AN ASSESSMENT OF TRADING MECHANISMS AS A METHOD FOR INCREASING LIQUID BIOFUELS IN THE ROAD TRANSPORT SECTOR

A. Türk[1], H. Schwaiger[1], C. Kettner[1], A. Arasto, J. Vehlow, J. Sijm, M. Hunder

[1]JOANNEUM RESEARCH Forschungsgesellschaft mbH, Institute of Energy Research, Elisabethstrasse5, 8010 Graz, Austrią

ABSTRACT: The road transport sector is currently excluded from the EU-ETS and is unlikely to be included until 2020. Abatement costs for biofuel-related measures in the transport sector are higher than in other sectors. Therefore an inclusion into the EU-ETS represents a risk that transportation companies will purchase allowances from other sectors, leading to higher CO_2 prices within the EU-ETS. This would also reduce incentives to mitigate emissions in the transport sector itself. Policy options include regulation, market based instruments such as emissions trading and provision of information. Policy makers will need to decide whether to focus on limiting emissions from the transport sector or to increase use of biofuels. A cap & trade scheme would be the appropriate instrument to reduce emissions. To increase biofuel use, regulation would be the appropriate instrument. Inclusion of emission reductions from the transportation sector via a baseline & credit approach would favor biofuels and could lead to more flexibility and lower costs. Such an approach could also be specially designed to address issues of sustainability and to accelerate the implementation of new technologies. This approach was taken in California and this paper illustrates that it could also be the way forward for the EU.

Keywords: emissions trading, transport sector, CO_2 emissions reduction

1 INTRODUCTION

The transport sector accounts for 21 percent of the EU's total greenhouse gas (GHG) emissions. In its Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport the European Union (EU) sets a minimum percentage for each member state for liquid biofuels in the transport sector (on an average 5,75% by 2010). The targets were missed in 2005, therefore the EU reinforced the framework directive with an increase to 10% minimum for the market share of biofuels in 2020 as part of the Climate and Energy Package published in January 2008 [1]. From 2005 the EU implemented the European Emission Trading Scheme (EU-ETS) as a main instrument to reach its Kyoto commitments on Climate Change. Since 2008 the second phase of the scheme has followed, while the third phase begins in 2013. The EC has reviewed the EU-ETS over the last three years [2] and has tabled a set of improvements and changes to the system for the 3rd phase beginning in 2013. While the EC tabled a legislative proposal to include the aviation sector from 2013 and may also include maritime shipping it is highly unlikely that it will include road transport in it scheme from 2013.

There are several proposals, however, on how to include the road transport sector in the EU-ETS and other emerging emissions trading schemes. The main purpose of this paper is to analyse

i) the performance of different instruments targeted to increase the use of liquid biofuels

ii) to assess the role of different trading mechanisms and

iii) to trace out a possible design of a future European trading scheme.

2 THE EU-ETS

2.1 Overview

Following directive 2003/87/EC establishing a scheme of GHG emission allowance trading within the Community in January 2005 the European Union implemented the European Emission Trading Scheme (EU-ETS) as a main instrument to reach its Kyoto commitments on Climate Change. The EU-ETS is the largest multi-country, multi-sector GHG emissions trading scheme world-wide.

The first phase comprised 3 years (2005-2007) and included around 12,000 installations covering about 46% of the EU's total CO_2 emissions or about 30% of its overall GHG emissions. For this period, the EU-ETS included the five most energy intensive sectors: iron/steel, minerals, pulp/paper, refineries, and power. The 2nd phase runs from 2008-2012 and coincides with the first Kyoto commitment period.

2.2 The philosophy behind the EU-ETS

The trading scheme allows companies to buy and sell certificates to release CO_2 into the atmosphere, so called allowances. In the National Allocation Plans (NAPs), the number of allowances allocated to companies (cap) and the method to allocate them is determined on EU member state level. Companies exceeding their individual CO_2 emissions targets can purchase allowances from others who overfulfill them. Most allowances are allocated to the installations free of charge – at least 95% in the first period, and at least 90% in the second phase. In the 3rd phase a large share of allowances will be auctioned [3].

