Benchmarks as a basis for allocation of emission allowances in the energy sector

Stage 1
An assessment of practical applicability

Contents

1 Summary and conclusions

The National Energy Agency has been instructed by the Government to set benchmarks for electricity and heat production that can be used as a basis for assigning emission allowances for both existing plants and for those brought into the emissions trading system at a later date ('new entrants'). This report, which is a feasibility study for a more extensive analysis of the use of benchmarks in the energy sector, consists of an assessment of the practical feasibility of such an approach prior to setting the allocations for the 2008-2012 commitment period. The Agency has been instructed to put forward its proposals for benchmarks by not later than 31st October 2005, together with a presentation of associated effects and consequences in terms of such aspects as simplicity, environmental impact and relations with other policy instruments.

Some changes to national legislation governing the emissions trading system will be needed prior to the coming trading period of 2008-2012. In connection with the necessary review, there is also justification for investigating whether some other principle should be applied for determination of emission allowances. In this context, it is relevant to note that the Government has stated that benchmark-based allocation is a desirable principle of allocation, which should be employed wherever it is feasible in practice[1].

In order to enable it to prepare this report, the Agency has found it necessary to prepare an initial assessment of how a benchmarking system for the determination of emission allowances might be constructed for the energy sector. Naturally, no final recommendations can be made until the results of the rest of the work are known. The Agency has also elected to comment on the reasons for constructing a national benchmarking system.

A summary of conclusions

Overall

- The Agency is of the opinion that a national benchmarking principle for assigning emission allowances in the energy sector should be developed, while waiting for a harmonised allocation principle within the entire EU. We start from the principle that the system must be simple, easy to extrapolate and must contribute to ensuring that the emissions trading system becomes an accepted long-term instrument.

- The Agency notes that benchmarks have been employed in the allocation plans

[1] Bill no. 2004/05:18, *Trading in Emission Allowances II*

for the 2005-2007 period, although only to a limited extent and primarily for new entrants falling within the remit of the system.

- The Agency recommends a benchmarking principle that is not based on fuels. Reasons for this include the fact that a fuel-dependent approach would involve more problems in connection with the classification of plants, and the fact that a national fuel-dependent benchmarking system would not differ sufficiently from the present emissions-based system.

- It is our preliminary assessment that a non-fuel-dependent benchmarking principle is compatible with the Directive's allocation criteria.

- We are of the opinion that the size of the benchmark for electricity to be applied to and used by new entrants to the system should be set such that it results in a harmonisation between the countries of northern Europe.

- The Agency is of the opinion that a benchmarking system can be constructed without having to know in advance what the aggregated allocation for the energy sector will be. Any necessary scale factors can be applied retroactively, regardless of the magnitude of the benchmarks calculated on the basis of national data.

Construction of benchmarks

- The Agency assesses that existing statistical material provides the necessary basis for calculating national non-fuel-dependent benchmarks for electricity and heat.

- The Agency is of the opinion that benchmarks for existing plants should be based on their production during the most recent activity year for which data is available, and that separate benchmarks should be developed for electricity and heat.

- The Agency feels that, as far as new entrants to the system are concerned, there is reason to consider allocations derived from the use of capacity-based benchmarks.

- The Agency is of the opinion that, in its continued work, there is reason to analyse the extent to which industrial boilers should be included in, or covered by, the benchmarking principle.

- The Agency is of the opinion that, in its continued work, there is reason to analyse how *existing* cold condensing power plants should be treated in the benchmarking system.

Some general notes on benchmarks

The National Energy Agency is of the opinion that, until a harmonised allocation principle has been developed for application throughout the EU, a national benchmarking principle for the allocation of emission allowances in the energy sector should be developed.

There is considerable pressure within EU institutions and in many member states to agree the use of benchmarks as a basis for determining the allocation of emission allowances. The Directive[2] includes several criteria that have a bearing on the use of benchmarks as a basis for assigning emission allowances: almost all of them underscore the many benefits of a benchmarking procedure. When the Commission reviews the Directive in 2006, it will investigate the possibility of developing benchmarks that are applicable throughout the EU: several countries are already working on preparations for such systems[3]. Greater use of benchmarks can therefore be expected during the nearest upcoming trading periods. However, it is unlikely that the EU will be able to decide on changes to the Directive in time to harmonise allocation on the basis of mandatory international benchmarks before 2013.

Sweden must therefore choose between waiting for common benchmarks with obligatory effect to be developed as a result of changes to the Directive, or introducing its own benchmarking procedure, either on its own or in conjunction with other member states.

The main emphasis of the joint work that several countries are engaged in in order to develop a harmonised procedure based on the use of benchmarks is the possibility of developing benchmarks that differ for different technologies and different fuels. The National Energy Agency is monitoring this work, and feels that it represents an interesting approach, but is at present unsure of the impact that it could have, if applied on a voluntary basis, in time for the 2008-2012 allocation period.

The Agency is of the opinion that a national benchmarking principle can be applied for the Swedish energy sector, without other countries necessarily having to do the same. The reasons for the Agency's assessment include:

- the fact that conditions are particularly favourable in the energy sector for the establishment of benchmark-based allocation, due to the fact that the sector's products are few and mutually comparable,

[2] Directive (2003/87/EC) on Establishing a Scheme for Greenhouse Gas Emission Allowance Trading.
[3] Article 30(2)(k), Directive (2003/87/EC) on Establishing a Scheme for Greenhouse Gas Emission Allowance Trading.

- the fact that, over time, there will be progressively less need to compensate plants producing high carbon dioxide emission levels for the increased costs resulting from application of the system,
- the fact that the allocation-determining years in an emissions-based allocation system cannot be updated. A procedure by which the allocation-basing period could be extended or updated would disadvantage measures already taken and/or would create an incentive for individual companies to maintain high emission levels,
- the fact that, by definition, new entrants into the system during 2005-2007 cannot be regarded as new entrants during the 2008-2012 period, but should in principle receive allocations on the same basis as other existing plants, *and*
- the fact that, in the next trading period, it is not particularly relevant to base allocations on 7-14 year-old statistics, which would be the result if present principles were retained.

At the same time, the Agency is of the opinion that an internationally harmonised allocation principle is to be recommended, and that it is important that Sweden should participate in the work of developing such a benchmarking system. The results of Swedish experience can be employed in the EU-wide work. The Agency also accepts that, if an international benchmarking principle is developed, it may be necessary to modify a national Swedish benchmarking system. In this respect, a national system does not present any problems, but can instead be seen as a step along the road towards an EU-wide system.

The Agency notes that benchmarks have been employed in determining the allocations for the 2005-2007 period, although to only a limited extent and primarily in respect of new entrants.

Several countries have chosen to employ benchmarks as a basis for determining emission allowance allocations during the introductory 2005-2007 trading period, although the actual methods by which these benchmarks have been calculated vary from one country to another. Some countries have based their calculations on the needs of energy-efficient plants using some particular fuel, while others have based their values on average specific emissions for all plants within a particular activity. Several countries have related their benchmarks to the size of additional capacity in new plants, which means that they have had to make assumptions concerning the utilisations of particular types of plant.

The present application of benchmarks is connected primarily with allocations of rights to *new entrants*, although there are exceptions under which existing plants have been treated in accordance with the same principle. One such is Lithuania, which has set different benchmarks for different processes: one for cold condensing power production, of 576 tCO_2/ GWh_{el}, two for electricity from CHP production (421 and 779 tCO_2/GWh_{el}) and two for the production of heat (250 and 289 tCO_2/GWh_{heat}). The different levels reflect whether the plant is able to burn

natural gas or not. The Swedish allocation plan assigns emission allowances to combustion plants on the basis of benchmarks and a forecast of future fossil-based production: these benchmarks are 265 tCO_2/GWh for electricity and 83 tCO_2/GWh for heat.

The design of benchmarks

The National Energy Agency recommends a non-fuel-dependent benchmarking principle.

The Agency is of the opinion that there are several substantial reasons for why a *non-fuel-dependent* benchmarking principle is to be preferred over a *fuel-dependent* principle. They include:

- practical problems associated with the number of benchmarks, and the need to classify plants capable of using several fuels,
- the fact that classification based on fuel groups can result in undesirable incentives, e.g. the fact that a plant which, as a result of these measures, converts to a fuel having a lower carbon dioxide intensity, risks subsequently ending up in a group of plants having a lower benchmark. This would counteract any incentive to make improvements, and thus also the overall efficacy and objective of the system[4].
- the fact that a *fuel-dependent* principle for new entrants could result in a company investing in a more carbon dioxide-intensive technology than would have been the case if the market price of emission allowances alone had been the determining factor, unaffected by allocation principles.

