Combining long term agreements with emissions trading

An overview of the current EU energy efficiency policies for the industrial sector and a proposal for a new industrial efficiency policy

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Abstract

Industrial energy consumption is still responsible for about 28% of final energy consumption and 41% of the total electricity consumption in the EU. The energy intensity in industry has been steadily improving due to gains in energy efficiency and to structural changes. However, industry still offers a large cost-effective potential for CO_2 emission reduction of about 12% as indicated in the ECCP final report [ECCP 2000].

Traditionally in the EU the industrial energy efficiency policy has been left to Member States' initiatives. These initiatives have resulted in different instruments being adopted or used, in particular long term agreements (e.g. NL, UK, D, B), energy or CO_2 taxes (UK, DK both combined with agreements) and energy audits (e.g. SF, F). The EC itself has expressed some interest in the agreements instrument and has proposed some harmonisation in the criteria.

Recently the EC has adopted a proposal for emissions trading (COM(2001)581 final) to reduce GHG emissions. The proposal addresses energy efficiency, however, only for large industrial and power-production installations for which emissions allowances are allocated. Because the proposed emissions trading scheme covers only direct emissions, it does not focus on electricity end-use energy efficiency options directly.

The paper presents an overview of the policy instruments and initiatives to promote energy efficiency in the industrial sector an proposes a process how to combine emissions trading with energy efficiency instruments such as agreements and audits. The introduction of indicative efficiency targets per each sector – e.g. by using the benchmarking approach – is also discussed to facilitate the integration of the two instruments.

Introduction

In recent years long term agreements (LTA, also called voluntary or negotiated agreements) got more and more attention within the European Union as a means to increase energy efficiency in industry and consequently to achieve the CO_2 reduction targets of the Kyoto protocol, which is ratified by now by all EU Member States. In general agreements are the favoured policy instrument of industry as they tend to avoid mandatory approaches such as new regulations or taxes, fearing negative effects concerning international competitiveness.

Several EU Member States introduced agreement schemes by linking them either to CO_2 or energy taxes, to subsidy schemes or to energy audits procedures [Starzer 2001a, Bertoldi 1999]. The main principle of all approaches was to intensify industry's efforts to increase energy efficiency by offering them in turn incentives such as tax rebates and reductions (like in the UK climate change levy or the Danish industry agreements), subsidies for audits and/or for investments and providing services to help them improving their energy situation (e.g. the French Decision making support scheme or the Finnish energy audit programme). Several Member States' Governments included or were starting to include agreements into their policy mix

as long as they were in line with the EC guidelines on environmental state aid [EC 2001].

With the adoption of a proposal for a EU wide emissions trading scheme (COM(2001)581 final) to reduce GHG emissions [EC 2002] a new instrument entered the "energy efficiency market" creating a need for integration within the existing policy mix. The proposal concerns in general all installations exceeding 20 MW rated thermal input, but in particular mineral oil refineries, coke ovens, production and processing of ferrous metals, mineral industry and other activities such as the production of pulp and paper. For these concerned energy intensive industries it looks like emissions trading can put an end to all agreement-like approaches. Within national allocation plans they will be given absolute emissions allowances for a certain time period. Do they produce more emissions as they have allowances they have to buy, do they produce less they can sell. This is the usual functioning of a trading scheme.

How does energy efficiency come into the game? As the proposal mentions in its Annex III (criteria for national allocation plans) "*the total quantity of allowances ..... shall be consistent with the Member State's obligation to limit its emissions .....*" and "*..... with the potential, including the technological potential, of activities covered .....*", it can be concluded that the national allocation plans have to take into account energy efficiency developments of the concerned installations. However, the criteria are not yet very precise, leaving some leeway for national Governments, even if the EC promised to come up with guidelines on how to use the criteria by latest end of 2003. The paper explains how national allocation plans can take advantage of agreement schemes, in order to quantify realistic potentials.

One particular issue presents the fact that the emissions trading scheme covers only direct emissions, i.e. it does not quantify industrial emissions resulting from electricity consumption. These emissions are quantified for the power production installations, which practically excludes electricity end-use energy efficiency options such as motors and drives, efficient lighting etc within industrial installations. This could lead to serious implications such as shifting from thermal installations to electricity, giving also wrong signals for industrial CHP. The paper presents and discusses different options how energy efficiency targets can be integrated or linked to the emissions trading scheme, by using benchmarking and audit approaches.