The philosophy behind the system is to create incentives for the affected industry sectors to reduce their specific CO_2 emissions. The cap on the allowances allocated should create scarcity, a precondition for a market. If companies manage to keep their CO_2 emissions below their cap, they are able to sell their excess allowances at the price determined by the market. As a result emissions reductions are carried out where they are cheapest and measures to reduce CO_2 emissions,

such as switching to a low emission fuel mix and investments in new "climate friendly" technologies, are encouraged. Emissions trading ought to ensure that emissions are reduced in a most cost-effective way.

As the EU-ETS sets a price on CO_2 emissions it increases the competitiveness of low carbon fuels. Biomass is regarded as carbon neutral in the scheme causing no additional CO_2 costs. The scheme thus has obviously the potential to increase the use of biomass.

Several studies [4] have shown that the EU-ETS has motivated companies to investigate internal reduction measures, and that abatement has occurred.

3 PARTICULARITIES OF BIOFUEL RELATED ABATEMENT MEASURES

There is a wide range of options with highly varying abatement costs in the transport sector. While there are reduction measures with negative or small abatement costs such as fuel efficient vehicle or cellulose ethanol most of the biofuel-related abatement measures have costs far over €50 per ton of CO_2 reduced (see Figure 1).

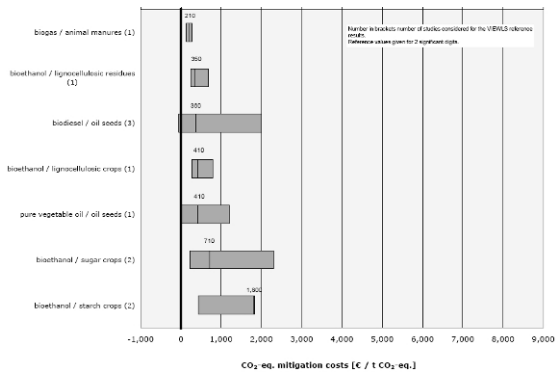

Figure 1: CO_2 eq. mitigation costs ($€_{2002}$/t $CO_{2\ eq.}$) – Future Technology [5]

Biofuel related abatement costs in the transport sector are far higher than many measures in the energy and industry sector with costs between 20 and 40 Euro per ton of CO_2 avoided.

4 PERFORMANCE OF DIFFERENT INSTRUMENTS

4.1 Overview of different instruments

The following instruments can reduce transport emissions and/or increase the use of liquid biofuels:

- Regulation

  This includes command and control measures such as technology standards or fuel mandates.
- Market-based instruments

  Market based instruments can be taxation or emissions trading
- Information

  These include for example the labeling of cars or the driving style that cause less emissions (Ecodriving).

There are two types of emissions trading schemes:

- Cap & Trade (CT) systems

  In a cap-and trade system emissions are capped and a corresponding amount of emissions allowances is allocated. Companies with fewer emissions than allocated can trade with companies that emit more than allocated. The EU-ETS is a Cap-and Trade scheme.
- Baseline & Credit (BC) systems

  In a baseline and credit system a baseline is set. If the emissions of an installation are below its baseline tradable credits are generated.

4.2 Performance of different instruments Overview of different instruments

This section gives a brief assessment of the performance of different instruments in reducing emissions and increasing the use of biofuels. The performance of instruments is assessed regarding the policy evaluation criteria costs, effectiveness, equity, competitiveness and acceptability.

- ETS versus (fuel/car) taxation

  An ETS gives certainty on the environmental effectiveness. Emissions are capped, but abatement costs are however uncertain. A tax gives certainty on the costs, the environmental effectiveness however is uncertain.
- ETS versus regulation

  An ETS gives more flexibly compared to regulation and thus reduces the cost of emissions reductions. Furthermore, an ETS internalizes external costs but fails to address other (technology) market failures such as the failure to appropriate privately the benefits of R&D.
- Emissions trading/taxation

  Through emissions trading in the transport sector the impact on biofuels is probably very low due to the high costs of biofuels. To see an effect the CO_2 price or the CO_2 tax would have to be very high. This would significantly increase the transportation costs with effects on other sectors of the economy. There is a high incidence of other market failures (besides cost externalities) for specific biofuel technologies, including technological learning (i.e. cost reductions) of biofuels, high risks, uncertainties, etc. .
- Regulation (biofuel mandates)

  Through regulation the impact on stimulating biofuels use is high, but there is uncertainty about the costs.

