Bringing End-Use Energy Efficiency to the European Emissions Trading Scheme: Outlook for the Third Trading Period

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ABSTRACT

The European Emissions Trading Scheme (EU ETS), a cornerstone of the EU climate change policy, has entered its second trading period (2008-2012). The present design of the ETS has limited impact on certain types of end-use energy efficiency measures. Although promotion of energy efficiency is not the objective of the EU ETS, its extension to less energy intensive sectors, and the inclusion of fuel use in sectors not covered by the EU ETS at present, could foster energy savings. The paper looks at those features of the current EU ETS that may have unintended or limited effects on additional efforts in end-use energy efficiency, discusses design modifications proposed by the European Commission and explores practical solutions in line with the recent proposal of the Commission for amending Directive 2003/87/EC. The paper proposes solutions how to include these additional end-use energy efficiency opportunities in the EU ETS. While the primary scope of the ETS is to reduce emissions in a cost effective manner, depending on its design the EU ETS could also foster additional energy efficiency, thus bringing additional and cheaper options to the carbon market.

Introduction

The Emissions Trading Scheme of the European Union (EU ETS) was established in Directive 2003/87/EC[1]. It is a 'cap and trade' system that limits the overall level of emissions and allows participants in the system to trade the allowances they need. The scheme was launched in January 2005 and its first trading period ran for 3 years to the end of 2007[2]. The second trading period runs between 2008 and 2012 and the third between 2013 and 2020. As of the first trading period the EU ETS involves about 10,000 installations[3] from energy-intensive industry and power installations with 20 MW of rated thermal input, covering almost half of the EU's total CO_2 emissions and 40 % of total greenhouse gas emissions (GHGs). In the second and third period more installations and their emissions are included in the scheme[4]. Each installation is allocated emissions allowances for the full trading period; allocations are described in the

[1] A directive is binding on the Member States as to the result to be achieved. The main purpose of a directive is to align national legislation.
[2] Note that there is an additional true-up period of four months which installations may use for compliance. Therefore the first trading period in practice only ended at the end of April 2008.
[3] Combustion plants, oil refineries, coke ovens, iron and steel plants, factories making cement, glass, lime, brick, ceramics and pulp and paper. In larger Member States 1,000 to 2,500 plants are covered, while in most other Member States the number of plants covered tends to range from 50 to 400.
[4] The exact number of installations for the third period is not available at this point and is contingent upon the acceptance of the Commission's proposal. The proposed increase in scope refers to a number of new industries (e.g. aluminium and ammonia producers), as well as two further gases (nitrous oxide and perfluorocarbons). Discussions are underway on legislation to bring the aviation sector into the system in 2011 or 2012.

national allocation plan (NAP) of each country[5]. Each EU Member State (MS) specifies the total amount of allowances to be allocated and how these allowances would be allocated to the installations. For every ton of CO_2 that an entity under the ETS emits, they are required to surrender an allowance that was either allocated to them or purchased. Emission reductions from joint implementation (JI) or clean development mechanism (CDM) projects can be used to supplement domestic action in fulfilling emission reduction targets[6]. MSs limited the use of JI and CDM[7] by companies as a percentage of allocation in their NAPs: these limits differ substantially across countries and range from 0% in Estonia and Malta to 70% for public service electricity generation in Spain (only 20 % for remaining sectors) (Schleich, Betz and Rogge 2007). If the emissions from an installation exceed its individual cap, its operator either has to purchase allowances or pay a penalty of 40 and 100 Euro/tCO_2 respectively for the first and second trading period. For comparison, carbon prices for the first trading period have fluctuated between 8 and 30 Euro/ton CO_2 in 2005-2006 and have dropped to below 1 Euro/ton CO_2 in February 2007 and almost zero in December 2007 (reflecting over-allocations and lack of banking, see discussion later). 2008 prices fluctuated between 13 and 33 Euro/tCO_2 (Point Carbon March 2008).

The paper discusses end-use energy efficiency in the context of the EU ETS in the first and second trading periods, outlines the main changes proposed by the European Commission for the third trading period and proposes further practical solutions to strengthen the role of end-use energy efficiency in the EU ETS. Section 1 looks at design features of the EU ETS that may have unintended negative impact on additional efforts in end-use energy efficiency in the first and second trading periods. Section 2 discusses the changes proposed by the Commission for the third trading period. Section 3 explores further possible design adaptation and practical solutions for bringing end-use energy efficiency under the EU ETS. Section 4 concludes.