The Government's Bill (2004/05:18) *Trading in Emission Allowances II* states that the benchmarks that might be used in the energy sector should be applied across the entire collective of plants, including those burning biofuels. The Agency's interpretation of *'the entire collective'* is that it refers to both new and existing plants.

It is the Agency's preliminary assessment that a non-fuel-dependent benchmarking principle is compatible with the allocation criteria set out in the Directive.

In its guidelines for application of the criteria for allocation set out in the Emissions Trading Directive, the Commission has said that, within a framework for allocation based on benchmarks, it recommends classification of the plants on the basis of their types of fuels, with separate benchmarks for the separate

[4] In the same way, it would be unsuitable if a change to a more carbon dioxide-intensive production process were to be rewarded by a higher allocation.

groups[5]. However, there is no specific prohibition of the use of non-fuel-dependent benchmarks.

In this context, it is worth noting that, through its acceptance of the Lithuanian allocation plan, the Commission has *de facto* indicated that a non-fuel-dependent benchmarking principle can be compatible with the subsidy rules set out in the treaty. The Agency is also of the opinion that benchmarks based on average emissions from the types of plants concerned in Sweden will not exceed the benchmark levels accepted by the Commission as compatible with the requirements in its acceptance of the Lithuanian plan.

In its final version of this report on the use of benchmarks in the energy sector, to be published in October, the Agency intends to include a more in-depth analysis of how the non-fuel-dependent benchmarks relate to the criteria in the Directive. At the same time, the Agency recommends that the Government should enter into a dialogue with the Commission in order to *ensure* acceptance of the non-fuel-dependent benchmarks which, during the autumn, will have been developed for the Swedish energy sector.

If, against expectations, continued work shows that a *national* principle has no room for alternatives other than the application of *fuel-dependent* benchmarks, the Agency feels that it would be unsuitable to use benchmarks for the energy sector with effect from 2008. This is because a fuel-dependent approach would involve practical problems in connection with classification of plants and the calculation of associated benchmarks. In addition, it still remains to be decided how, when using such a method, it will be possible to avoid the undesired incentives that would risk arising in connection with changes to classification in subsequent periods. Other reasons are that a national fuel-dependent benchmarking system would not be sufficiently different from the present emissions-based system to justify the greater complexity of the method.

For existing plants, the basis for application of benchmarks should be production from the plants during the most recent activity years for which data is available.

The Agency feels that it is *production*, as opposed to installed capacity or energy input, that should be the preferred allocation-determining parameter for existing plants. However, as far as *new entrants* are concerned, there are reasons to indicate that a capacity-based approach has some advantages in practical terms: see separate conclusion of this summary.

There is no reason, in a production-based allocation system, to choose a historically remote series of years *(activity years)* on which to base the allocation, although this is the case in an emissions-based method. Basing the allocation instead on forecast production data has the advantage of largely allowing for future changes to the plants, although it is not suitable from an administrative

[5] KOM(2003)830, Final.

point of view. Nevertheless, the need to be able to allow for changes in production from individual plants is met by the rules for determining allocations for new entrants, and by the fact that the activity years in a *production-based* allocation system can be updated during later trading periods. As far as existing plants are concerned, it is therefore their production during years for which *latest available data* exists that provides the best basis for allocation, both in terms of simplicity and of the most representative allocation.

In addition, the choice of activity years on which to base the allocation should also reflect the availability of statistical material, as well as the fact that, by June 2006, it will be necessary to have decided an indicative allocation for each of the years in the trading period. A possible period in this respect is therefore 2000-2003.

The Agency is of the opinion that separate benchmarks should be employed for electricity and heat.

The Agency feels that it is appropriate that the benchmarks should reflect a distinction between electricity and heat production. If separate benchmarks are not applied for these products, there is a risk of over-valuation of heat, both in terms of physical and of production technology aspects. As the energy efficiency in a combined heat and power plant increases as the amount of electricity produced is reduced, the use of identical benchmarks creates an incentive to use the same fuel to produce more heat at the expense of electricity, as this would result in a greater allocation of emission allowances without actually increasing the need for them.

The Agency is of the opinion that benchmarks for existing plants in a Swedish benchmarking system should be based on national conditions.

The size of the benchmarks can be based on national or international data, in the form of average specific emissions for plants of the particular types concerned.

According to the Agency's assessment, a non-fuel-dependent benchmarking principle that is limited to the Swedish market cannot use benchmarks that are based on international data. This is because it would give a one-sided result, without ensuring that all winners and losers were included within the group of plants covered by the comparison with the benchmarks[6]. As, in comparison with plants in other countries, Swedish heat and electricity-producing plants have a relatively low carbon dioxide emission intensity, this would result in an allocation that exceeded the sector's needs without creating a corresponding deficit in any other country. If any benchmarking method based on non-fuel quantities is to be built up from international data, it will presumably be necessary to consider this when determining the internal Burden-sharing agreement when the EU sets the individual country allocations for fulfilment of the joint EU commitment.

[6] 'Trading for a better climate – From introduction to application' (SOU 2005:10), page 137.

The Agency feels that the size of electricity benchmarks for new entrants to the system should be set such as to result in harmonisation between the northern European countries.

Assigning emission allowances on the basis of benchmarks means that both new and existing plants can be treated in essentially the same manner. At the same time, there are also reasons for not doing so. By definition, new entrants to the system do not have any *stranded costs*[7], but allocation of rights to them can affect their investments and choices of fuel in a way which would not occur in existing plants. Although it is supposed to be the price of the emission allowances, rather than their allocation, which determines the amount of investments and choice of fuel, it is difficult to avoid allocations to new entrants having some effect on overall development. The magnitude of each allocation cannot but help affect the profitability of an investment, and as it is therefore dependent on the project actually being carried out, these emission allowances will partly lack any alternative cost for the operator.

The Agency feels that a Swedish benchmark for electricity for application to *new entrants* should be set such that it results in greater harmonisation of the rules for assigning emission allowances between countries sharing a common electricity market. Such a measure can be applied, regardless of what benchmarks are selected for the *existing* plants. In this context, there is reason also to consider the allocation of emission allowances for heat from new CHP plants, as this has an indirect effect on electricity subject to international competition. One way would be to base the benchmarks for new entrants on the actual need of emission allowances for each particular technology. In its final report, the Agency intends to include an overview of what this could involve.

The Agency feels that, for new entrants, there is reason to consider benchmarks based on capacity.

As opposed to the situation for existing plants, there is reason to consider a benchmarking principle for new entrants that is based on capacity. The main benefit of this is that it is easier to forecast the installed capacity than to attempt to make individual forecasts of future production. At the same time, it is a measure that more clearly relates to the fact that it is concerned with an increase in capacity, which is the basis of the definition of *new entrants* in accordance with Paragraph 8 of the Ordinance (2004:1205) concerning Trading in Emission Allowances.

[7] Companies which, on some earlier occasion when the trading system could not reasonably have been foreseen, had made major investments in carbon dioxide-intensive technology can be regarded as having, as a result of the restrictions imposed by the requirement to hold emission allowances, stranded assets for which compensation is required.

At the same time, application of arbitrary values for annual utilisation factors, which is a prerequisite for a capacity-based method, results in application being a poorer reflection - in comparison with a production-based variant - of actual conditions in the plants.

The Agency intends to return to this matter of the parameters to be used when determining allocations for *new entrants* in its final report.

The Agency feels that any necessary scale factors can be applied retroactively, regardless of the size of benchmarks determined on the basis of national data.

Determining the size of the allocation to the trading sector, or to some individual part of it, is a political decision that must allow for many factors. In general, regardless of whatever method of allocation is used, it will be necessary to apply scaling factors in order to adjust the allocations to reflect various objectives. Depending on updated forecasts within and outside the trading sector, on the content of applications for allocation and on various commercial policy aspects, it will be possible to adjust the calculated allocations in one or more sectors in a similar manner through application of a constant. This constant does *not* need to be included in the benchmarks, but can be applied retroactively when all the decision-making material is available in connection with final setting of the allocation plan.

Continued work

The Agency feels that existing statistics contain sufficient material to allow national non-fuel-dependent benchmarks for electricity and heat to be determined.

The amount of work involved in calculating national benchmarks for electricity and heat, based on data from Swedish plants, would vary, depending on the number of benchmarks that need to be developed for each product. There is at present sufficient material available in existing statistics to allow *non-fuel-dependent* national benchmarks to be calculated for electricity and heat, and to assess the specific results of these benchmarks for each plant.

The need for statistical material for determining a benchmark-based allocation reflects essentially two aspects: the first is determination of the benchmarks, and the second is calculation of the plant-specific allocations on the basis of these benchmarks. For the first of these, there is already appropriate material in the form of the country's official energy statistics, coupled with details in the formal applications for allocation for the 2005-2007 period, as well as in the replies to the questionnaire that was sent out in connection with the Government's decision for the first allocation plan to the plants in the trading sector that could be identified at the time.

