

*Michael Bartels and Felix Müsgens*

## **DO TECHNOLOGY SPECIFIC CO<sub>2</sub>-ALLOCATIONS DISTORT INVESTMENTS?**

M. Bartels: Institute of Energy Economics, University of Cologne  
Albertus-Magnus-Platz, 50923 Cologne, Germany  
Phone: +49 221 17091816, Fax : +49 221 446537, E-mail: bartels@wiso.uni-koeln.de  
F. Müsgens: Faculty of Economics , University of Cologne  
Albertus-Magnus-Platz, 50923 Cologne, Germany  
Phone: +49 221 4705490, Fax : +49 221 4705485, E-mail: felix.muesgens@uni-koeln.de

### **Overview**

In the beginning of 2005, the EU established a tradable permit system (TPS) for CO<sub>2</sub>. Its purpose is to support the member states achieving their international emission reduction commitments in a cost-efficient way. An important point is the allocation of emission rights. There is already an extensive literature on the general implications of auctioning and grandfathering. In practice, recently developed national allocation plans contain a broad variety of special allocation rules at sector and installation level, e.g. on early action, on CHP, on allowance transfers to new installations, modernization incentives and rules on benchmark allocations for new entrants. Due to the complexity of national allocation plans a complete analysis of their effects on emission reduction efforts and efficiency is hardly possible.

This paper surveys how technology specific benchmark allocation for new installations alters the choice of technology. In contrast to recent papers, e.g. Schwarz (2005), the authors assume that technology specific allocation does not increase total emissions. This reduces the possibility for a technological shift to high emission technologies. Nonetheless, investment in technologies granted a high benchmark is favoured. In most actual allocation plans emission intensive plants receive a higher benchmark than other ones. New emission intensive power plants will benefit from that, dampening the fuel substitution effect in the long run. Due to the TPS's overall cap emissions must not overshoot those of an auctioned TPS. Hence, some emission reduction must be achieved by other means than fuel substitution, e.g. by increased replacement of old plants. Scenario analyses are conducted for the electricity industry of ten EU countries and Switzerland. It is shown that a technology specific benchmark incurs higher costs in achieving a certain emission reduction. Thus, CO<sub>2</sub>-abatement in a TPS with technology specific benchmarks becomes inefficient.

### **Methods**

The first part of the paper describes briefly how investment decisions in new power plants will be altered by (ex-ante) permit allocation using technology specific benchmarks. These incentives on investment are compared to an auctioned TPS.

The paper's main part then quantifies effects of benchmark allocation using the optimization model CEEM of the Western European electricity market. First, a baseline scenario is set up showing the market development under permit auctioning. This results in the least-cost solution to achieve a certain emission reduction. A second scenario describes the development in a grandfathered TPS where permits to new installations will be allocated on the basis of technology specific benchmarks. Future electricity production, capacity development and costs will be compared in both scenarios. Results are derived assuming competitive electricity and permit markets for an emission reduction path until 2020.

## Results

A technology specific benchmark distorts investments and reduces welfare. More investment is directed to those technologies that are granted a comparably high benchmark allocation. At the same time, investment in other technologies declines. Total emissions must not exceed the baseline levels. Therefore, additional abatement will be achieved by increasing the average plant efficiency within some technologies. This is done by earlier decommissions of old plants and replacing them with more efficient new capacity.

A quantification method of this effect for a large part of the European Union was developed using an extensive empirical optimization model.

## Conclusions

Technology specific benchmarks lead to inefficiencies in the achievement of CO<sub>2</sub>-reduction targets. They change both the investments and the production pattern. While it can be a political goal to keep certain technologies in the market, it is questionable whether technology specific benchmarks are the right mean to achieve this aim.

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