Overview of industrial energy efficiency policy instruments and initiatives

The following chapter gives an overview of the most important policy instruments and initiatives to increase energy efficiency in industry – such as agreements, energy and CO_2 taxes, energy audits, best practice initiatives, benchmarking and energy management (E2MAS) – and points out their possible relation to the EU emissions trading scheme.

AGREEMENTS

LTA are understood to be "negotiated agreements": through bargaining between a public institution and industry (OECD classification) targets are set in order to improve industrial energy efficiency. LTA as such represent only a framework. They have to be integrated in the existing national policy mix and linked to effective accompanying measures. The framework has to provide all features necessary to allow two parties to enter into a transparent negotiation process concluding in signed contracts. It has to take into account the various players and involve them in an early stage, it has to define appropriate mechanisms if contracts are violated and it has to ensure independent monitoring and evaluation [Starzer 2001 a/b]. Especially the target setting process looks very similar to the negotiation when emissions are allocated to individual installations for the national allocation plans.

In general two basic approaches towards LTA can be taken into account:

- The "mandatory" approach:
  Countries with (existing) CO_2/energy tax schemes were using LTA to justify tax exemptions for energy intensive industry. A typical example is the Danish or the UK case. The LTA scheme in the NL offered industry an easier access to environmental permits.
- The "voluntary" approach:
  Countries with existing energy audit programmes or similar schemes can use LTA to design a visible and more flexible and effective framework to achieve environmental targets. This seems to be the case e.g. in Finland.

Of course in reality these approaches often appear in combination. While the "mandatory" approach offers a clear offer/sanction mechanism, the "voluntary" approach integrates effective accompanying measures to support companies in achieving their targets. "Mandatory" approaches were so far limited to national initiatives, but for the "voluntary" one exist also examples on the EU level (e.g. the Motor Challenge and the Green Light Programme).

ENERGY AND/OR CO_2-TAXES

In general the nature of "green" taxes is to let the party being responsible for emissions take also the financial responsibility. Companies which are environmentally very good should pay less than the bad ones. The collected tax should be fed back to society in a manner to support environmental issues and/or to lower labour costs. Reality is of course a bit different. As already pointed out above industrial companies have often lower tax rates (e.g. justified through agreements etc).

In general taxes present a good means to increase awareness. For industry it is only important that they do not distort competition. So far such taxes are applied only on national level, however, some harmonisation within the EU is at the moment ongoing and the EC is in the process of preparing a directive.

ENERGY AUDITS

Energy audits are applied throughout the EU as well as in the accession countries. After first IEA analyses two major audit studies (AUDIT I and AUDIT II, financed by SAVE II) identified in about 28 European countries a huge amount of programmes which have audits at least as a strong element. Energy audits can be described as tool for decision making,

it is a systematic procedure to evaluate the energy situation of a site or object, to identify energy efficiency measures within these sites and to report these activities. Thus their main purpose is to illustrate energy efficiency possibilities for an energy end-user (e.g. an industrial company) and to convince this end-user to realise at least those projects which are economically profitable [Väisänen et al 2002].

Energy audits have a clear connection to both, agreements and emissions trading. Several agreements schemes (e.g. in Finland, Denmark, UK, etc.) have audits as their operational tool. Also for ET it can be actually the tool to get transparent information on how to allocate emissions within the national allocation plan.

BENCHMARKING

Benchmarking is a tool well known in industrial companies for economical comparisons. Energy benchmarking builds on this principle and provides a mechanism to compare the specific energy consumption (SEC) of companies. In principle the mechanism is very simple: comparable companies e.g. from one industrial branch relate their yearly energy consumption to their product output figures or other suitable indicators. This produces a SEC value which can be compared. The companies with very high values see that possibilities exist to lower their consumption. The tricky part is that each production company argues to be unique. So it is very important to define clusters of companies where apples are compared with apples and not with pears. Also confidentiality issues have to be taken into account.

Several national programmes include a benchmarking element (e.g. the Norwegian Industrial energy network, the UK programme action energy etc.). The NL adapted their LTA scheme to a benchmarking covenant. Also a couple of EU studies have been carried out on energy benchmarking [Irish Energy Centre 1999, Best Practice Initiative 2002]. The main findings were that benchmarking has to be kept simple, if applied on a trans-national level. Benchmarking results give only first indications where energy efficiency potentials sit. In terms of emissions trading benchmarks could get very attractive, as they might be the means to evaluate technological potentials for the allocations plans.

