The Alliance of Energy Intensive Industries (AEII)

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Allocation and benchmarks of products where interchangeability of energy carriers occurs & the use of the electricity CO_2 emission factor in the EU Emissions Trading Scheme

1. When setting benchmarks, we agree with the European Commission that where energy carriers are interchangeable the efficiency of the use of electricity should be included when a performance curve is made to determine the 10% best installations.

2. We disagree however, that the Commission has used the factor 0.465 ton CO_2/MWh for the assessment of the risk of carbon leakage for all industrial sectors or sub-sectors, which relates to the average emissions per MWh in EU-27. In contrast, the economic effect on power prices comes from the emissions per MWh of the marginal power plants. The same is true for the environmental effect, a lower use of electricity per unit of product results in avoiding the emissions from the marginal power plants.

The Commission insisted that the carbon leakage assessment was done on the basis of the average emissions per MWh, as an estimate. This leads to a structural undervalued impact of the indirect impacts, which needs to be revisited in the future when the exposure to the risk of carbon leakage will be re-evaluated.

3. But for the present, a more realistic value is needed for the determination of benchmarks for products where electricity is interchangeable with heat (most often steam) or fuel.

4. Therefore we reiterate the argumentation for the use of the emission factor of the marginal plants. The marginal EU-wide CO_2 emission factor is approximately 0.70-0.75 ton CO_2/MWh.

Ecofys / Fraunhofer benchmark report & parity of economic and environmental effect

The relevant CO_2 emissions factor of electricity, expressed in ton CO_2 per MWh, plays an important role in determining the benchmarks in case the energy carriers electricity, steam and fuel can be interchanged, see final report Ecofys / Fraunhofer *"Report on the project approach and general issues"* (chapter 6.3).

It is well known that the CO_2-price impact on the electricity price is set by the CO_2 content of the marginal electricity production plants. When companies invest to reduce emissions leading to a lower use of electricity per unit of product, the emissions of the marginal electricity production plants go down. Only the use of the marginal electricity emission factor would result in a correct

performance curve in which fuel, heat and electricity are included to identify the 10% most efficient manufacturing installations.

Ecofys has mentioned the extreme example of electrical and fuel-fired furnaces. Assume there are 100 furnaces of which 10 electrical furnaces. Only looking at the direct emissions would lead to zero allocation of allowances for all manufacturing plants of such a sub-sector. This is why it is necessary to take the indirect emissions related to the electricity emissions (as also the costs) of the companies into account when setting the benchmarks. This is important as carbon leakage is based on the real cost impact imposed on the companies,

Ecofys concludes by pointing to the economic and environmental risk: *"The first method* [not correcting for these differences, so ignoring the problem] *is regarded as undesirable if the electricity-intensive route is from an overall greenhouse gas efficiency point of view not beneficial (which can only be assessed based on the emission intensity including the indirect emissions)."*

The Commission must therefore come with structural solutions to avoid perverse effects leading to more fossil fuel emissions. The Commission is aware of the environmental risk: with a too low allocation for existing and new installations there is a significant risk of carbon leakage and a serious impact on competitiveness. However, this risk is still present if the CO_2 emission factor of electricity to be used is too low.

Evidence of the correct electricity emission factor

The conclusion that the *"relevant European electricity production mix"* is not the average but the marginal production mix is supported by evidence of numerous specialist sources including the EU Commission itself, for example:

- Matthes (2005, p. 10)[1]: *"Although the main share of the allowances was allocated free of charge [in phase 1 of EU ETS] to the installations, the price of electricity will be set by the marginal power generation unit including almost the full costs of carbon in a liberalized and competitive power market."*.
- The EU Commission's energy sector inquiry (p. 123) clearly explains the mechanism of price setting by the marginal power plants on the basis of Short Run Marginal Cost ("SRMC"). The report continues to explain that market power can lead to even higher electricity prices*: "Therefore, generators with market power on spot markets have ample opportunity to also exercise their influence on forward prices. For example dominant operators could withhold a part of their generation capacity. This would not only raise spot prices but also … resulting in higher forward prices"* (p. 124 -125). In such cases the price is still set by marginal power plants, but with costs for fuel and CO_2 higher than necessary.
- In the same vein the International Energy Agency (IEA) elaborated that the marginal power plants set the electricity price. The pass-through of the CO_2 price in the electricity prices was reported to be below 100% in phase 1 (2005-2007) of EU ETS. IEA (2007, p. 23)[2] mentions two possible causes: the expectation of updating of the allocation and the treatment of new entrants. These causes are completely removed through full auctioning for electricity production as from 2013 onwards.