The available statistics would be complemented by information submitted by the companies in connection with the 2006 allocation of emission allowances. In addition, the Government (or the public authority instructed by the Government) will be able to require applicants to submit any information needed in order to decide upon the allocations, in accordance with Section 3, Paragraph 2 of the Act (2004:1199) Concerning Trading in Emission Allowances. However, it would simplify the work for both public authorities and companies if the formal application procedure could be carried out in connection with determination of the indicative allocation in the allocation plan.

In general, calculating national benchmarks for electricity and heat production requires a suitable way of allocating the fuels burnt by a CHP plant to the respective fractions of heat and electricity. The Agency intends further to develop the method that was employed to determine the relationship between electricity and heat for the benchmarks that are at present being used for new entrants to the system in the energy sector.

The Agency is of the opinion that the continued work should pay particular attention to investigating the consequences of assigning emission allowances to biofuel-dependent production.

The Agency's starting point for this is that *new entrants* in the energy sector who use *biofuels* should be able to receive an allocation of emission allowances based on benchmarks in accordance with the same principles as other new entrants who use *fossil fuels*. This is also what the Agency and the Environment Protection Agency suggested in their 2004 review of the effect of the carbon dioxide tax on combined heat and power stations in the trading system.

In its continued work, the Agency intends to investigate the opportunities for, and consequences of, including biofuel-dependent production in *existing plants* in the benchmark system. An important aspect here is the relationship with other policy instruments, such as the electricity certificate trading system, and the link with changed energy taxation in the trading sector. Another aspect to be considered is what happens when a plant changes from being a new entrant to being an existing plant. A substantial change in the plant's allocation in connection with this transition could affect the company's policy at the time of investment.

The Agency feels that there is justification, in its continued work, to analyse to what extent industrial boilers should be included in the benchmarking principle.

Bearing in mind the fact that heat-only production from a number of boilers used in industry is not at present included in the totals in the official energy statistics, it can be said that the statistics material is incomplete, and needs to be complemented by other sources of data in order to be able to calculate the benchmarks.

In addition, there is reason to consider whether those industrial boilers that are not covered by the Ordinance's definition of *combustion plant* should receive an allocation based on benchmarks. According to the definition, plants that produce electricity, hot water for space heating, domestic hot water, steam or heated oil in any industry named in Section 2, Paragraph 1, Sub-paragraph 1, Item 2-6 of the Act (2004:1199) Concerning Trading in Emission Allowances must be classified as 'other industrial plant'. In the regulations as at present structured, plants that produce electricity and heat therefore receive emission allowances on different bases, depending on whether production occurs within the identified industries or not. Under the terms of the Ordinance (2004:1205) Concerning Trading in Emission Allowances, a new entrant producing electricity and heat (e.g. a pulp mill) receives an allocation based on *best available technique*, while other new entrants with corresponding production in the electricity and district heating sector, or in some sector of industry other than those named in Section 2, Paragraph 1 of the Act, receive an allocation based on *benchmarks*.

At the same time, the industrial boilers differ from other electricity and heat-producing units in that their output is largely used within the particular plant. In these cases, allocation based on electricity, heat or steam means that it is based on internal energy carrier flows of which the magnitude is not affected by the energy efficiency of the plant. This means that if allocation is based on electricity and heat flows, there is a risk of disadvantaging companies that intend to implement, or have already implemented, energy efficiency improvement measures within the plant.

In its final report, the Agency intends to present a more in-depth analysis of the conditions for, and consequences of, including industrial boilers in allocations based on benchmarks.

The Agency feels that there is reason, in its continued work, to analyse how existing cold condensing plants should be treated under the benchmarking system.

The Agency assumes, from the Government's stated intentions towards new entrants, that emission allowances shall not be allocated to cold-condensing power stations[8] for the 2008-2012 period either. This means that the present rule – that new entrants in the electricity and district heating sector must be high-efficiency CHP plants, in accordance with the definition given in the CHP Directive, or plants making corresponding efficient use of their fuel - will continue to be a requirement for qualification for allocation. However, the Agency feels that it remains to be decided whether *existing* cold condensing power plants should be able to receive an allocation in accordance with the same production-based benchmarks as other plants.

The emission-based procedure that has been employed for the 2005-2007 period means that *existing* cold condensing power stations are entitled to an allocation of

[8] Bill No. 2004/05:18, *Trading in Emission Allowances II*

emission allowances, but as very little use was made of them during the period on which the emission allocations were based (1998-2001), very few allowances have actually been allocated to plants of this type. Even in a benchmark system based on production, the allocation would still have been small if based on the same activity years. However, a production-based method does have the advantage that the reference activity years can be updated in the future, although this also means that it is necessary to decide whether any limitation rules will be needed in order to decide whether the *existing* cold condensing power stations should have an allocation based on the benchmarks or not.

2 Background

Ratification of the Kyoto Protocol has meant that the EU and its member states have committed themselves to reduce (during the first commitment period from 2008 to 2012) their emissions of six greenhouse gases by 8 % in comparison with their 1990 emission levels. Internal negotiations as part of the *Burden-sharing agreement* have then assigned this quantitative commitment to specific commitments at national levels for the EU-15 states[9]. The other countries that have joined the EU since then are all signatories to the Protocol, and in general also have quantitative commitments for reduction of their emissions.

The Kyoto Protocol contains three Flexible Mechanisms, of which one is trading in emission allowances. This allows a country to be credited with an emissions reduction that occurs in another industrialised country having a quantitative commitment by purchasing the second country's transferable emission allowances. In addition to this, there are two project-based Flexible Mechanisms, under which emission reduction measures taken in a second country, whether or not that country has quantitative emission reduction commitments, can be credited to the country of the first part in order to fulfil that country's own commitments. When the Protocol was finally ratified by Russia in November 2004, the necessary criteria for the Protocol to come into force was satisfied, with the result that all the signatory countries' commitments became binding in February 2005.

The European Climate Change Programme (ECCP) was adopted in the spring of 2000, by which the Commission confirmed that emission allowances trading should be a central means by which the EU could achieve the reductions in emissions to which it was committed by ratification of the Kyoto Protocol[10]. On 13th October 2003, the European Parliament and the European Union adopted the Directive (2003/87/EC) Establishing a Scheme for Greenhouse Gas Emission Allowance Trading, known as the Trading Directive. The main purposes of the Directive are that it shall contribute to the Union fulfilling its commitments in a cost-efficient manner, and to acquiring early experience of application of this policy measure before the first commitment period under the Kyoto Protocol (2008-2012) starts.

The emission allowances trading scheme started on 1st January 2005 and, under Article 10 of the Directive, at least 95 % of the allowances for the first trading period shall be allocated free of charge, followed by a corresponding figure for free-of-charge allocation during the next period (2008-2012) of 90 %.

[9] EU Council Decision (2002/358/EG) concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

[10] KOM(2000)88, Final

Article 9 of the Trading Directive requires each member state to have developed a national plan stating the total quantities of allowances that it intends to allocate for each coming period by not later than 18 months before the start of that period. These plans shall show the quantities of emission allowances that the country intends to allocate for the period, and the principles that it intends to employ to determine the allowances. Annex III of the Directive sets out the criteria for the national allocation plans. The Commission has notified benchmarks for Member States' application of these criteria[11].

On the bases of these criteria, the member states have considerable freedom to construct their own national principles for allocation of emission allowances, and it is likely that the limited harmonisation that has marked the 2005-2007 allocation plans will continue to some extent for the 2008-2012 period. The EU intends to attach importance to the countries applying more consistent definitions of which plants are covered by the Directive, dealing with plant closures and so on. As far as the actual allocation principles are concerned, it is unlikely that there will be any obligatory harmonisation over and above what is already prescribed.

Before determining the allocation principles for the 2008-2012 period, the Government must decide whether benchmarks are to be used as a base for allocating allowances to plants in the energy sector. This present report is a pilot report for the October 2005 eport that will contain proposals for benchmarks and a description of various possible consequences of their application. The purpose of this report is to investigate the practical conditions for implementing such a method.

[11] KOM(2004)830, Final

3 The assignment

In its budget document for 2005, the National Energy Agency has been instructed by the Government to construct a system of benchmarks for electricity and heat production that can provide a basis for the allocation of emission allowances to existing plants and to new entrants for the 2008-2012 trading period.