BEST PRACTICE

With the best practice instrument it is understood to give companies practical examples on which are the best installed measures that can be found on the market. It builds on the principle that to show what others already realised is the most convincing argument to do it as well. Several national programmes include this more service-oriented mechanism e.g. the former UK best practice programme (now called "action energy") as well as international activities such as CADETT. Best practice check lists adapted to the specific needs of groups of companies can provide an overview of practical energy efficiency measures. In terms of emissions trading such check lists can also refer to the BAT (best available technologies) documents of the IPPC directive [IPPC 1996].

ENERGY MANAGEMENT

Applying energy management in industry means that companies should continuously analyse the energy consumption of their sites. They should identify on a continuous basis possibilities to increase their energy efficiency (which can be done by energy audits), if possible also involving their employees (shop floor activities).

Several national programmes involve energy management such as the Norwegian industrial energy efficiency network. Denmark even made energy management for companies mandatory by law. Also on the EU level energy management has high visibility. It is mentioned in the ECCP as the means to increase energy efficiency especially for small and medium sized enterprises (SME) and it should be integrated within the European EMAS system (environmental management and auditing scheme) called then E2MAS.

The EU GHG emissions trading scheme

Several countries already developed trading schemes for energy efficiency and green certificates. Tradable green certificates have been established in several EU Member States including UK, NL, B (Flanders), S and DK. Tradable certificates schemes for energy efficiency were considered e.g. in Australia, Italy and the UK [Berutto et al 2002].

In beginning of Dec 2002 the European Council agreed to the adopted "*proposal for a directive of the European parliament and the council for establishing a scheme for greenhouse gas emission allowance trading within the Community*". In principle this scheme offers the possibility to realise the most cost-effective measures to reduce GHG emissions while still achieving the same environmental benefit: operators which can meet their emissions targets only with high costs can buy from others which have met their obligations at lower costs and have access allowances to sell [Wallström 2002].

This first trans-national emissions trading scheme is supposed to cover about 46% of the EU 15's total CO_2 emissions in 2010. The proposal foresees that the first three year trading period shall start from 1 January 2005 and will be limited only to CO_2. It covers all activities specified under Annex I of the proposal which practically includes all energy intensive sectors (see Table 1).

According to the common position of the Environment Council, each installation gets emissions allowances for the whole period. For the first period (2005-2007) they are free of charge (grandfathering), for the second phase (2008 to 2012) up to 10% can be auctioned. However, after the first reading in the European Parliament 15 % auctioning is suggested for all phases. The Member States have to allocate the emissions to the concerned installations by means of a national allocation plan and according to defined criteria. The plans will be checked then by the European Commission, which until end of 2003 also will develop guidelines on how these criteria have to be applied. This might be a challenge for Member States as they have to establish their national allocation plans before they really know these guidelines. The Member States have to yearly report to the EC.

If installations do not meet their obligations they have to pay a penalty of 40 Euro per ton CO_2 for the period 2005-2007, for the next periods it will be 100 Euro/ t CO_2. Emission reductions from JI (joint implementation) or CDM (clean development mechanism) projects can be used by

Table 1. Categories of activities covered by the ET scheme (source: [EC 2002], Annex I).

Activities (installations)
energy activities: ▪ combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations) ▪ mineral oil refineries ▪ coke ovens
Production and processing of ferrous metals: ▪ Metal ore (incl. sulphide ore) roasting or sintering installations ▪ Production of pig iron or steel incl. continuous casting, capacity > 2.5 t/hour
mineral industry: ▪ Production of cement clinker in rotary kilns (capacity > 500 t/day), or lime in rotary kilns (> 50 t/day, or other furnaces (production capacity > 50 t/day) ▪ manufacture of glass incl. glass fibre (melting capacity > 20 t/day) ▪ manufacture of ceramic products by firing (production capacity > 75 t/day) and/or kiln capacity > 4 m3 and setting density per kiln > 300 kg/m3
Other activities: ▪ Production of pulp from timber or other fibrous materials ▪ Production of paper and board, capacity exceeding 20 t/day