At the ECCP meeting on 26 September 2008 the Commission stated its intention to use the average electricity mix, as was repeated in the ECCP meeting of 6 November 2009. Concerning the former meeting, the criticism of industry and Member States is reported in the EU Commission's minutes of the meeting (p. 2)[3]: *"Several Member States were sceptical about assumptions on the cost-price mechanism for electricity and the choice of fuel mix. They also underlined differences between Member States. The cost increase should not be evaluated on average fuel mix but on marginal fuel mix and if possible be country specific."*

[1] *"The environmental effectiveness and economic efficiency of the European Union Emissions Trading Scheme: structural aspects of allocation*", by Öko-Institut, dr. Felix Matthes, Verena Graichen, Julia Repenning, in cooperation with Ilex, Ilex Iberia, AVANCI and ESC, November 2005.
[2] IEA (2007), *"CO_2 allowance & electricity price interaction"* IEA, J. Renaud, February 2007.
[3] "Report ad-hoc stakeholders meeting ECCP Working Group ETS on carbon leakage", Brussels, 26 Sept. 2008

We considered this point to be accepted, especially after own reports from the EU Commission such as mentioned above and for example in the non-paper about Combined Heat and Power in November 2008[4] (page 1):
"Industrial CHP is often fuelled by natural gas or biomass. In these cases only CO_2 costs related to the actual fuel occur for the operator, while the price for electricity purchased from the grid would contain the CO_2 costs for the marginal power plant, which is often coal based".

It would obviously be highly inconsistent to use different CO_2 emission factors for electricity on a case by case preference: a high factor (marginal based) when arguing in favour of CHP and a low factor (average based) for the benchmarks.

Best proxy for the CO_2 emission factor of marginal power plants
Information from a neutral source – stated by the Commission to be important– can be used by taking the average CO_2 emission per MWh of the fossil-fired power plants as the most realistic approximation of the CO_2 emission of the marginal power plants. This was also confirmed by Fraunhofer which in the past has done work for the German government to evaluate the decrease of emissions of the power plants by increasing renewable power production.

Based on the average emission per MWh of 0.425 ton CO_2/MWh as originally used by the Commission and the share of 54.8% of fossil-fired electricity (EUROSTAT 2005/2006, share of thermal electricity minus biomass), the result is: 0.425 / 54.8% = 0.773 ton CO_2/MWh.

This result is a much more realistic proxy for the effect of the marginal power plants, because at higher demand gas-fired plants are marginal and at lower demand coal- and lignite-fired power plants are marginal. This approach is in line with the evaluation by IEA (2004)[5]. The result of 0.773 ton CO_2/MWh is between both situations and close to the assessment of 0.75 ton CO_2/MWh submitted by IFIEC Europe.

For comparison, the European Wind Energy Association (EWEA) calculated on this basis for the EU 0.78 ton CO_2/MWh for 2005 (EWEA reference 2008[6] below) and 0.76 ton CO_2/MWh more recently (EWEA reference 2009[7] below).

The value of 0.922 ton CO_2/MWh for Germany (BMU[8]) is judged as a good indication for EU-27 when the CO_2 market price is above the fuel switch level. Then coal- and lignite-fired power plants are the marginal ones also during high demand of electricity. This situation can be more and more expected when we move towards 2020 with the ambitious greenhouse gas reduction target.

Conclusion
Electricity prices are set by the marginal power plants. The economic effect of the marginal electricity emission factor fully coincides with the environmental effect. The overall best assessment of the needed Community-wide electricity factor is **0.70-0.75 ton CO_2/MWh.**

A realistic determination of benchmarks – where appropriate in case of interchangeability of energy carriers – can only be made on this basis.

We urge the Commission to let a competent consultant – e.g. Fraunhofer – or the European regulators investigate the proper value for the needed Community-wide electricity emission factor of the marginal power plants.

[4] "Non-paper from the Commission services on treatment of CHP in the ETS review", 28-11-2008.
[5] *"Emissions trading and its possible impacts on investment decisions in the power sector",* J. Renaud.
[6] *"Pure Power",* European Wind Energy Association (EWEA), pp 44, March 2008.
[7] *"EWEA News Release*" 2 February 2009.
[8] *"EEG Erfahrungsbericht 2007",* Bundesministerium für Umwelt, Naturschutz und Reactorsicherheit, pp 35-36, 7 November 2007.