While it can be argued that the carbon content of electricity will be internalized in the electricity price and this will create a sufficient price signal to be passed through to consumers, this impact of the EU ETS on electricity prices will be contingent upon a plethora of factors[8]. As discussed in this paper, the size of the carbon-related price increase depends on the stringency of emission caps for the producers of this product, the methods and criteria used for allowance allocation to both existing installations and newcomers, allocations to newcomers and closures of

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[5] The European Commission needs to approve all NAPs based on criteria specified in Annex III of Directive 2003/87/EC and in the NAP Guidance documents.

[6] The details are regulated in an amendment to the ETS Directive - Directive (2004/101/EC), which entered into force in November 2004. Starting from 2005 firms have direct access through CDM to credits from countries without targets; from 2006 JI credits are available from countries with targets.

[7] The CDM allows a country with an emission-reduction commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in **developing countries**. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO_2. JI allows a country with an emission reduction commitment under the Kyoto Protocol (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in **another Annex B Party**, each equivalent to one tonne of CO_2. CDM credits can be used from 2005. JI projects can generate credits for Phase I of the ETS starting in 2008, with special provisions for new MSs until 2012. The Linking Directive forbids project credits from JI when they lead directly or indirectly to emission reductions in installations covered by the EU ETS.

[8] If we take as a starting point that the two major determinants of investment choices in fossil fuel power generation are fuel price and carbon price, then high carbon price would reduce the demand for coal, thus reducing the price of coal. On the contrary, low carbon price would increase the demand for coal and keep stable or decrease the demand for gas.

installations and information about future allocation (Schleich and Betz 2005). These are all policy design issues that can be addressed by modifying the policy.

This paper argues for explicitly creating favorable conditions for the uptake of energy efficiency in the ETS for a few reasons. First, energy efficiency could bring **additional mitigation options to the carbon market**, thus extending the scope of the market to projects in sectors that may be more cost effective but are currently left out. Second, carbon finance can be important **tool to leverage energy efficiency** potential. Third, price increases associated with fully internalizing climate change externalities may be socially painful and thus politically difficult to accept. Furthermore, empirical literature suggests that demand elasticities for electricity are generally low (see literature review and results of real-time elasticity in Lijesen 2007; see Bernstein and Griffin 2005) and thus price instruments may have limited effect. Finally, internalizing externalities and associated price increase may cause affordability concerns leading to consumption reduction due to restricting consumption rather than energy efficiency improvement related to reduced consumption without loosing the desired service level.

Limitations of the EU ETS for Energy Efficiency in Phase I and Phase II

Energy efficiency is often not recognized as a business opportunity because of deviation from core business expertise, due to the smaller size of measures and associated larger transaction costs, split incentives and other barriers extensively analyzed in literature. While the primary aim of the EU ETS is to reduce emissions in a cost effective manner, depending on its design ETS could also directly foster end-use energy efficiency.

A number of reasons exist why the EU ETS in its current design may be insufficient to directly stimulate cost-effective end-use energy efficiency. These are mostly rooted in general design compromises of the ETS that have an impact on the overall functionality of the scheme and raise specific concerns related to energy efficiency projects.

- The EU ETS provides a direct incentive to energy savings in part of sectors. It only provides an indirect incentive for the other sectors (electricity end-use) and no incentive for non-electricity consumption in non-ETS sectors (natural gas and heat consumption in residential and tertiary sectors, for example)[9].
- Lenient emission caps have resulted in an excess supply of allowances and therewith low carbon prices. Consequently, the cap has had no significant impact on investment decisions and has had limited impact on emission abatement in the industrial sector. This is not a specific energy efficiency issue, but has resulted in limited energy efficiency incentives.
- The chosen bases for allocation have not resulted in a large incentive to energy efficiency measures (see explanations below).
- Compared to required efforts in non EU-ETS sectors, disproportional smaller efforts are required from EU ETS industries in some countries (see explanations below). Again this is not providing sufficient stimulation to emission abatement, including energy efficiency.

[9] Note that here the signal that the ETS passes on to EE projects is taken into consideration: the discussion about the general effectiveness of upstream versus downstream systems is outside the scope of the present paper.

