The impact of the EU ETS on European energy and carbon markets

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Danish Environmental Economic Conference

Skodsborg Hotel 23 August 2010

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Outline

• Climate Change Challenge
  – more carbon underground than we should release
  – Kyoto then ETS sets targets
• The logic of EU targets
• GHG targets and the EU ETS
• EU 20-20-20 Directive and ETS
• R&D and EU SET Plan
Climate change challenges

• World should not release all C from fossil fuels
• Climate policy risks depressing fossil fuel prices
  – unless CCS on major scale?
• How best to limit cumulative GHG release?
  – Limits on annual emissions or scarcity GHG price related to remaining absorptive capacity?
  – Kyoto sets emissions targets not a carbon price
• EU ETS as response to emissions targets

  Ambitious target of 80% reduction by 2050
If we want a 50% chance of less than 2°C rise we can only use another 500 Gt C ever!

At present, the combination of proven L and H oil and gas resources is equivalent to approximately 1 Gt C.

The logic of EU targets

• easy to determine “fair” allocation
  – and can buy off opponents with free allocations
• does not impinge on sovereign tax powers
  – EU carbon tax failed
• easier to give impression of leadership/action
  – without spelling out costs
  – ETS => electricity prices ↑ unanticipated by voters

*Targets should be translated into sensible policy*
CO₂ prices are volatile and now too low

EUA price October 2004-April 2010

Actual emissions revealed

start of ETS

Second period
Effect of quota driven ETS

• Scarcity of EUAs determines EUA price
  – rather than long-run view of required carbon price
• Fuel cost + EUA of marginal plant sets electricity price
• When coal and gas competitive in electricity market
  – EUA price set by coal-gas relative price
  => coal and gas-fired plant costs move together

*Lax quantity target keeps coal competitive*  
*Discourages greater CO₂ reduction*
EUAs can make coal and gas competitive in GB

Fuel choices in UK electricity generation, 2000-10

Coal 38%, gas 50%

Coal 34%, gas 55%

Gas cheaper than coal

Coal cheaper than gas

Gas cheaper than coal

EUAs can make coal and gas competitive in GB
UK price movements: 2007 to 2009 in €

Electricity forward 2010 (€/MWh)
Gas cost forward (2010) + EUA
Coal cost forward (2010) + EUA
EUA price in €/tCO2

Correlation of coal+EUA on gas+EUA high at 96%

Source: Bloomberg data
Collapse in EUA price impacts electricity prices

Forward base year contracts - France and Germany Aug 2005-May 2006

Source: EEX
But not price less EUA cost

=> EUA directly feeds through to electricity price

Forward 2007 annual prices - France and Germany 2006

Source: EEX

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Rise in gas price shifts generation into coal

Weekday moving 24 hr av coal and gas generation Britain 1 Oct-9 Dec 05

Source: NGT
Impact on gas market

• Suppose gas price increases
  – initially: demand falls (fuel switch gas ⇒ coal)
  ⇒ demand for EUAs rises ⇒ EUA price ↑
  ⇒ partially offsets advantage of coal
  ⇒ offsets some demand reduction for gas
  ⇒ reduces elasticity of demand for gas, ε
  – Lerner Index \( \frac{p-c}{p} = \frac{1}{\varepsilon} \)
  ⇒ increases market power of gas suppliers
    • Gazprom, and suppliers with protected markets

Bad idea
Demand for gas

Demand for gas if EUA price constant

Demand for gas if EUA price varies

EUA price rise induces some switch back to gas

Price rise

Initial demand fall (gas-coal)

Demand for gas in ESI
Policy implications

• Imposing extra constraint on market reduces demand elasticities, amplifies market power
• If the price of EUAs is independent of gas demand then there is no multiplier effect
  => banking over longer periods helps
• Other reasons for fixing C-price, not quantity:

  Prices vs Quantities (Weitzman, 1974)
Permits vs Taxes

Weitzman: Taxes superior to permits unless MB of abatement steeper than MC

CO$_2$ is a global persistent stock pollutant
- CO$_2$ damage today effectively same as tomorrow
  => marginal benefit of abatement essentially flat
- marginal cost of abatement rises rapidly
- hazard of global warming very uncertain, as are the future abatement costs

*Carbon tax superior to tradable permits*
  *but permits easier to introduce*
Costs of errors setting prices or quantities

- Correct MC
- MC
- Best estimate of Marginal cost of abatement
  - $\text{MB}$, Marginal benefit from abatement
  - $t^*$: efficiency loss from charge
  - $t$: efficiency loss from quota
  - $Q^*$, $Q$: Reductions in emissions

- £/tC: Efficiency loss from charge
Reforming ETS

• Reform EU ETS to provide rising price floor
  – sufficient for nuclear or on-shore wind or CCS
• Commitment to raise CO$_2$ price at 3% p.a. over life of plant may suffice
  – €25/EUA 2010 => €34 in 2020, €61 in 2040 ...
• Making it credible: write CfD on this path
  – offer CfD at €45/EUA for 20y from commissioning?