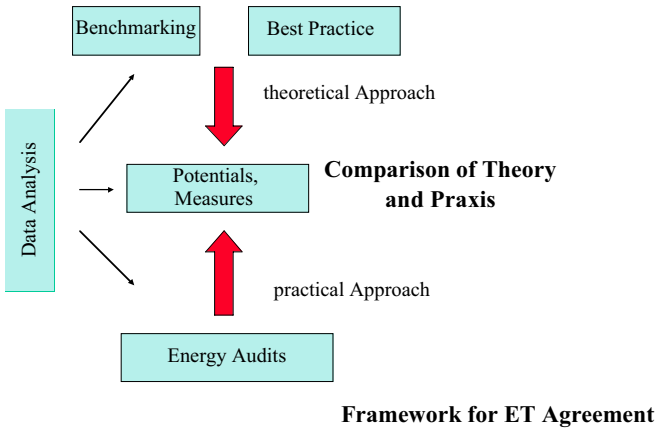

Figure 1. *Framework for ET agreement, including Benchmarking, Best Practice and Audits.*

the companies to fulfil their emission reduction targets. The details will be regulated in a specific directive, which will be proposed by the EC next spring. It is also agreed that companies have the possibility to pool their emissions allocations until 2012, which means that e.g. industrial branches can try to find a common solution.

The proposal foresees also the possibility to integrate early actions, i.e. CO_2 reduction measures or investments a company has already undertaken at an installation since 1990. For the future the EC has to consider the relationship of the EU trading scheme with the international emission allowance trading that will start in 2008 and has also to adapt the scheme to an enlarged European Union.

After the first reading the European Parliament supports the national allocation plans but mandatory benchmarking and quantitative limits for Member States according to their respective targets should be considered. Credits for JI/DCM projects should not be considered before 2008.

Energy efficiency and the ET scheme

The crucial part within the ET scheme in terms of energy efficiency is the national allocation plan. It can be easily assumed that the negotiations between authorities and industry on how to agree on absolute emissions targets are a very "delicate" matter: For the industrial companies it means that they get a cap on their emissions which can affect their economical growth considerably. Thus they might tend to get as many allowances as possible not to limit possible production increases. Companies will of course also try to include their early actions.

For the authorities on the other hand it is important to make the system work and to achieve high environmental benefits. National governments have to consider that the allocation plan should be consistent with the targets of their national climate change programmes as well as with the obligation under the EU burden sharing under the Kyoto protocol. They have also to make sure that the quantities of allowances match the actual (technological) potentials. This might lead to conflicting situations with industry and therefore transparent information on the available potentials can be of utmost importance.

HOW TO CONSIDER ENERGY EFFICIENCY WHEN ALLOCATING CO_2 EMISSIONS?

As already pointed out in [Berutto et al 2002] one of the main implementation issues for trading schemes is how to verify energy efficiency projects and how to set baselines against which to measure their impact. This paper proposes a transparent process how the allocation of CO_2 emissions could integrate energy efficiency projects by using an agreement approach including benchmarking, best practice and audit elements to verify technological potentials (see Fig 1).

The emissions trading scheme can actually present a strong driver towards industrial energy efficiency if it is prepared in the right way. As Member States and their respective authorities have almost no chance to check and monitor all ET installations regarding their actual energy efficiency status in detail, they should prepare a framework which takes energy efficiency well into account. Within a general (long term) agreement with the concerned industry (signed maybe on a company-by-company basis) they could agree on a common procedure how companies have to check their actual energy efficiency status.

In order to identify the technological potential of installations a two-fold approach is suggested:

1. On the one hand a theoretical approach should be followed:
   Based on a comprehensive data analysis of all energy and CO_2 related data of an installation – which is anyway necessary for the allocation of emissions –benchmarks should be developed for each comparable type of installation. In many cases the values presented in the BAT documents (best available technologies) of the IPPC directive [IPPC 1996] can serve as master benchmarks to define what is best value. It is important that the benchmarks take into account the thermal as well as the electricity consumption. Then the distance from the best value can be distinguished and serve as a first indication on the technological potential. However, it is

essential to know that benchmarking is not a perfect instrument. It can only give the general tendency. Therefore in parallel checklists of theoretically possible best practice measures should be developed. By commenting this check list a company can point out which measures they already accomplished since 1990 (early actions) and which are still open to be realised. Pay back time will be an important criteria to justify that measures are not yet undertaken.