Coverage of Direct Emissions

The ETS covers direct emissions based on the physical source ('the stack'), whereby the emitters are obliged to operate under emission caps The EU ETS caps emissions from energy-intensive industry and large power installations, leaving out smaller emitters in order to avoid the monitoring and inspection complications of having all emitters under a cap.

In this system the cost of the allowances is, to a certain extent, accounted for in the product price: electricity with high carbon content will become more expensive. The key questions are (1) what factors determine the carbon-related price increase of electricity and (2) will consumers respond by consuming less or switching to a product alternative that has lower price rise (which presumably, but *not certainly,* is also less carbon intensive). Re-orientation of consumption to less carbon intensive products would depend on the extent to which additional costs are passed on to consumers rather than to e.g. shareholders, the carbon intensity of the electricity generation system as a whole[10], and the elasticities that operate on behavior (in relation to price, substitution, and income) (Sorrell 2003). At the same time one should keep in mind that (1) the demand side of the energy sector is rarely as responsive to price incentives as economic theory predicts (see Lijesen 2007 and references herewith and Bernstein and Griffin 2005), and (2) because the ETS covers only direct emissions, industrial users with an emission cap under EU ETS cannot get any credits for improving the electricity efficiency of end-use at their site(s), which may give a wrong incentive to electricity end-use options (horizontal technologies such as motors/drives, lighting) and may result in a shift from thermal energy to electricity.

The ETS approach only indirectly gives some incentives to energy savings as a way of consuming less carbon intensive products without losing the desired service level.

Lenient Emission Caps

Fundamental to the functioning of the EU ETS and therewith for additional incentives for energy efficiency, is a meaningful price for carbon on the market. This requires scarcity in supply and thus *emissions caps* set at levels significantly below BAU developments. In Phase I most national emission caps were set in a loose way. The release of installation-level data for verified emissions and allowance allocations for the first two years of the trial period for the ETS revealed that CO_2 emissions from ETS sectors were on average about 60 million tones or 3% lower than the number of allowances distributed to installations for these years (Ellerman and Buchner, forthcoming). This shows that indeed caps for Phase I were weak and the surplus is mostly due to over-allocation, not to serious emission mitigation effort. With regard to Phase II, with some exceptions, the caps proposed by Member States in their initially notified NAPs are above independent estimates of BAU emission projections: a comparison of proposed Phase II caps with independent calculation of BAU emissions[11], reveals a predicted surplus of allowances of around 53 million tons CO2/y, which corresponds to 2.5 % of the total emissions within the EU ETS (Rathmann, Reece et al. 2006). This suggests that the proposed Phase II caps would not

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[10] If the electricity generation sector is dominated by, say, low-carbon nuclear, the consumers would face a weaker price signal.

[11] In this study an independent estimate of BAU emissions for EU ETS participants in 2008-2012 was made, based on own estimates, verified 2005 emissions data and sector level emissions projections taken from the "European Energy and Transport – Trends to 2030 – Update 2005"

require substantial emission abatement effort by EU ETS participants and thus no shortage of allowances were to be expected if the Commission would have accepted the Member States' proposals. In its decisions on the Phase II NAPs the Commission responded by requiring an average cap cut of 7%, which would push the market again to an overall shortage. Some Member States have consequently lowered their caps, meeting the Commission requirements. Other Member States however are contesting the Decisions.

The lenient emission allocation in Phase I and therewith the low carbon price have resulted in less actual emission reductions than expected. This has general implications on emission mitigation efforts of ETS entities that go beyond energy efficiency.

Allocation Methods and Criteria

In Phase I grandfathering was the main allocation option for existing installations: more than 90% of CO_2 allowances were given away to businesses free-of-charge and very little use was made from the possibility to auction up to 5 % of allowances. Grandfathering was not based on real "historic" emissions but on *projections* of emissions for the three-year trading period of 2005-2007 (assumed future emissions) calculated from previous periods; this gave an incentive to exaggerate projections (WWF 2006). The power sector has treated freely distributed allowances as opportunity costs and has passed-through these costs in electricity prices. Even though windfall profits have raised concerns[12], they have resulted in only small electricity price increase[13]. Auctioning a larger part of allowances will provide a more explicit price signal on the costs of carbon and therewith a more clear argument on the internalization of carbon prices in product prices, which in its turn can provide a stronger impetus to using more efficient technologies.