An important conclusion is that the choice of the appropriate instrument depends on whether policymakers want to cap emissions or want to increase the use of biofuels. When the aim is to control emissions a cap-and trade scheme would be the appropriate instrument, when the aim is to significantly increase the use of biofuels regulation would be the appropriate instrument, the cost would, however, be higher.

4.3 Options and effects for emissions trading for the transport sector

There is an ongoing discussion whether to include the road transport sector in the EU-ETS or not.

Existing literature shows several options to implement emissions trading for the transport sector. Figure 2 depicts an overview of the explored options:

- Full integration of all transport sectors and EU-ETS

  The whole transport sector – road transport, aviation and maritime shipping – could be integrated in the EU-ETS.

- Full separation of all transport sectors and EU-ETS

  The EU-ETS would in this case only include the energy and industry sectors.

- Hybrid, limited linkages between transport sectors and EU-ETS

  In this case some transport sectors (aviation, shipping) would be integrated in the EU-ETS while other transport sectors would either have their own, separate ETS or rely on other instruments. There may be restrictive linkages between EU-ETS and a transport ETS.

There are different options for the trading entity in a transport ETS:

- Downstream: Trading entities are the vehicle drivers (end-users)
- Mid stream: Trading entity are the filling stations
- Upstream: Trading entity are the fuel suppliers
- Far upstream: Trading entity are the oil refineries

The allowances could be auctioned or given for free (grandfathering, benchmarking).

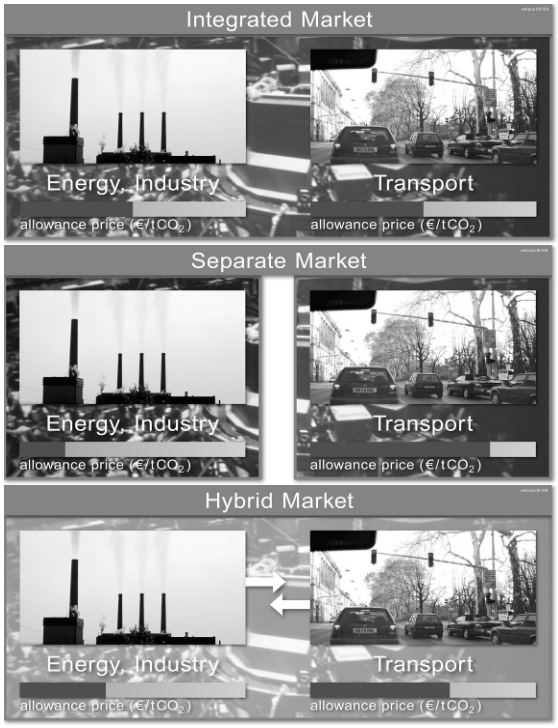

Figure 2: Overview of three options for implementing emissions trading in the EU-ETS

A survey of existing literature shows that a full integration of EU-ETS and transport sectors would increase the cost-effectiveness of the total scheme. Given the high average abatement costs in the transport sector it would, however, have the effect that the entities in the transport sector would purchase credits from the energy and industry sectors, where the abatement measures are much cheaper. This would lead to a rise of the EUA price and hardly any mitigation of transport emissions. As also the transport sector has cheap abatement options (most of the biofuels don't belong to them), the marginal abatement cost of the energy/industry and the transport sectors may only diverge after a certain level of emissions reduction has taken place. An increase of the EUA price would lead to a decrease of industrial competitiveness and possibly to carbon leakage, while there would hardly be any mitigation of transport emissions.

A full separation of the EU-ETS and a transport sector would have no impact on the EU-ETS. It would be an effective tool to control transport emissions if it is designed as a cap and trade system. The carbon price in the transport sector might, however, become (unacceptably) high (i.e. high social costs).