2. On the other hand a practical approach should be followed:
   To be able to compare the theoretical results with "real life", companies under the ET scheme can undertake energy audits to show the realistic potentials which are applicable on their site. The audits could be carried out by the company's staff themselves or by third parties such as consultants, ESCOs etc. Whoever carries out the audit has to follow clearly defined audit procedures, to ensure the quality and comparability of the results. This will ensure that transparent emissions allowances are considered in the national allocation plans.

Depending on the outcome of this process each installation will get a certain amount of CO_2 emissions allowances for the basis period (e.g. 1998-2000). This may be corrected according to the early actions identified. The angle of allocation line for the first period (2005-2007) can then be chosen according to the potential and measures identified within the above mentioned process (see figure 2).

The adjustment for early action only can apply for the first period. The allocation of emission rights for the second period must be based on the allocation of first period and could be adjusted for structural changes in the first period (e.g. shift from fuel to electricity).

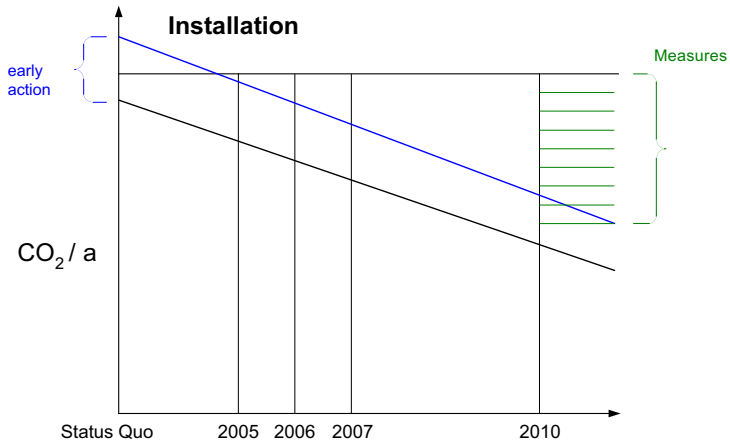

Figure 2. *The allocation plan for an installation, early actions and potentials (measures).*

PROBLEMS IDENTIFIED: ELECTRICITY END-USE, CHP

One particular problem presents the fact that the emissions trading scheme covers only direct emissions. Each installation gets only emissions allowances (and certificates) for CO_2 emissions produced by energy carriers such as fossil fuels. However, industrial emissions resulting from electricity consumption are not quantified for the industrial installation itself but for the power production installations, which supply the electricity. This fact might take away the focus from all end-use energy efficiency measures effecting the on-site electricity consumption of industrial installations such as motors and drives, efficient lighting etc and could lead to negative effects for energy efficiency.

Companies might be better off to switch from thermal installations to electricity supply if the production process and economy allows it. Or they might buy electricity from the grid rather then to produce it themselves in an industrial CHP. Within the emissions trading scheme it might be then tempting first to get all allowances for an industrial CHP (which is mostly fossil fired) and then to switch to electricity supply and sell the free allowances on the market. This might lead to exactly the opposite effect as the EC has intended with the aim to increase the share of cogenerated electricity to 18% [Cogen Europe 2002].

If this happens, then it depends strongly on the market mechanisms (also induced by the emissions trading scheme) whether the power production companies will give a price signal towards their industrial customers when the demand for electricity rises and they needed to build new plants or to "switch on" older not so efficient ones. It is also thinkable that the power production companies rather increase the prices for households than for industry, or at least to a higher percentage.

This observations lead to the conclusion that it is absolutely necessary that within the emissions trading scheme energy efficiency options effecting electricity consumption are sufficiently considered e.g. in the allocation plans.

POSSIBLE SOLUTIONS

There exist several options to avoid above mentioned effects. However, the proposed adjustments can apply only for the allocation for the next period.

Electricity savings

For all industrial installations which use fossil fuels to produce their demand for thermal energy but buy the electricity from the grid – and this might count for the majority of installations – the emissions allowances will not cover the consumed electricity. However, Annex III of the proposal states, that the national allocation plans have to take into account the technological potential of each installation.

Therefore, as already pointed out in Figure 1, it is proposed to benchmark each installation, i.e. to calculate the specific energy consumption (SEC = energy consumption per unit of production output; e.g. TJ/t) of each site and to compare it to a best value for a specific type of installation. This has of course to be done separately for the thermal as well as for electrical consumption. It is further proposed to compare these values to the best values stated in the BAT (best available technologies) documents of the IPPC directive. If for some types of installations no BAT values are available, appropriate values still need to be defined. However, it has to be stated, that for a plenty of very complex installations in branches covered by the directive the benchmark approach is quite difficult to implement.