Technological (benchmarking) considerations were taken into account in very few cases, mainly in the allocation of allowances to new entrants and in some instances in a manner that is incentivizing lower efficiency coal generation[14]. In Germany new entrants in the power sector are allocated allowances based on fuel-specific benchmarks ranging from 365 to 750 g CO_2/kWh, with coal installations being given twice as much allowances as gas installations for equivalent production amounts (WWF 2006). Some allocation options, discussed later in the paper, may provide greater incentive to energy efficiency measures, both on the supply and on the demand side.

Implications from the Limited Sectoral Coverage in Phase I

The limited sectoral coverage of Phase I and Phase II has a few important implications. In Phase I emissions from buildings and transport – sectors, which after the power generation and energy-intensive industries represent the largest share of CO_2 emissions – were for a large part

[12] Several studies have illustrated that there is significant pass-through of EU ETS allowance prices to the wholesale electricity prices in many EU countries. The degree of pass-through also depends on the functioning of the electricity market.

[13] With 0.7 tonne CO_2 per MWh for fossil fuel-based electricity and a price of 10 Euro per tonne of CO_2, the impact of the EU ETS on marginal cost is around 7 Euro/MWh. However, assuming that a large part (90%) of the allowances are allocated for free, and are based on the actual percentage of fossil fuels in power production, the real cost of emissions trading should be around € 0.25 per MWh on average in Europe (Cembureau n.d.).

[14] Ideally benchmarking would favour carbon efficient installations, but differentiating the benchmarks by fuel type or technology softens these effects compared to a uniform benchmark applied in a certain group.

not covered by the ETS cap. Nevertheless, in the context of meeting the national Kyoto targets, sectors outside the ETS are influenced by the initial distribution of emission reduction tasks between trading and non-trading sectors, as implicitly determined in the NAPs. Especially in Phase I MSs favored export-oriented companies inside the ETS, which were required smaller efforts whereas other sectors were required to do more in order to meet the overall national Kyoto target[15]. This worked better in Phase II, although analysis of Phase II NAPs still suggest that European EU ETS industries will not contribute sufficiently to achieving the overall Kyoto target (Rathmann, Reece et al. 2006). This indicates that smaller industries, residential sector and transport that are outside the emission market were required to do more in order to progress on the national Kyoto target. Allowing cost-efficient energy efficiency measures in sectors currently excluded form the ETS would increase the cost efficiency of the ETS compared to its current scope.

The harmonized, sectoral approaches proposed for Phase III aim to tackle the lop-sidedness in mitigation efforts. Nevertheless arguments exist for some of these disproportionate requirements, including past efforts taken in different sectors. In some MSs larger efforts had been made in the past in industry, which is now reflected in the purchase of credits to relief the relative effort of that same industry. Another important argument is that renewable energy targets press heavily on some of the EU ETS sectors, especially the energy sector. Despite all these arguments it still remains that disproportionate efforts are expected from smaller industries, residential sector and transport in several MSs.

Further Issues

Despite the fact that end-use energy efficiency is a low-cost carbon saving option, direct 'competition' of end-use energy efficiency projects against other carbon saving options in the EU ETS might result in the additional deployment of only a limited number of end-use energy efficiency projects. This is because businesses may not recognize energy efficiency as an energy source, as a business opportunity and as a way to improve competitiveness and comfort, as well as due to smaller size of highly cost efficient energy saving measures and associated larger transaction costs. Furthermore power generators obliged under the EU ETS are more likely to take measures on the supply side where their area of expertise is (Bertoldi and Rezessy 2006). Nevertheless, if emission caps are progressively tighter and the allowance price increases, even small-scale measures are likely to become attractive.

Already current evidence shows that under the CDM supply side projects and methane emission reductions are the preferred option for investors. Most energy efficiency-related projects will generate only a small stream of carbon credits and consequently fall under the small project stream of the CDM. Even though this stream is designed for easier flow through the CDM project cycle, as of early 2008 there are less than 15 % energy efficiency projects out of all projects in the CDM pipeline (UNEP/Risoe 2008). At the same time it has been shown that many energy efficiency project types have negative cost of emission abatement[16] (Vattenfall/McKinsey). This demonstrates that energy efficiency projects are under-represented

[15] This is based on the key assumption that the ETS sector will make an even contribution to meeting the Kyoto target as other sectors and gases in the economy in order to provide indication of the extent to which MSs intend to use the EU ETS to move towards their Kyoto target.