*makes extra carbon savings additional*
Carbon tax alternative

• Each Member State imposes a Carbon tax
  – tax bads not goods as part of fiscal adjustment
  – rebated by EUA price for covered sector
  – can start low: €20/t CO$_2$ and escalate at 5% p.a. above RPI = €34/t by 2020

• Tax or full EUA auctioning to finance SET-Plan and RES, avoid taxing electricity
Supporting RD&D

- 80% GHG reduction => decarbonising electricity
- Zero-C electricity requires renewables
  - and CCS + nuclear
- RES is not yet commercial (except in niches)
  - requires support now to drive down future costs
- R&D + deployment drives innovation and learning
- But RD&D is a public good benefiting the whole world

So how to gain collective support for RD&D?
ETS and Renewables

• Aim: deliver low-C solutions for world
• Need to explore a portfolio of possible solutions
  – Then select those which show most promise
• Danger with RES target – choose cheapest
  – Fortunately MS have differing resources to explore
  – And differing aspirations to industrial leadership

20-20-20 Directive: least bad feasible solution?
Experience curves justify deployment support

Source: IEA
2050 projected CO2 price

Source: Committee on Climate Change, 2008 and 2009
Failures of ETS

• Current ETS sets quota for total EU emissions
• Renewables Directive increases RES
  ⇒ increased RES does not reduce CO₂
  ⇒ but does reduce price of EUAs
  ⇒ prejudices other low-C generation like nuclear
• Risks undermining support for RES

Solved by fixing EUA price instead of quota
Reforming 2020 Directive

• Not to reduce CO₂ - ETS ensures no impact
  – ETS intended to price CO₂
  – but fails to give credible signals
• not to support low-C generation, only RES
  => support to RD&D to drive down costs of RES
• How? Support investment or generation?
• Learning comes from:
  – design (cost, reliability, controllability, etc)
  – production, installation, siting/planning, grid integration

*but not from operation (provided reliable)*
Implications for RES support

• No RES should bid below SRMC
  – Given that it can rapidly reduce output
  => support should be for availability, not output

• RES should not have automatic priority
  – merit order should be based on avoided costs
  => if RES is more costly than alternatives
    (including balancing, redispatch), back it off
  => foregone RES generation should count to RES target (as it has no CO$_2$ credit)
  – unless ETS reformed to support CO$_2$ price
Conclusions

• **ETS** to price CO$_2$
  – but volatile, price too low, impacts gas market power

• **RES Directive** to support deployment and learning
  => Well defined MS funding in place through obligations

• But RES Directive undermines ETS
  – risks bringing ETS into disrepute

  => Reform ETS – provide floor price
  – de-links gas and coal markets
  – reduces risk of low-C generation investment
  – makes Renewables contribute to reduced emissions

• Failing which encourage MS to impose C tax
  – With rebates for EUA’s surrendered
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Spare slides on SET-Plan
SET Low-C Plan

• **Strategic Energy Technology (SET) Plan**
• Promising technology benefits from LbD
  – Supported by 20-20-20 Directive and national deployment
• Many obstacles require R&D and perhaps pilots
  ⇒ need efficient collective action to increase low-C R&D
  ⇒ IPR benefits made widely available, contrary to MS interests
• But R&D collapsed at end of 1980s
  – liberalisation and resulting pessimism over nuclear future?
• SET plan to leverage MS’s R&D, steer choices

*Ensure adequate size and diversity of portfolio*
SET support schemes

• 2007 SET R&D non-nuclear ~ €2.4bn (Nuclear €0.94)
  – 70:30 private:public; 80:20 MS:EC

• SET plan to 2020 total €70 bn or double current rate
  – Grid: €2bn; fuel cells + H₂: €5bn; Wind: €6bn;
  – nuclear fission €7bn; bio-energy €9bn;
  – smart cities €11 bn; CCS €13 bn; Solar: €16bn;

• Joint programming to amplify MS R&D
  – CCS as an example

ETS auction revenues as funding source?
Three pillars of EU low-C policy

• **ETS** to price CO$_2$
  – for mature low-C investments - reform needed

• **20-20-20 Directive**: demand pull for renewables
  – justified by learning spillovers and burden sharing
  – induces near-commercial low-C deployment

• **EU SET-Plan** to treble R&D spend
  – to support less mature low-C options

*Ensure they work together not in conflict*