural Reforms
- backloading
- market stability reserve

FIGURE 2.5 Market price for European allowances (€/ton)
Source: Bloomberg New Energy Finance / EU Climate Policy Explained
Conclusions

• **Emissions trading is only one part of climate policy**
  - *modelling* can inform how ETS & other measures fit together
  - *modelling* can inform policymakers about general effects

• **Learning-by-doing is crucial**
  - gathering data, consulting stakeholders, conducting empirical research
  - and getting started is a great way to learn

• **Complementary measures are important**
  - *Solidarity*: effort-sharing, Modernisation Fund, free allowances
  - *Incentives for Innovation*: Market Stability Reserve, Innovation Fund...
Thank you

**ETS website**

http://ec.europa.eu/clima/policies/ets/index_en.htm

**ETS Handbook (detailed)**

Appendix

• **Main economic models used in EU climate policy**
  (some soft linked)
  • **PRIMES** – energy & CO2 model. Provides energy-emissions baseline
  • **POLES** – global energy model
  • **GEM-E3 & E3ME** – macroeconomic models (CGE & econometric)
  • **GAINS** – non-CO2 GHG emissions, air pollution co-benefits
    (cost curves introduced into PRIMES)
  • **GLOBIOM/G4M & CAPRI** – LULUCF & agriculture
  • and many more!
Appendix

- **Selected EU modelling cooperation projects**
  - **MILES project** – modelling from INDCs & beyond in large developed & emerging economies
    
  
  - **CLIMACAP** – cooperation with modellers in Latin America
    
    [http://climacap.org/](http://climacap.org/)
  
  - **Africa-LEDS** (coming soon)

- **JRC Global Energy & Climate Outlook** (POLES & GEM-E3)
  