[16] E.g. building insulation, fuel efficiency in commercial vehicles, lighting systems, air conditioning, water heating, fuel efficiency in vehicles, standby losses.

relative to their estimated potential, which suggests the existence of factors and flaws, such as high administrative costs or other barriers that are not fully reflected in analyses of the achievable potential for these projects. On the other hand, projects that involve non-CO_2 gases, such as methane, are over-represented because the higher global warming potential values of non-CO_2 projects improve their project economics (Haites 2004) and because their baseline and monitoring methodologies are relatively simple, especially compared to methodologies for distributed end-use efficiency projects. Nevertheless, several efforts are underway around the world to improve the CDM, including policies and strategies to promote investment in small-scale CDM energy projects and assistance for key participants in the process of developing, financing and implementing small-scale CDM project activities. Programmatic CDM is a main lever for such small end-use energy efficiency projects.

In summary the design of the EU ETS, especially in Phase I and Phase II, was unsatisfactory to contribute to emission reductions. More ambitious target setting, causing the price of carbon to stay at reasonable levels, and addressing the flaws outlined above are required to support emission reductions from end-use energy efficiency projects.

Proposed Changes for the Third Trading Period

In January 2008 the European Commission came with a **proposal** for a Directive amending Directive 2003/87/EC so as to extend in time and scope the GHG emission allowance trading system. The proposal must be approved by both the Council of the EU and the European Parliament to become law. The expectations are that a final decision will be taken by 2009. Major changes have been proposed by the Commission for the third trading period (Phase III).

First, it is proposed that there will be one EU-wide cap on the number of emission allowances instead of 27 national caps. The annual cap will decrease along a linear trend line (starting with the average total quantity of allowances in Phase II, adjusted to reflect the extended scope of the system for 2013), which will continue beyond the end of the third trading period (2013-2020).

Second, a much larger share of allowances will be auctioned instead of allocated free of charge. The European Parliament and the Council have endorsed the use of proceeds from auctioning of allowances within the EU ETS to be used for reducing emissions, including for energy efficiency. A 5 % new entrants reserve is envisaged for new installations or airlines (see point 5 below) that enter the system after 2013. However, no free allocation shall be made in respect of any electricity production by new entrants.

Third, harmonized rules governing free allocation will be introduced; these rules will be developed later under a committee procedure[17] and will ensure that as far as possible that the allocation promoted carbon-efficient technologies. Allocation for free will be phased out progressively from 2013, resulting in no free allocation in 2020[18].

[17] Each legislative instrument specifies the scope of the implementing powers conferred on the Commission by the Council of the EU. In this context, the Treaty establishing the European Community provides for the Commission to be assisted by a committee, in line with the procedure known as "comitology". The committees are forums for discussion, consist of representatives from MSs and are chaired by the Commission.

[18] An exception is proposed to installations in sectors judged to be at high risk of carbon leakage, i.e. relocation to other countries outside of the EU that do not impose emission restrictions.

Fourth, while MSs will carry out the auctions and distribution of auctioning rights to MSs will be largely based on historical emissions, part of the rights will be redistributed from the MSs with high per capita income to those with low per capita income.

Fifth, a number of new industries (e.g. aluminum and ammonia producers, and airline operators) will be included in the ETS, along with two further gases (nitrous oxide and perfluorocarbons) in certain applications.

Sixth, MSs will be allowed to exclude small installations (rated thermal input below 25 MW with reported emissions below 10 000 tones of CO_2 equivalent in each of the three years preceding the year of the application) from the scope of the system, provided they are subject to equivalent emission reduction measures. These are estimated to be around 4,200 installations accounting altogether for approx. 0.7% of total ETS emissions. Moreover, installations with less than 3 MW rated thermal input are excluded from the scope of the aggregation clause, potentially leading to another 800 very small installations being excluded[19].

Seventh, the Commission proposed that CDM credits up to the remainder of the level which they were allowed in the second period should be allowed in the third trading period. The extended availability of credits will affect the possibilities for energy efficiency measures.

Eight and most importantly for the present discussion, the Commission is proposing that projects in MSs which reduce GHG *emissions not covered by the ETS* could receive **'domestic offset credits'**. These domestic offset credits would be available only for projects that cannot be realised through inclusion in the ETS. They would need to be managed according to common EU provisions set up by the Commission, which provisions will seek to ensure that domestic credits do not result in double-counting or impede other policy measures to reduce emissions not covered by the ETS. These projects must not entail a huge administrative burden, but should be based on simple, easily administered rules.