This work is being carried out in two stages, with publication of an interim report on 15th April 2005 and a final report on 31st October 2005. The first of these reports consists of an assessment of the practical feasibility of using benchmarks as a basis for allocation of allowances for the energy sector in the 2008-2012 period. The practical feasibility is largely dependent on the structure of the specific allocation scheme decided upon, and so the report presents a detailed description of what a theoretically feasible and acceptable benchmarking principle might look like. It is only then that the practical implementability of a suitable benchmarking principle can be investigated.

The questions considered in this first report are concerned mainly with the type of benchmarking systems that could be used, bearing in mind not only existing conditions but also the need for relevant statistics in order to enable the benchmarks to be created and applied.

In the second stage of its work, the Agency intends to put forward concrete proposals in the form of benchmarks for electricity and heat production, complemented by further analyses of the consequences of applying these benchmarks in the energy sector. In particular, this will involve consideration of the consequences of the benchmarking principle on investments, environmental impact, relations to other policy measures, simplicity of application etc., as seen by various types of plants. This comparison will be made primarily in the light of the present allowance allocation principle, which is based on historical emissions.

This report represents conclusion of the first stage of the work.

4 Introduction

In its vote on Bill No. 2003/04:31 *Benchmarks for Implementation of the EU Directive concerning a Scheme for Trading in Emission Allowances for Greenhouse Gases* (Report 2003/04/MJU11, Parliamentary Communication 2003/04:150), Parliament instructed the Government to produce the required allocation plan for the 2005-2007 trading period. Some of the starting points that were specified in the Bill were that the initial allocation of allowances to be made for the period concerned should be entirely free of charge, and that there was a need for distinction between emissions related to the type of fuel used and those related to the type of raw materials used.

One of several possible ways for a cost-free allocation of allowances is to start from an agreed standard for emissions associated with a particular product. This means that it is necessary to decide how a particular installation relates to a standard (for this purpose, known as a *benchmark*) that is common to a particular group. Depending on the distribution that is intended, a benchmarking principle can be constructed in a number of different ways.

In its simplest form, the formula consists of a benchmark, such as specific emissions, tCO_2/unit, and a plant-specific parameter in the form of production or capacity. As the benchmarks can be tailored to make special allowance for many aspects of production, and effectively to contribute to fulfilment of the criteria in Annex III of the Directive, it is common to incorporate technology-related and fuel-related aspects in the allocation formula. This explains why allocation based on benchmarks is sometimes regarded as more demanding in terms of input data and less transparent than, for example, an emissions-based allocation.

Under the terms of Article 9 of the Directive, the national allocation plans for the total quantity of allowances to be allocated for the second period (2008-2012) shall have been notified to the Commission by not later than 30th June 2006. By that time the Commission shall also, in accordance with Article 30(2) of the Directive, have submitted a report to the European Parliament and the Council on a review of the Directive, in which it shall have (*inter alia*) analysed '*the practicality of developing Community-wide benchmarks as a basis for allocation, taking into account the best available techniques and cost-benefit analysis'*. This is an indication of the desired direction that EU institutions have given expression for on many occasions.

The fact that the member states' allocation plans for the 2008-2012 period shall have been notified to the Commission at the same time as the Commission submits its review of the performance of the Directive means that any changes to the regulations as a result of the Commission's conclusions concerning (for example) benchmarks cannot be made before allocation of the allowances for the period starting 2013 at the earliest. Sweden must therefore choose between (i)

waiting for the Commission to develop EU-wide obligatory benchmarks, and then making any necessary changes as required by the Directive, or (ii) introducing its own benchmarking procedure, either on its own or in conjunction with other member states. It should be noted in this context that it is uncertain as to when a harmonised approach might be realised, and that it is important for several reasons to move away as early as possible from the emissions-based allocations in those sectors where this can be done, bearing in mind the requirement that most of the emission allowances must be allocated free of charge.

In the Government's *Trading in Emission Allowances II* Bill, which was presented to Parliament in September 2004, it is stated that, as far as possible, the allocation of free-of-charge emission allowances for the 2008-2012 trading period shall be based on the use of benchmarks. The same Bill indicates that the Government intends actively to support such an approach, and that application of benchmarks for the entire collective of installations in the energy sector that produce electricity and heat should be a starting point[12].

[12] Bill No. 2004/05:18, Commission report no. 2004/05:MJU5, Parliamentary communication no. 2004/05:43

5 Allocations, 2005-2007, and the transition to the first commitment period

5.1 Allocations during the period 2005-2007

For the first trading period in the emissions trading scheme, allocation of emission allowances to existing installations in Europe has generally been based on the amount of historical emissions. One of the exceptions to this is Lithuania, where all energy sector installations, whether existing plants or new entrants, have been allocated an allowance based on electricity and heat benchmarks.

For *existing* combustion plants in Sweden, the allocation of allowances for the 2005-2007 period has been based on average historical emissions for the period 1998-2001, with allowance for any exceptional events and, in those cases where the plant belongs to both the electricity and the district heating sector, with application of a scaling factor of 0.8. *New entrants* producing electricity, heat and/or steam have received an allocation based on a production-based benchmark principle, with a benchmark of 265 tCO_2/GWh for electricity and of 83 tCO_2/GWh for heat[13]. In addition, if installations within the electricity and district heating sector are to be entitled to receive an allowance allocation at all, they must fulfil the criteria for being regarded as *high-efficiency combined heat and power plants* in accordance with the definition in the Combined Heat and Power Directive[14], or must be an installation making correspondingly efficient use of its fuel. Under the terms of Paragraph 23, Item 5 of the Ordinance (2004:1205) concerning Trading in Emission Allowances, a plant that has been commissioned after 1st January 2002, but which is not a new entrant, may receive an allocation of allowances on essentially the same principles as for new entrants. For both groups, it is only the fossil-based proportion of additional production that is entitled to an allocation in accordance with the applicable benchmarks.

It can be seen from the above description that there is a difference in the treatment of *existing plants* and *new entrants* and other plants first started up after 1st January 2002. While allocation of allowances for existing plants, based on the amount of their historical emissions, can amount to a quantity equal to the actual emissions from the plant, new entrants in the energy sector must expect an allocation which is less than not just their actual emissions, but also less than the emission allowances for corresponding plants in most other countries. This is regardless of whether the plants use any of the least carbon dioxide-intensive

[13] New entrants are plants that had not received permission for (for example) an increase in capacity at the time of submitting the Swedish allocation plan to the Commission.
[14] Directive (2004/8/EC) on the Promotion of Cogeneration Based on a Useful Heat Demand in the Internal Energy Market.

fossil fuels and/or of whether they have equipment providing the best available technique. The reason for this deficit can be partly explained by the 0.8 scaling factor applied in the electricity and district heating sectors, although the benchmarks themselves are already lower than the allowances needed by (for example) a high-efficiency cogeneration plant burning natural gas.

However, it is not necessarily the Swedish treatment of new entrants that is too restrictive: on the contrary, free allocation to new entrants could theoretically provide an incentive to build plants that are not completely matched to applicable conditions. This could manifest itself, for example, in investments in less appropriate technology or in less favourable regions than would otherwise have been the case. The basis of the problem is that *other countries* may have chosen to be generous in their treatment of new entrants.

The fact that new entrants can be allocated allowances only for the fossil-based portion of their production means that, to some extent, there is an incentive for investment to be made in more carbon dioxide-intensive technology. The possibility of allocating a free allowance to new entrants using *biofuel-dependent* production might fall foul of public subsidy regulations if a plant received allowances that exceeded its forecast emissions. The question of whether renewable production should receive allowances on the same principles as fossil-based production is considered later in this report.

It is important to remember that allocation based on benchmarks is just one of a few allocation principles that could be used if free allocation is to account for a significant proportion of allocations of emission allowances in future trading periods as well. In addition to this, the benchmarks have important characteristics which mean that they fulfil many of the criteria that at present apply for allocation, e.g. the need to allow for improvement measures taken at an early stage and for the technical potential of reducing emissions within the various industry sectors.

5.2 The role of emissions-based allocation in coming commitment periods

In the national allocation plans that have been prepared for the first trading period of 2005-2007, *emissions-based grandfathering* has been the most frequently used method of allocation, which is partly explained by the requirements at present imposed on allocation by the Directive[15]. These specify that emission allowances must be allocated almost entirely without cost, and that an installation that receives more allowances than are needed to cover its present or future requirements can be regarded as being in receipt of unallowable public subsidies, regardless of any earlier steps that it might have taken to reduce its emissions. The most relevant criterion (Criterion 5) in Annex III of the Directive in this

[15] ER 2005:2, *A review of national allocation plans*, National Energy Agency.

context is based on deciding whether the allocation can be regarded as unacceptable favouring of a plant or sector in relation to requirements in the Treaty of Rome, and in particular to Articles 87 and 88 in the Treaty.

