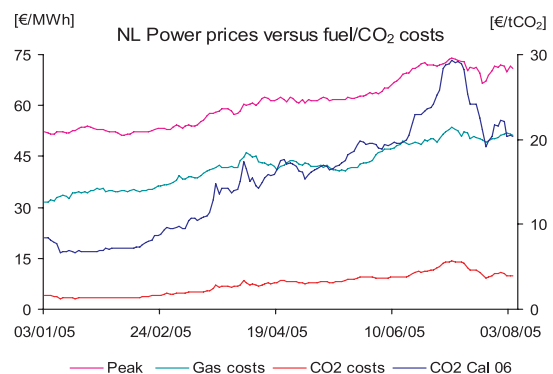


## CO<sub>2</sub> price dynamics: The implications of EU emissions trading for the price of electricity

A recent ECN report analyses the relationship between EU emissions trading and power prices, notably the implications of free allocation of emissions allowances for the price of electricity in countries of North-western Europe. To study this impact, it uses a variety of analytical approaches, including interviews with stakeholders, empirical and statistical analyses, theoretical explorations, and analyses by means of the COMPETES model. It concludes that producers of electricity pass on the costs of free emission allowances fully in their production and trading decisions. The extent to which the costs of emission allowances eventually affect the electricity price depends on a large number of factors. Based on a number of different methods, it has been established that this effect amounts to approximately 40 to 70 percent. As a result of passing through the costs of free emission allowances to the electricity price, the producers increase their profits, whereas consumers are facing higher electricity prices. For some large industrial consumers it is difficult to pass through their higher electricity costs to their sales prices. A major objection to the current system of free allocation of emission allowances is the fact that it stimulates polluting CO<sub>2</sub> intensive investments in new production capacity, which conflicts with the ultimate target of the system. Therefore it is recommended to replace the current system of free allocation with an auction of emission allowances in the near future.

Interviews with the power sector and major industrial electricity consumers have been held. It appears that power companies try to maximise their profits by optimising their production and trading decisions. In that respect, costs of freely allocated CO<sub>2</sub> allowances are regarded as opportunity costs, which are included when power companies make their production and trading decisions. Power producers are not able to simply set power prices or simply pass through costs to these prices as they are primarily determined by a complex set of wholesale market forces. Major industrial power consumers in the Netherlands estimate that in June 2005 the forward prices of coal-generated electricity during the off-peak/base-load hours have increased by approximately 7-9 MWh due to the partly passing through - i.e. about 65 percent - of CO<sub>2</sub> allowances costs. The impact of higher power prices is very significant for power-intensive industries, especially for the aluminium and iron & steel industries. The options to avoid or mitigate the impact of higher power prices for these industries are limited.



Trends in prices of electricity, fuels and CO<sub>2</sub> emission allowances have been analysed for Germany and the Netherlands over the period January-July 2005. Based on these trends, rates of passing through CO<sub>2</sub> costs in power prices have been analysed for four cases (see table). They have been selected as they are regarded as the most representative cases for the load period and countries considered.

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Comparison of estimated pass-through rates in Germany and the Netherlands over the period January-July 2005 (in %)

Country	Period	Fuel (efficiency)	OLS <sup>a</sup> (in %)	PW <sup>a</sup> (in %)	ECN	
					(in %)	(in MWh)
Germany	Peak load	Coal (40%)	72	69	73	9.5
	Off-peak	Coal (40%)	42	42	46	5.9
	Base load	Coal (40%)	53	52	55	7.2
NL	Peak load	Gas (42%)	40	44	39	2.8
	Off-peak	Coal (40%)	53	47	55	7.2
	Base load	Coal (40%)	83	60	88	11.4

<sup>a</sup> All regression estimates are statistically significant at the 1% level. OLS: ordinary least square; PW: Prais-Winston.

### COMPETES model findings

- Power prices increase significantly due to CO<sub>2</sub> emissions trading under all scenarios considered. These increases are generally highest in Germany (13-19 €/MWh) and lowest in France (1-5€/MWh)
- Estimates of the pass-through rates are generally high. Most of these rates vary between 60 and 80 percent, depending on the country, market structure, demand elasticity and CO<sub>2</sub> price considered.
- Emissions trading in general and the free allocation of emission allowances have a major impact on business profits of major power companies.

### Policy implications

The EU ETS is a cap and trade system based primarily on a free allocation of a fixed amount of emission allowances, often denoted as *grandfathering*. If applied equally to existing and new fossil-fuel installations, however, such an allocation system may have two opposite effects on power prices with significant different implications for power producers, consumers and policy makers:

- A price increasing effect due to the passing through of the opportunity costs of grandfathering.
- A price compensating or neutralising effect of grandfathering due to its subsidisation of fixed investment costs.

In order to address the adverse implications of grandfathering, the present study discusses a wide variety of power options and strategies. These options and strategies include:

- Indirect allocation of emission allowances
- Auctioning;
- Regulation;
- Benchmarking with ex-post allocation adjustments;
- Limiting the price level of a CO<sub>2</sub> emission allowance;
- Encouraging competition in the power sector;
- Abolishing grandfathering to new investments;
- Taxation;
- State aid;
- Other long-term options such as broadening the climate coalition or encouraging carbon-saving technologies in the power sector;
- Strategies at the level of power consuming industries such as energy saving, stringent power contract negotiations, or self-generation of electricity.

However, there seems to be no ideal option or package of options to address these implications as each option has its specific pros and cons. Overall, auctioning seems to be a better option than grandfathering or an ex-post benchmarking system. While auctioning would raise power prices by the costs of the CO<sub>2</sub> allowances, it would have several beneficial effects, including (i) avoiding windfall profits among producers, (ii) enhancing environmental-economic efficiencies by internalising the external costs of CO<sub>2</sub> emissions into the power price, (iii) raising public revenues that could be used to mitigate potential drawbacks of rising power prices, and (iv) treating incumbents and newcomers equally while avoiding potential distortions of new investment decisions.

J.P.M. Sijm, S.J.A. Bakker, Y. Chen, H.W. Harmsen and W. Lise, 2005. *CO<sub>2</sub> price dynamics: The implications of EU emissions trading for the price of electricity*. ECN report ECN-C--05-081, Petten, The Netherlands. Downloadable at [www.ecn.nl/](http://www.ecn.nl/); or contact Jos Sijm: [sijm@ecn.nl](mailto:sijm@ecn.nl)