Strengthening End-Use Energy Efficiency under the ETS: Practical Design Issues about Domestic Offset Credits

Energy savings can technically be converted into carbon savings (project credits) without a burdensome procedure, and could be treated in a way similar to CERs resulting from CDMs. In the present paper project credits from end-use energy efficiency projects are discussed in the framework of white certificate schemes that involve an energy saving target imposed on a certain category of market actors in the energy sector and tradable certificates for energy savings. An alternative can be certified energy savings (white certificates) that exist on a voluntary basis to meet emission market needs, i.e. not linked to formal energy saving obligations.

Equivalence between emission allowances and emission project credits (such as white certificates) would make it possible to credit the party that has actually undertaken measures that have directly resulted in carbon savings. This section presents a few practical solutions related to allowing the conversion of carbon credits generated from end-use energy efficiency projects into emission allowances. Establishing a *reserve margin* for implementing energy efficiency projects that generate carbon credits is one of these solutions.

We focus on end-use energy efficiency projects implemented in **non-ETS sectors or premises**, such as savings in natural gas in the tertiary or residential sectors. Projects inside ETS

[19] The aggregation clause implies that where one operator carries out several activities falling under the same subheading in the same installation or on the same site, the capacities of such activities are added together.

sectors and/or electricity saving measures are discussed due to double counting concerns: electricity saving measures in ETS or measures that reduce heating consumption on premises heated by DH installations above 20 MW undertaken within the EU *cannot* be converted in a straightforward manner into CO_2 reductions and imported into the carbon market because this would result in the same amount of CO_2 accounted for twice[20]. Different and much less complicated is the case of converting energy savings achieved from natural gas or heating oil on *non-EU ETS premises* into emission project credits. A residential or tertiary building insulation project (in a building heated by a gas or oil boiler) can bring genuine and additional to EU ETS carbon reduction that are otherwise not covered by the EU ETS and that can be accounted for via a white certificate and converted into a carbon (project) credit, which could be used in the EU ETS. **Such non-electricity savings undertaken in sectors outside the EU ETS ones represent genuinely additional emission reductions to the EU ETS that are *easily accountable*.**

On the other hand, such projects will only partly be stimulated by carbon prices even in the range of 20 – 50 Euro/tCO_2 – for comparison the energy tax for households in the Netherlands already equivalent to 100 Euro/tCO_2 has had no discernible effects (Joosen, Harmelink and Blok 2004). In contrast this paper argues for integration of energy efficiency into carbon markets as a way to provide *incentive* for energy efficiency and not following the price increasing effect of taxation[21].

Practical Solutions for Integration of White Certificates into the Carbon Regime

We believe there are the following major routes to establishing links between certificate and carbon allowance markets:

- direct integration by making tradable commodities fungible, and
- set-aside quotas for energy efficiency projects.

Below we demonstrate that while direct integration establishes links between the markets, it does not really integrate them. In contrast set-aside quotas allow real integration of project credits (white certificates) into carbon markets.

Direct integration via one-way fungibility. Here we have a situation with two types of targets (an emission cap and an energy saving target) and two types of tradable commodities (emission allowances and white certificates). One-way fungibility refers to a situation whereby white certificates can be converted into emission project credits and used to comply with emission caps. White certificates are allowed to enter the carbon markets, but in contrast emission

[20] The same electricity or energy savings has also reduced the emissions of the power generator or the DH installation, respectively. For this reason currently the Linking Directive in principle forbids project credits from JI when they lead directly or indirectly to emission reductions in installations covered by the EU ETS. In the case of electricity savings, in theory double counting can be avoided if the indirect impact of savings can be *traced back* to the power generator that benefits from emission reductions due to a particular electricity saving project, for example. Consequently it is a corresponding amount of emission allowances would need to be *withdrawn* from the account of this power generator. However such re-adjustments along the way may be too burdensome to implement.

[21] For example with an average carbon content of 0.5 tC/MWh and prices of 20 – 50 Euro/tCO_2, a MWh saved would accrue 10-25 Euro, which is well comparable to the revenue spent at present for recovering to distributors the cost of saving electricity in the Italian white certificate scheme.

allowances cannot be used to meet energy saving targets. Separate carbon and energy values are assigned to energy savings that are not covered by emissions trading.