'Emissions-based grandfathering' means that the allowance is determined in proportion to the amount of emissions from the plant over a historical reference period. In Sweden, most of the over 700 plants have received an allocation of emission allowances based on their carbon dioxide emissions during the period 1998-2001. In conjunction with this, there are rules which allow the reference period to be adjusted if some unforeseen and temporary interruption of production occurred as a result of what are known as *exceptional events*, or if the start-up date of an existing installation was after 1st January 1998. In addition to an allocation based on historical emissions, it is also possible to grant additional allowances if it can be expected that there will be an increase in *raw materials-related* emissions from the installation, or if the installation is to be expanded or some other change is to be made that will mean that the installation meets the criteria to be regarded as a *new entrant*.

Economic theory can provide arguments that can support the use of an allocation principle in the form of emissions-based grandfathering. These arguments are based on the understanding that companies having the largest quantities of carbon dioxide emissions are also those facing the highest costs for modifying their production to suit the changed conditions brought about by the introduction of the trading scheme. One objective of the allocation method could therefore be initially to allocate the emission allowances to those operators having had the greatest emissions, which would therefore act as compensation for companies that have made investments with long payback times at a time when they could not have foreseen the restrictions that would be imposed by the need to surrender emission allowances equivalent to their actual emissions. This is sometimes referred to as companies having stranded assets, for which they need compensation.

In addition to the difficulty of proving the existence of costs for stranded assets, this argument should be weighed against the factors that indicate that allocation based on historical emission data cannot be seen as a long-term solution within the framework of continued free allocation of emission allowances. In addition, the problems associated with an emissions-based approach can also be expected to increase during the nearest commitment periods, in the form of both practical and theoretical considerations.

The commonest reservation against emissions-based allocation is that it comes across as a way of rewarding plants that have historically made major contributions to the increased concentration of greenhouse gases in the atmosphere. It can therefore be seen as a method of allocation that is in opposition to the 'Polluter Pays' principle for preventive or restorative measures,

despite the fact that the system as such is in fact merely aiming at applying a cost to greenhouse gas emissions.

Another drawback of allocation based on historical emissions is that, in principle, the reference period (activity years) on which the allocation is based should not be updated. This is because it would otherwise create an incentive for individual plants to maintain (or even increase) their emissions at (or to) a high level, with the aim of becoming entitled to increased future allowances. Companies would therefore regard their future allowances as revenue when performing their cost analyses for continued use of fossil fuels, which would conflict with the system's objective of creating cost-efficient incentives for investments in energy-efficient and renewable production. In addition, extension of the period to cover, for example, emissions during the 2002-2004 period as well would unavoidably result in unfair treatment of plants that have taken steps to reduce their emissions during the period. Nor should we underestimate the importance of the signals that any such change of the allocation principle would give rise to.

One of the most important characteristics of an emission allowances trading scheme is that it creates incentives to take the most cost-efficient steps at system level to reduce emissions equivalent to the total quantity of emission allowances. According to the theory, participating companies will find it rational to reduce their emissions to a level at which further reductions would be at a marginal cost equal to, or higher than, the price of the emission allowances. In other words, no-one will want to reduce emissions if it costs more to do so than to balance their requirements by purchasing emission allowances on the market, and vice versa, i.e. no-one will purchase emission allowances (or surrender cost-free allowances) amounting to a greater value than what it would have cost to reduce the emissions in the party's own plant.

When designing a trading system, there are several factors that could reduce the high cost-efficiency that is in general associated with emission allowances trading systems. One such aspect is the fact that many countries have decided that emission allowances that have been allocated for the 2005-2007 period are valid only for the period for which they have been issued. Another is the more or less widespread impression (or fear) that allocations for the next period will be related to emissions during activity years that consist to a greater or lesser degree of the first trading period.

Despite certain negative effects, a ban on the carrying forward of emission allowances from one period to the next can be justified by considering the need to ensure fulfilment of each country's quantitative commitments during the next phase of the trading system. Widespread saving of emission allowances from one period to the next could put a country's ability to meet its national commitments at risk, and would also have an adverse effect on its ability to forecast its allocation plans in June 2006, and to forecast what steps are necessary in its non-trading sector. Corresponding problems would not arise during a later stage,

when allocations correspond to a well-defined proportion of each country's Assigned Amount Unit (AAU). The second type of obstacle to investment, that could arise from emissions-based allocation if based on an updated reference period, cannot be justified.

In its *Trading in Emission Allowances II* Bill (2004/05:18), the Government has stated its intention that *if* allocation to existing installations for the 2008-2012 period must be based on historical emissions, it should not be based on emissions during the preceding 2005-2007 period. Emissions-based allocation would therefore require either application of essentially the same reference period as has been used for determining allocation for the first trading period, or would require inclusion of data for 2002-2004. The former alternative would require the drafting of new regulations in order to include plants that had been started up after the reference period, but which were not to be regarded as new entrants. The second alternative would, to some extent, punish companies that had taken steps to reduce their emissions in recent years.

5.3 The 2004 investigation of benchmarks

As preparation for the Government's decision on the country's 2004 national allocation plan, the Agency performed an investigation that involved the construction of a set of benchmarks for allocating emission allowances in the energy sector. IVL, the Swedish Environmental Research Institute, was instructed to calculate and analyse possible results (at plant level) of an allocation based on Swedish benchmarks[16]. As the results were wanted quickly, and as there was some difficulty in collecting all the necessary data, the analysis was restricted to 165 plants, of which 58 were industrial boilers and the rest were heating plants, cold condensing power stations or cogeneration plants.

The starting point for the investigation was that the allocation principle should be simple, and be based on only one benchmark for electricity and one for heat. The method was based on a national comparison, with the electricity or heat production at the plants in the investigation being used in various ways to provide the basis for determining the benchmarks. Several possible structures were analysed, varying such factors as the significance of biofuels for the benchmarks and how carbon dioxide emissions from cogeneration plants and industrial back-pressure production could be apportioned between the electricity, heat and steam produced in the plants. Guidance in constructing the benchmarks was provided by the aggregated historical emissions from the plants in the analysis for 1998-2001 (benchmarking years), which years also constituted the activity years for which the production quantities from the individual plants were used for determination of the allowance allocations. Bearing in mind the relatively early

[16] *Allocation of emissionallowances within the energy sector based on benchmarking*, IVL, Swedish Environmental Research Institute AB, April 2004.

reference period, it can be said that this was a form of *production-based grandfathering*, starting from the benchmarks[17].

As the allocations calculated in this investigation were production-based, they resulted in a distribution that was not directly proportional to the amount of the historical carbon dioxide emissions from the plants. The result was that, in general, the allocated allowances tended to depart to a greater or lesser extent from the plants' actual needs for emission allowances. The investigation also included analysis of the results of a benchmarking principle originating from a proposal in the *Trading for a better climate – allowances and allocation etc.* (SOU 2003:120) interim report from the FlexMex2 Delegation. This specific proposal involved limiting the initial surplus of emission allowances that could arise. Plants having a carbon dioxide intensity lower than the relevant benchmark were given an allocation based on their own specific emission, while other plants received an allocation based on what was, from their perspective, a relatively low benchmark. For those plants having a below-average emission intensity, the effect of the limitation rule would have meant that there was no incentive to take further steps to reduce their emissions.

One conclusion from the investigation was that the spread of the emission allowances was considerably greater if biofuels were included when determining the values of the benchmarks, and at the same time were regarded as having an allocation allowance for their production in the same way as for the fossil fuels[18]. In other words, the fuel-independent method had the effect of transferring some of the emission allowances from the most carbon dioxide-intensive plants to that group of plants which had lower carbon dioxide emission intensities than the benchmark when seen in a comparison with an allocation system based on the magnitude of historical emissions. Another conclusion was that the weighting of emissions – i.e. the allocation of emissions from combined heat and power production to the benchmarks for electricity and heat – had different effects on cogeneration plants for district heating and industrial back-pressure generation, due to the relative differences in electricity yield and the proportion of renewable fuels used by the two categories.

Other important results from the investigation included identification of the problem areas associated with attempts to design a benchmarking principle, showing how the results for different types of plants vary in a simple product-based approach, and confirmation that it was possible, in a short time and with a relatively restricted quantity of data available, to perform the calculation exercise at plant level.

[17] Note that, in this respect, *grandfathering* has nothing to do with *emission-based grandfathering*, which is sometimes incorrectly abbreviated to *grandfathering*.

[18] The various scenarios included benchmarks that were designed either with or without elements of renewable production, but were not more specific than this in respect of the particular fuels.