This benchmarking process is indeed very similar to a target setting process when negotiating a LTA. In practice it is the introduction of efficiency targets for industrial sectors or groups. It offers the possibility to monitor also the specific electricity consumption of an installation. If the monitoring of the electricity benchmark shows no increase in energy efficiency over time (or even a decrease), this could be taken into account by re-adjusting the allocation plan for the specific installation.

A nice solution is to calculate CO_2 benchmarks, which would level the thermal and electrical consumption. However, to be able to do so reliable emission factors for electricity are needed. A further pre-condition is to know the right electricity mix of an installation (portfolio mix: how much from UCTE, fossil, hydro, etc?). There are several ongoing projects working on the issue of electricity labelling. For the time being the uncertainties of such an approach are probably bigger than possible energy savings.

A solution to integrate energy efficiency for electricity is to offer industrial companies the possibility to enter into an agreement which promotes electricity end-use options. It might be worthwhile for industrial companies concerned by the ET scheme to sign up to EU wide voluntary programmes such as Motor Challenge [MCP 2003] or the Green Light Initiative, if it is ensured that their signing up is recognised widely as a strong will to get active at the electricity end-use side. Within these programmes companies are obliged to undertake motor audits and to draw up energy efficiency action plans. However, companies will only burden themselves with such activities, if these agreements are recognised adequately during the allocation of emission allowances.

Another link to agreements is possible if an industrial branch opts for a pooling solution. Whether this presents in general a realistic scenario can be doubted, since the allowances are allocated per installation. But for industrial branches with few member companies or with very homogenous firms (in terms of energy efficiency) this might be an attractive solution.

Industrial CHP

The possibility of CHP disincentives might be a serious problem. But it does not only apply to industrial CHP. Also public CHP for district heating are concerned. Industrial CHP are considered as "energy activities" according to Annex I of the ET proposal, if their rated thermal input exceeds 20 MW or if they are mentioned explicitly as industrial sector. In principle for CHP applications counts the same than for electricity savings: The energy efficiency status of the installation can be monitored via a specific benchmark , in this case the total efficiency of the CHP unit. For definitions of efficiency etc. the forthcoming European CHP Directive [EC 2002a] should serve as basis.

The following options are practically possible [Cogen Europe 2002]:

- If new CHP are build or old ones are upgraded they could be treated like new entrants to the system, which means that Member States had to establish a sort of "allowance reserve";
- Allocation of allowances to useful heat and/or power output: This option would immediately reward CO_2 savings from existing CHP installations (early actions, only after 1990);
- Probably the best solution is to calculate the CO_2 savings according to the rules of the forthcoming European CHP directive [EC 2002a]. Then the savings could determine the amount allowances (early actions).

There is still a lot of leeway in order to avoid that industrial CHP are not installed or upgraded or that they are even shut down and replaced by heat-only applications (so called "steam blocks"). The forthcoming EC guidelines might be suitable to consider these issues.

Conclusions

The proposed EU emissions trading scheme can present a strong driver towards industrial energy efficiency if it is prepared in the right way. The EC together with the Member States and their respective authorities could prepare an agreement-like framework which takes energy efficiency well into account when deriving national allocation plans. Such an agreement – maybe signed on a company-by-company basis – could specify a common procedure how industrial companies have to check their actual energy efficiency status. This would combine theoretical approaches like energy benchmarking with practical tools such as energy audits applied on company level. A link to BAT documents and BAT values is proposed.

To avoid negative effects on energy efficiency due to the fact that the ET scheme only quantifies direct emissions the monitoring of an electricity benchmark is suggested. This would ensure that electricity end-use options such as motors, lighting etc are not excluded within the scheme. The opportunity to enter into voluntary type of programmes such as the Motor Challenge should be considered as a possibility for industry to show their improvements on the "electrical side". In the long term CO_2 benchmarks (based on reliable emission factors) are proposed.

(Industrial) CHP should get adequate attention within the ET scheme and the EC and Member States have to ensure that the trading scheme does not have negative effects on this technology. A link to the forthcoming CHP directive and the EC guidelines (on how to apply the allocation criteria) would be more than welcome.

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