In contrast, two-way (full) fungibility would imply that white certificates can be converted into emission project credits and used to show compliance with the emission target and at the same time also emission allowances can be converted into certificates to show compliance with savings targets. This however is not recommended by the authors as it may compromise the integrity of energy saving targets. While end-use energy efficiency projects always have a carbon component (i.e. they displace emissions), not all carbon projects have an energy component and thus leakage into energy saving systems can take place.

Impact of direct integration on the overall cap. With regard to the overall emission cap, direct integration can lead to two scenarios are possible: (a) keeping the initial emission cap intact after allowing project-based white certificates to enter the carbon market, or (b) allowing the cap to be exceeded under certain conditions. The former case is more complex as it will require an equal number of carbon allowances to be *withdrawn* from the total allocation. However such withdrawal scheme is likely to introduce some extra complexity in the system, making it politically unacceptable. In addition the proposal of the Commission for amendments of the ETS specifically emphasizes that domestic offset credits would be available only for projects that cannot be realized through inclusion in the ETS.

The latter case – allowing the cap to be exceeded under certain conditions – would make it possible for the EU ETS installations to exceed their individual caps with an amount of emissions, which can be precisely offset with project-based energy saving credits generated by sectors outside the EU ETS. Because energy savings have precisely measurable carbon content, this will have no implications in terms of environmental soundness as long as the surplus emissions can be covered by white certificates denominated in carbon.

Set-aside quotas. Direct integration via one-way fungibility in effect keeps the two markets – the emission allowance market and the project credit/white certificate market – separate. Depending on the stringency of the caps (emission cap and possibly energy saving obligation) which determines tradable commodity prices, there will probably be profound influences across markets, but no real linkage. An alternative can be to seek integration of energy savings (white certificates) with emissions trading via a dedicated link. A possible approach to integration via a dedicated link is through a set-aside quota in the emissions trading scheme.

A *set-aside* is a pool of allowances that are kept by the program administrator in charge of emission trading and used to reward energy saving projects. Set-asides described here are of o*ffset type* that allows parties outside of formal emissions markets to participate in the emission market by allowing certain types of activities to be recognized as project credits for the emissions reductions they provide. Energy efficiency or renewables set-aside quotas have been developed and introduced by 6 states in the NO_x Allowance Trading Program in the USA (see more in Shiller, Kumar et al. 2004).

Set-aside quotas could avoid possible problems arising from additional allowances generated by energy savings projects, as these are reserved ex-ante and therefore there is no need for ex-post adjustments of allowance numbers. Energy efficiency generate emissions offsets that firms under the EU ETS can purchase to meet their targets.

A set-aside can function in different ways. One arrangement is via a ***reserve margin***: each entity under the EU ETS would have its total emission cap (like at present), but a fraction of this total emission cap would be ‘reserved’ for emission reductions coming from energy efficiency project credits (*dedicated set-aside within a cap*). This reserve is a fixed target representing a share of total emission cap. It can be optional or mandatory. Under an optional reserve margin parties with emissions caps will have the possibility to create or purchase the ‘special’ allowances generated from end-use energy efficiency projects if they wish to fully utilize their initial emission cap. If parties under the emission cap do not wish to utilize the reserve margin, they would only be entitled to a reduced cap. Alternatively the exact share of the set-aside quota can be mandated, thus creating a portfolio standard in the emissions trading scheme and making end-use energy efficiency generate ‘tagged’ emission allowances. Under such arrangement the program administrator reserves a certain share of allowances that are dedicated only to verified and certified CO_2 reductions from end-use energy efficiency projects (white certificates).

Conclusion

The paper has examined the general and specific design features of the EU ETS that may have unintended negative effects on additional efforts in end-use energy efficiency in the first and second trading periods of the EU ETS. It has been concluded that more ambitious target setting, along with addressing flaws related to allocation methods and criteria and sectoral coverage are required. Further, the paper has outlined the main changes proposed by the European Commission for the third trading period. Based on the Commission's proposal that projects in MSs which reduce GHG emissions not covered by the ETS could receive 'domestic offset credits', the authors argue for the establishment of a reserve margin of emission allowances for implementing energy saving projects on fuel use in sectors not included in the EU ETS that generate emission reductions. Because energy savings have precisely measurable carbon content, this will have no implications in terms of environmental integrity of the emission cap as long as the surplus emissions can be covered by white certificates denominated in carbon.

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