6 The structure of a benchmarking principle

Under its terms of reference of instruction from the Government, the Agency is required to assess the practical feasibility of employing benchmarks as a basis for allocation of emission allowances in the energy sector for the 2008-2012 period. In order to do so, we need to create a picture of what an appropriate benchmarking principle would look like. In this chapter, we describe the variables that can be used when constructing such a method, together with a description of the factors that could be most appropriate for use under the current conditions.

Characteristic of an allocation principle based on benchmarking is the fact that it starts from one or more reference values in the form of some technical parameter that is common to a group of parties affected by the scheme. Allowances are then allocated on the basis of the benchmarks and a plant-specific quantity, e.g. production, installed capacity or energy input. The product of the benchmark and the plant-specific parameter is then used to give an annual allocation. Depending on how the carbon dioxide intensity of the individual plants varies in relation to the benchmarks as a result of choice of fuel, efficiency, electricity yield etc., the plant receives an allocation that rewards those that have taken steps to reduce emissions or that have invested in energy-efficient production.

The procedure can be simply described when broken down into two stages: construction of the actual benchmarks and construction of the rules governing use of the benchmarks. Although the size and quantities (units) of the benchmarks are important for the result, almost equal importance can be ascribed to the rules determining if and how the benchmarks are to be applied. This can be illustrated by the present Swedish treatment of *new entrants* producing electricity, heat or steam, for which only the *fossil fuel-dependent* portion of additional production is allocation-entitling, and which must also (if in the electricity and district heating sector) be of high-efficiency type to qualify.

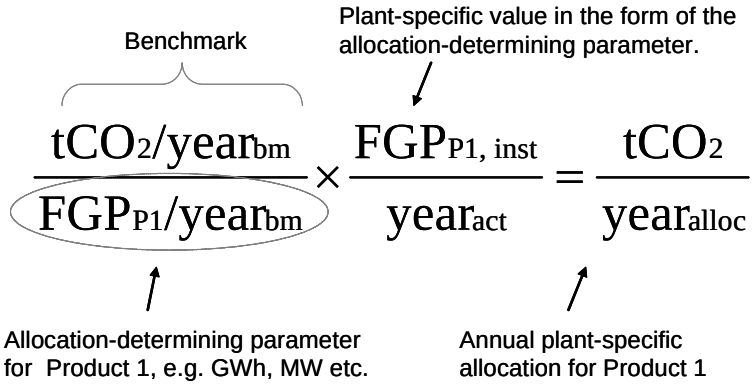


Figure 1. In its simplest form, the benchmarking principle consists of a benchmark formulated in terms of emissions per unit of the allocation-entitling parameter (*FGP*) for a particular product

(*P1*) which, when multiplied by the plant-specific value, produces an expression of the annual allocation. The allocation is based on the plant-specific activity during one or several qualifying years (*act*), which can differ from the number of years (*bm*) that have provided the basis for calculation of the benchmark and the year (alloc) for which the allocation applies.

6.1 Allocation-determining parameters

The activity-related measure

A benchmarking principle for electricity and heat-producing plants in the energy sector can be based on product output, energy input or the installed capacity of the plant. A method which concentrates only on the energy input does not allow for differences either in energy efficiency or in the various products, which is sufficient to say that such an approach is unsuitable.

Capacity-based methods have been applied in a number of countries when allocating emission allowances to *new entrants* for the 2005-2007 trading period. Denmark and Finland provide examples that are close to hand. An important difference between these two countries is that the Danish benchmarks are applied only to the fossil-based proportion of the additional electricity capacity, while the Finnish benchmarks are the same for electricity and heat production[19]. Although these benchmarks are applied to both fossil and renewable fuels, they distinguish between gaseous/liquid fuels and solid fuels. As both countries use arbitrary values for the capacity utilisations of different types of technologies and applications, the result is that allocations do not always match the actual production at individual plants. As opposed to production-based benchmarking principles, which are used in (for example) Germany and Sweden, this results in an allocation that favours plants having a low capacity utilisation in comparison with plants having a capacity utilisation that exceeds the arbitrary value.

If a capacity-based benchmarking principle is used, together with arbitrary values for degrees of utilisation in various applications, there is less need of being able to make plant-specific forecasts of future production from new entrants. There is also less uncertainty in determining in advance what the installed capacity of a plant will be after expansion than there is in attempting to forecast the annual production level. However, if the benchmark considers only additional future capacity, it will result (as said above) in less accurate allocation. Production data is available for existing plants, and so capacity-based allocation is not relevant other than for *new entrants*.

In the case of existing plants that are regarded as *new entrants* because they are increasing their installed capacity, a *capacity-based* benchmarking principle would be more appropriate in certain respects than a production-based variant. This is because the capacity-based measure relates more closely to the fact that

[19] See Section 6.4 for a brief introduction to these benchmarking principles.

this is concerned with an expansion of production capacity, which is one of the bases of the definition of *new entrants*[20]. In other words, the allocation will relate only to the additional capacity. If this is not done, there is a risk that the operator expands the installed capacity by only as much as is needed in order for the plant to be classified as a new entrant, while at the same time qualifying for a greater allocation which will be mainly the result of greater utilisation of the original capacity. If an operator had nevertheless planned to start to use what had previously been little-used plant to supply a base load, he would receive an allocation for the increased capacity utilisation, which was not the intention of the legislators as far as *fuel-related* emissions were concerned[21].

To some extent, a production-based allocation which, at some time, is a function of the actual production at the plant, can assist production by reducing the incentive to reduce emissions by cutting back on production. Nevertheless, providing an incentive for high productivity by means of a limited quantity of emissions is definitely preferable to rewarding (for example) the least energy-efficient plants.

The Agency is of the opinion that it is most suitable to use a production-based approach for existing plants, and that there is justification for considering a capacity-based variant for new entrants.

Breakdown of product classes

Having decided that a production-based allocation is the most suitable starting point for existing plants, we need to decide which products can be covered by one and the same benchmark. Electricity is a completely homogeneous product, as opposed to input energy as such. In physical terms, 1 MWh of electricity is more useful than 1 MWh of heat. The best comparison between the values of different forms of energy is probably provided by the quantity of *exergy* in each product. This means that any method for emission allowance allocations based on the use of benchmarks should start from something other than the produced quantity, although a distinction between electricity and heat is essential.

A consequence of not applying separate benchmarks for electricity and heat would be to overvalue heat in relation to electricity, which could in turn result in an undesirable incentive to produce more heat at the cost of electricity, as the same quantity of input energy can produce a greater quantity of useful (but low-value) energy, and thus give a greater emission allowance.

There is not the same need to develop separate benchmarks to distinguish between hot water and steam, as these are comparable products in the form of thermal

[20] Paragraph 8 of the Ordinance (2004:1205) Concerning Trading in Emission Allowances.
[21] This problem could be reduced to some extent by a rule limiting the allocation-entitling production on which the additional allocation is calculated to the value that could theoretically be produced by the additional capacity.

energy. High-temperature process steam contains more thermal energy than hot water at the same temperature, and therefore receives an allocation that allows for the fact that it has required more energy to produce it.

Fuel-dependent or non-fuel-dependent benchmarks

When determining the units for the benchmarks, it is necessary also to decide the type of production that is to be entitled to an allocation in respect of each benchmark. Swedish and Danish benchmarks for new entrants, for example, apply only to the fossil-based portion of production, while the benchmarks used in (for example) Finland and Lithuania result in a number of different emission allowances for the production of electricity and heat, regardless of the type of fuel from which they are produced.

A fuel-dependent benchmarking principle means that plants using the same fuel will be compared with each other. As, for example, a fuel category having a low carbon dioxide intensity receives an allocation based on a low benchmark value, the result of such as approach would depend primarily on the fuel that was used. However, the magnitude of the allocations to different plants in relation to their respective needs depends on how *energy-efficient* their production is. A plant with a high energy efficiency receives an allocation that goes further towards meeting its actual needs than does the allocation to a plant having a lower efficiency in proportion to its relatively greater needs.

Whether the allocation meets the needs in the sector and in the individual plants also depends on how the benchmarks have been calculated. An initial surplus of emission allowances is more likely if the value of a benchmark has been determined on the basis of an international average rather than if it has been arrived at using data from the best available technique.

