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The future European Emission Trading Scheme and its impact on biomass use

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ABSTRACT

Based on research carried out within the NoE, this paper assesses possible impacts of changes to the European Emission Trading Scheme on solid and the possible future inclusion of liquid biomass use in the EU. Based on these assessments, recommendations are outlined for optimising support for solid and liquid biofuels. In December 2008 the European Council agreed on the European Energy and Climate Package. This agreement contains fundamental changes to the European Emission Trading Scheme (EU-ETS), which started in 2005. With some exceptions, emissions allowances in the power sector will be auctioned starting with the third trading period of the scheme in 2013. This may have significant impacts on the sector's fuel mix and investment decisions. To the extent to which the EU-ETS results in a price on CO_2 emissions, it increases the competitiveness of low carbon fuels. Under current regulations no CO_2 emissions are attributed to combustion of biomass, thus it functions as a zero-carbon fuel. The paper shows that while the use of biomass is already viable under CO_2 prices that have been reached within the EU-ETS, investments in new biomass plants need a higher price level as well as more stable prices, conditions which cannot be predicted with any confidence. The road transport sector, which has significant scope to increase its use of biofuels is currently not part of the EU-ETS, and will not be included in the third trading period which begins in 2013 but may be included later. The likely consequences of including transportation fuels under the EU-ETS are considered as well as options which involve separate trading schemes for liquid biofuels. The paper also reviews other trading mechanisms which might serve as more effective vehicles for increasing the share of liquid biofuels, taking sustainability issues into account.

1. Introduction

In December 2008, the European parliament adopted the EU Energy and Climate Package followed by its adoption by the European Council in April 2009 [1]. The package sets three targets for 2020: a 20% reduction of greenhouse gas (GHG) emissions; a 20% improvement in energy efficiency; and a 20% share of renewable energy for gross final energy usage. Within

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the latter target, there is an additional sub-target of 10% renewable energy in the transport sector [1]. The Energy and Climate Package also aims to significantly redesign and improve the European Emission Trading Scheme (EU-ETS), and in 2009 a new EU-ETS directive was adopted [2]. This paper focuses on the question of whether the EU-ETS is an appropriate vehicle for increasing use of solid and liquid biomass.

Following the Directive 2003/87/EC [3] which established a scheme of GHG emission allowance trading within the community, in January, 2005 the European Union implemented the EU-ETS as a main instrument to reach its Kyoto commitments on climate change. The EU-ETS is the largest multi-country, multi-sector greenhouse gas emissions trading scheme worldwide. The scheme establishes a cap on total emissions from covered sectors. The cap approach guarantees that its environmental goal is met but the costs that companies will face in meeting this goal cannot be fully predicted. The first phase of the EU-ETS ran from 2005 to 2007, and included about 12,000 industrial plants [4]. It covered about 46% of total EU CO_2 emissions - about 40% of total GHG emissions - and included the most energy intensive sectors: iron and steel, minerals, pulp and paper production, refineries, and the power sector [3]. The second period runs from 2008 to 2012 and coincides with the first Kyoto commitment period. The third period will run from 2013 to 2020 [2].

The EU-ETS allows companies to buy and sell the certificates, referred to as allowances, that they must hold to cover their releases of CO_2 into the atmosphere. During the first and second periods, the number of allowances allocated to companies and the method of allocating them were determined by member states in National Allocation Plans (NAPs). Most allowances have been allocated free of charge based on historical emissions (grandfathering). At least 95% of allowances were grandfathered in the first period and at least 90% in the second phase. The trading scheme provides that companies whose CO_2 emissions exceed the amount received can purchase allowances from companies in possession of excess allowances.

The objective of a cap-and-trade system is to create incentives for the affected industry sectors to reduce their CO_2 emissions. The cap imposed on total allowances allocated should create scarcity, a precondition for a market. This will occur if emissions during the trading period would exceed total allowances if no emission-reducing actions are taken. Companies that manage to keep their CO_2 emissions below their allocations through emission reduction efforts can sell any excess allowances at the price determined by the market. Under this system, in theory, emissions reductions ought to be carried out where they are least expensive. The system should encourage measures to reduce CO_2 emissions such as switching to lower emission fuel mixes and investing in "climate friendly" technologies.

Starting in 2013 allocations will be determined at the EU level and, with a few exceptions, allowances for the power sector will be auctioned. Exceptions may be made for highly efficient co-generation plants and district heating as well as for electricity producers in some new EU member states [2]. To the extent to which then EU-ETS results in a price on CO_2, it will increase the competitiveness of low carbon fuels. Under current regulations no CO_2 emissions are attributed to combustion of biomass [3]. Therefore no allowances must be purchased to cover emissions due to the combustion of biomass, and, the scheme has the potential to increase use of biomass. In fact the European Commission expects a large increase in biomass use in the energy sector by 2020 [4].

Up to now, the CO_2 price has, on average, not been high enough to motivate companies to invest in low carbon technologies on a large scale. Surveys done within the NoE, however, have shown that the EU-ETS has motivated companies to investigate internal reduction measures, and that modest emission reductions have occurred in spite of a very volatile CO_2 price [5]. The transport sector will not be included in the EU-ETS beginning in 2013 but may be included in other planned emissions trading schemes in the future, such as in California. To stimulate greater use of liquid biofuels, emissions trading however may not be the most effective system due to the relatively high cost of most biofuel options in relation to other measures both in the transportation and power sectors.

2. Solid biomass under the EU-ETS

A model to analyse the competitiveness of biomass in power generation under the EU-ETS has been developed within the NoE based on previous studies by the IEA [6]. The model is designed to assess the influence of the CO_2 price on the Short Run Marginal Costs (SRMC) and Long Run Marginal Costs (LRMC) of power generation. The NoE model shows at what CO_2 price the use of biomass to replace coal becomes competitive in existing plants (e.g., through co-firing), and at what CO_2 price the construction of new biomass plants will become competitive. Model runs shown in this paper use an assumption of 100 percent auctioning of allowances however the model can be run under other assumptions. Further, in assessing CO_2 prices which would be required for new biomass plants to be build, the runs use costs for a medium-sized CHP biomass plant. Costs for small plants would be higher, thus requiring higher CO_2 prices for competitiveness than discussed below.

SRMCs, which are based on fuel prices and other variable costs, are the basis for daily operational decisions regarding which fuel to use. Investment decisions are based on the Long Run Marginal Costs (LRMC) of a plant which include not only fuel and other variable costs but also fixed costs such as investment and capital costs. In the cases shown in this paper, different thermal efficiencies were used for LRMC and SRMC calculations. For SRMC calculations a thermal efficiency rate of 37% was used for coal plants as representing the average of currently operating plants. For LRMC of coal plants a rate of 40% was used as new plants will have higher efficiencies. For gas (CCGT) an efficiency rate of 40% was assumed for existing and 55% for new plants. For new CHP biomass plants a thermal efficiency rate of 80 percent was assumed. The model can be run with other efficiency assumptions to address specific cases of interest.

The cheapest biomass, starting at €2.1/GJ, was available in Finland and the UK in 2009. Germany, Austria and the Netherlands faced the costs up to €10/GJ in 2009 [7]. While the