In a mixed system with hybrid linkages of the EU-ETS and a transport ETS the performance depends on specific design features.

Based on the existing literature it can be concluded that there should be no full integration of the EU-ETS and transport sectors, except aviation and maritime shipping. A separate cap and trade scheme for the transport sector would limit emissions and stimulate the use of biofuels if the CO_2 price becomes very high.

5 THE CALIFORNIAN "LOW CARBON FUEL STANDARD" AND ITS FEASIBILTY FOR THE EU

Chapter 4 showed that in order to stimulate the use of biofuels a cap-and trade scheme is not an appropriate instrument, even if it would be a separate scheme and not integrated into the EU-ETS. Regulation would be more effective. The costs could, however, be high. In the case of a regulation a baseline and credit scheme could give the system more flexibility as the following chapter shows.

An example for a baseline and credit scheme is the Low Carbon Fuel Standard (LCFS) in California (USA) [6]. California adopted the LCFS to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020. It is a complementary instrument to the planned ETS in California which also includes transport. Currently no linking of the two instruments is planned, but may be considered later. Under an ETS the CO_2 price would by far be not enough to implement low-carbon fuels. The basic concept of the LCFS thus is a baseline and credit system with the fuel standard as the baseline.

Based on the design of the LCFS it will be briefly assessed how a baseline and credit system with the fuel standard as the baseline could work in the EU. The European Commission has set a biofuel standard for the year 2020, which could be the baseline for the trading scheme. Most of the design element of the Californian scheme could also be implemented in the EU.

The base year would be the most recent year for

which data are available before the biofuel standard was announced. The regulated entities would be producers of transportation fuels (refiners).

GHG emissions from the production of fuels should be included in the scheme: Values used to certify the carbon intensity of different fuels should be based on empirical data representative of the specific inputs and processes in each fuel's life cycle. Fuels with a higher emissions profile would get fewer credits. Non-sustainable biofuels would be excluded from the scheme. Assigning additional credits for more innovative low carbon fuels should be considered.

In order to be cost efficient regulated entities should be able to bank credits (meaning that they would be able to use them in subsequent compliance periods), but not to borrow them from subsequent compliance periods as this would tend to reduce incentives to innovate.

Similar to the planed scheme in California as a cost containment measure regulated entities could be given the possibility to comply by paying a fee, which is different from paying a fine for non-compliance. The fee should be set at the marginal cost to society of reducing GHG emissions.

6 CONCLUSIONS

The road transport sector, currently excluded from the EU-ETS, is unlikely to be involved into the scheme until 2013. Some member states, however, are already discussing pilot activities on a national level. One of the key questions, with respect to a GHG emissions trading scheme for the road transport sector, is whether the sector should be included directly in the existing EU-ETS or whether a separate, parallel scheme should be developed.

It is a fact that abatement costs for measures in the transport sector are in many cases significantly higher than in the energy and industry sectors (the main current EU-ETS sectors), especially when it comes to liquid biofuels. There is therefore a risk that if the transport sector will be included in the EU-ETS, companies within this sector will purchase their allowances in the energy and industry sectors setting pressure on the CO_2 price for the whole market. Integrating the transport sector into the EU-ETS may as a consequence result in a net flow of CO_2 credits from the industry and energy sectors to the transport sector, and therefore reduce incentives to mitigate emissions in the transport sector. The paper illustrates that liquid biofuels specifically cannot benefit from an integration in the EU-ETS but also not from a separate scheme unless the carbon price is very (prohibitively) high given the high abatement costs of biofuels.

The paper showed that the choice of the appropriate instrument depends on whether policymakers want to cap emissions in the transport sector or want to increase the use of biofuels. When the aim is to control emissions a cap-and trade scheme would be the appropriate instrument, when the aim is to increase the use of biofuels significantly, regulation would be the appropriate instrument, but a trading scheme (baseline and credit) could give the system more flexibility leading to lower cost. Furthermore, such a scheme could be specially designed to address issues of sustainability and to accelerate the implementation of new technologies. This approach was taken in California and the paper illustrated that it could also be the way forward for the EU.

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