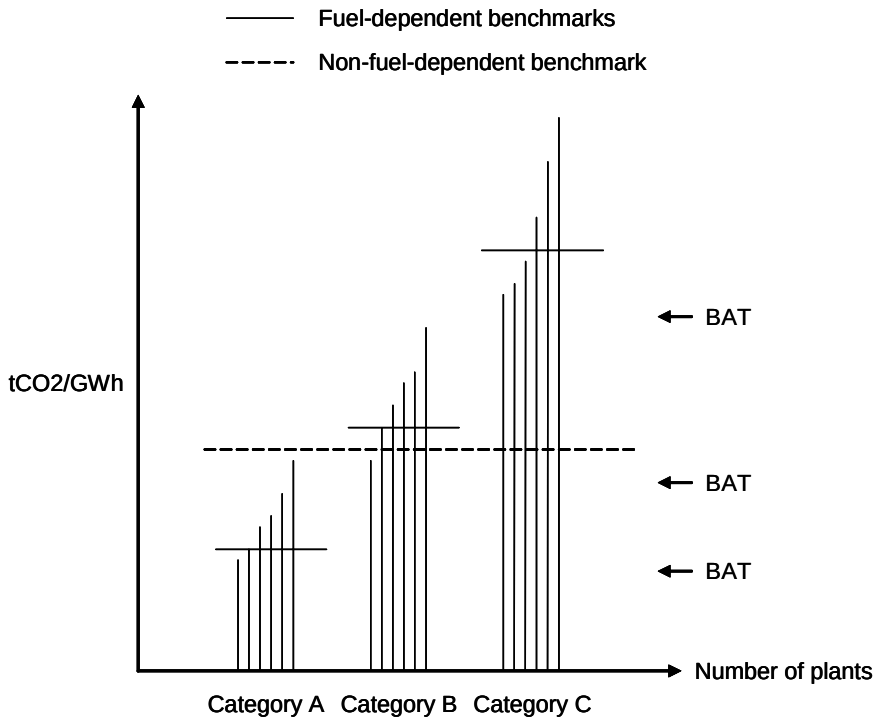


Figure 2. Examples of benchmarks (horizontal lines) with and without links to the fuels used, together with carbon dioxide intensities (vertical lines) for plants in different fuel categories.

In its benchmarks for application of the criteria in Annex III of the Directive, the Commission recommends the use of separate benchmarks after having divided plants up into groups depending on the fuel that they use. However, the benchmark recommendation does not include a clear ban on the use of non-fuel-dependent benchmarks.

In their joint report to the Government's review of climate policy in connection with Checkpoint 2004, the National Energy Agency and the Environment Protection Agency submitted that those *new entrants* in the energy sector using *biofuels* should also qualify for free allocation of emission allowances. The reason for this is because, at the same time, the investigation proposed a change in carbon dioxide taxation of cogeneration in the trading sector. The combined measures would encourage investment in efficient cogeneration processes, while not creating an incentive for such investments to be made in technology with higher carbon dioxide emissions than would have been the case if the price of emission allowances had been the determining factor, unaffected by the allocation rules.

In its *Trading in Emission Allowances II* Bill (2004/05:18), the Government stated that, as far as possible, benchmarks should be used for the entire energy sector, and also that they should apply to *biofuelled* plants. This applies to both existing parties and new entrants. The Agency believes that this would result in allocations being more neutral in terms of their effect on the choice of fuels when

making investments, in line with the fact that it is primarily the price of emission allowances that should be the determining factor. However, when deciding on the principle, allowance should be made for the fact that there are other policy measures that already contribute to this balance. This interaction with other policy measures is something that the Agency intends to return to in its final report of this work. The feasibility of using *non-fuel-dependent* benchmarks is also dependent on the extent to which the Directive allows a distribution structure that does not primarily result in emission allowances being allocated to those with the greatest emissions. However, the Agency feels that international requirements can approve such a principle of allocation[22].

As previously mentioned, the Directive specifies that the allocation in a given period must not be dependent on the actual result during that same period. In practice, this means that the classification category into which plants are grouped for the purposes of allocation must remain the same throughout the period. The Commission's prohibition of *ex-post* adjustment of allocations means that, for example, a coal-fired plant that changes over to the use of biofuels in, say, 2009, must receive its allocation from the benchmark applying to the entire group of *coal-fired plants* for the remainder of this period, i.e. 2010-2012. In addition, when using a *fuel-dependent* benchmarking principle, it is necessary to decide how any particular plant is to be treated in subsequent periods, and then to make sure that no reverse incentives to rational emission-reduction measures are created. In the case of a *non-fuel-dependent* approach, however, there is always the same incentive to convert to a less carbon dioxide-intensive technology and then to remain in this class.

The Agency feels that it would be unsuitable to weaken the pressures for plants to benefit from a surplus of emission allowances by investing in less carbon dioxide-intensive technology. This is the case in a fuel-dependent approach if, as a result of such a measure, a plant were to end up in another fuel category in connection with its allocation for the next trading period. Admittedly, as a result of the alternative cost of its emission allowances and the use of a fuel-dependent approach, a plant that receives a reduced allocation when changing to a less carbon dioxide-intensive technology has the same marginal production cost regardless of the size of its allocation. On the other hand, it becomes more difficult to repay the investment if it can be expected that the additional revenue will be withdrawn during the next trading period as a consequence of allowing longer-term allocations only to plants burning fossil fuels. A fuel-dependent approach would therefore reduce the incentive to transfer to renewable fuels.

Similar problems could also arise for plants starting to use a more carbon dioxide-intensive fuel. Being transferred to a group having a higher benchmark will reward them for making the change. This means that the *fuel-dependent* principle will have an adverse environmental effect, in the same way as would have an emissions-based approach with updated activity years.

[22] See Chapter 7 for an initial discussion of this.

From an implementation perspective, it can also in many cases be expected to be quite difficult to decide into which fuel category any particular plant should be placed, i.e. to decide which benchmark is to apply to it. Many plants use a mix of fuels, and it may also be necessary to allow for unused fuel flexibility in the plant. One alternative would be to decide on the fuel category on the basis of which fuels have mainly been used during a certain number of preceding years (e.g. the activity years). Such an approach would, to some extent, have the character of *emissions-based grandfathering*. Another way would be to group the plants on the basis of the most carbon dioxide-intensive fuel that can be used on its own in the plants without modifications. Nevertheless, regardless of how classification is decided, it can be expected that there will be a number of grey zones.

All this shows that a *fuel-dependent* benchmarking principle is associated with both significantly greater complexity and more undesired side effects than is a non-fuel-dependent benchmarking principle. However, the latter results in a spread of emission allowances that is proportional to the production levels of the plants, rather than to those plants having the highest carbon dioxide intensities. If we accept that the most carbon dioxide-intensive plants do not necessarily have to receive the highest allocations in terms of emissions per unit of product, we can use non-fuel-dependent benchmarks. In addition to the advantages noted above, this also to some extent reduces the need for statistical data and a larger number of separate benchmarks.

We wish to emphasise that correct allocation of emission allowances to *existing plants* using biofuels will not influence the choice of fuels to be used. The choice of one fuel or the other depends on relative prices on the fuel market, the price of emission allowances and the effects of other policy measures. As a result of their alternative costs, regardless of the principle of their allocation, any surplus of emission allowances will be sold at a profit instead of being used by the plant.

In its final report, the FlexMex2 Delegation has submitted that the use of benchmarking for allocating emission allowances would be preferable from the point of view of distribution policy, as it would provide compensation in the form of free emission allowances to plants which, at a given time, have lower specific emissions than comparable plants in the same sector. At the same time, the Delegation emphasises that, regardless of the method of allocation employed, it is the price of emission allowances that must determine measures that are taken to reduce emissions. It is against the background of such a criterion and of the longer-term consequences (i.e. longer than a single trading period) of allocation that can arise, that the Agency feels that there is reason when allocating emission allowances to avoid both emissions-based grandfathering with updated activity years and allocation based on fuel-dependent benchmarks.

Technology-dependent or non-technology-dependent benchmarks

In order to create an incentive for the use of desirable technologies, benchmarks that in some way reflect the technology to be used can be applied, as indicated, for example, in Criterion 8 of Annex III of the Directive and in the Cogeneration Directive. This means that one and the same product could qualify for allocations via different benchmarks, depending on how it has been produced, e.g. whether in a cold condensing power plant, a cogeneration plant or an industrial boiler. At the same time, such a technology-differentiated benchmarking principle would mean that allocation would become more complicated than would otherwise have been the case, and that the scheme is departing to some extent from the objective that, as far as possible, it should be the price of emission allowances, rather than their allocation, that should determine the choice of technology.

The role of the allocation in determining investments and the choice of fuel is more apparent for new entrants than for existing plants, and a technology-differentiated approach could be preferable for them. For the 2005-2007 trading period, new entrants in the energy sector must be classified as high-efficiency in accordance with the definition in the Cogeneration Directive if they are to receive a free allocation of emission allowances. In its *Trading in Emission Allowances II* Bill(2004/05:18), the Government has stated that allocation to new entrants should continue to be arranged in such a way that new cold condensing power plant does not receive a free allocation. It should be added here that it is not the technology as such that has been excluded, but only plants that do not meet the Cogeneration Directive's requirements in respect of high efficiency of fuel use, regardless of the type of plant or of its product. This is an important distinction, as the alternative would be discrimination against a particular technology, which would conflict with the Directive's non-discrimination criteria.

Any rule to except certain technologies does not have any direct effect on the feasibility of introducing a particular benchmarking principle, but can be applied in the way as is done at present. However, it needs to be considered whether *existing* cold condensing power stations should qualify for an allocation from the same production-based benchmarks as apply for other plants. The emissions-based procedure that has been applied for the 2005-2007 period means that cold condensing power stations qualify for an allocation, but as they were used only sparingly during the 1998-2001 qualifying period, very few emission allowances have actually been issued to plants of this type.

6.2 Deciding benchmark reference years and activity years

All forms of free allocation of emission allowances presuppose the selection of a reference period in the form of a number of reference years, from which data is taken concerning the plant-specific parameters that will be used as a basis for the

allocation. For the 2005-2007 trading period, most of the existing plants in Sweden have received an allocation based on their average emissions over the period 1998-2001. In principle, allocations based on emissions for this period cannot be updated when calculating the allocation for some future trading period. However, where allocations are based on benchmarks, it possible always to choose an activity year based on, for example, those years immediately preceding the trading period concerned.

We can identify two periods of time that are significant for allocations when using a benchmarking principle: the years used to determine the size of the benchmarks, known as *benchmark years*, and the years from which the plant-specific data to be used for determining the allocation proportion for each company has been taken, known as the *activity years*. See Figure 3.

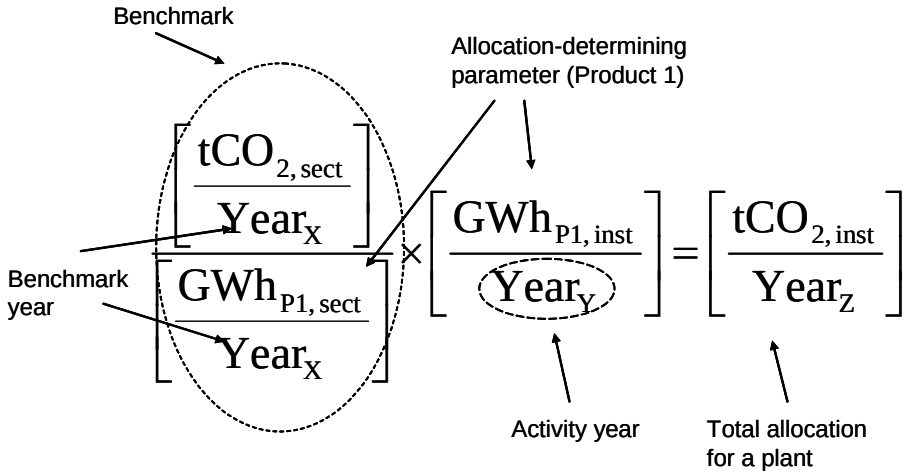


Figure 3. Examples of different time periods in a benchmarking principle, in which the benchmark is determined on the basis of an average in the form of specific emissions within a sector, i.e. tonne CO_2 per product unit.

The choice of activity year has a greater effect on the amount of allocation for individual plants than does the choice of benchmark year. This is because the fluctuations in emissions and production are less when seen at an aggregated level, which in turn means that the activity years should consist of at least 3-4 years in order to even out any temporary excursions and to ensure that the allocation is more representative.

6.2.1 Selecting the benchmark years

If the benchmark is to be based on average emissions per product for plants within the same activity group (whether international or national), it is necessary first to define from which years the statistics are to be taken. However, as opposed to deciding on defined activity years, it is not always necessary to choose benchmark years. If we decide, for example, to base the benchmarks on best available technique, the reference quantity is primarily the technical design, despite the fact

that even best available technique values change with time, and thus are to some extent associated with a benchmark year.

It is reasonable to start from use of the most recently available statistics when deciding on benchmark years, although it may also be necessary to consider other factors that have made the years concerned less representative of one or more of the benchmarks. In terms of the availability of statistics, 2000-2003 could be used as a basis for calculation, and could also be used as the activity years, although there need not necessarily be such an associative link in order to make the calculations.

Regardless of the choice of benchmark years, it is likely that it will be necessary to employ a scale factor in order to arrive at an overall allocation that meets the political target aspirations. Application of *national* benchmarks is therefore more of a question of internal redistribution of emission allowances within the particular groups, rather than of how much some particular sector is to receive.

6.2.2 Selection of activity years

Historical activity years

It should be possible for allocation based on benchmarks to be founded on data from a series of historical base years from several years prior to the period for which the allocation applies. However, there is no theoretical reason for such an approach in the same way as there can be within the framework of an emissions-based distribution, i.e. in order to allow for the effects of any earlier improvement measures that have been applied. Nevertheless, this aspect is allowed for in the benchmarking principle. An earlier reference period means instead that there is a poorer availability of reliable data, and that the allocation does not reflect data changes made in the plant.

Latest possible activity years

Another possibility is to choose a reference period immediately prior to the period for which the allocation is to apply. This has the advantages of being based on more up-to-date, and therefore more reliable, data, and on making better allowance for the effects of recent changes in production volumes than does an approach based on historical values. In addition, when compared with a method in which it is forecast production values that determine the basis of allocation, there is also a considerable administrative benefit in terms of the resources needed in order to evaluate the information in applications. It can also be mentioned here that the FlexMex2 Delegation has stated that it is appropriate to use the most recently possible years as the basis for application in a production-based system[23].

[23] 'Trading for a better climate – From introduction to application' (SOU 2005:10), page 127.

The working method could consist of basing allocation on the 3-4 years immediately prior to the specific year for which the allocation is intended, with reservation for the availability of final statistics for the most recent years. This would mean that the allocation for 2008 would be based on average production over the years 2003-2005, that the allocation for 2009 would be based on average production for 2004-2006 and so on. However, such an approach is not in accordance with the requirements of the Directive, as definitive allocations for each of the years in a commitment period must have been decided upon by not later than twelve months prior to the start of the period, i.e. 31st December 2006. In addition, the Directive requires submission of an indicative allocation in the national allocation plan by (in this case) 30th June 2006.

From the above it can be seen that the allocation for the 2008-2012 trading period will require a reference period at least earlier than 2006, which means that (for example) 2000-2003 would be a usable series of allocation-determining years (activity years).

Forecast activity years

If the allocation is based on forecast production from the plant, it will allow as far as possible for any changes in utilisation of capacity. This means that a plant that increases its production, e.g. through expansion of a public district heating system, can receive an increased allocation that reflects this. This has not been the case during the 2005-2007 period unless expansion of a district heating network has necessitated a simultaneous increase in installed capacity in the plant, thus bringing it within the remit of rules for *new entrants*. Nevertheless, despite this flexibility in the production-based approach, plants with carbon dioxide intensities exceeding the benchmark would suffer an initial deficit of emission allowances that would increase linearly with the increase in production.

A drawback of a forecast reference period is that it is necessary to assess the probable correctness of plant-specific production forecasts. This seems to be unreasonable from an administrative point of view, bearing in mind the large number of plants that will require benchmark-based allocations. In addition, the procedure would be further complicated by the fact that the macro-economic reference values that are available are not particularly applicable, due to the large number of plants and to variations in local conditions. It can be mentioned in this context that possible *ex-post* adjustments of allocations, that would have made assessment of forecasts less critical, are not allowed under the terms of the Directive[24].

Despite not using forecast activity years for existing plants, future changes in production as a result of capacity expansion will still be allowed for by the general

[24] *Ex-post adjustment*: Retroactive correction of the allocation from the actual result, if the underlying data used for plant-specific forecasts was shown to differ substantially from what had been assumed in the allocation application.

rules for allocations for new entrants. However, increased production that is not the result of an increase in installed capacity will also be allowed for, as the method consists of updating the latest possible activity years as soon as the period has caught up with the results of the measures.

There will always be a number of *existing* plants which, in the same way as for new entrants, will require allocations based on forecast activity years. An example of such plants would be those starting up between 2005-2007, and therefore being new entrants during the first period. By definition, they will be existing plants with effect from 2008, but yet will have little or no recorded production data by the time when the national allocation plan is to be submitted. Existing plants taken into use after a particular date must therefore be given an allocation from more or less the same activity years as for new entrants.

Even though it may be necessary to use different activity years, the same benchmarks can be used for both existing plants and new entrants, which means that the allocation can be considerably more consistent than it would be if completely different allocation principles were being used.

According to the Commission's guidelines for interpretation of the criteria in Annex III of the Directive, member states who use benchmarks may use (for example) the most recently available production data or a forecast of such data for the period for which the allocation applies[25]. However, they may not base the allocation on the actual result from a plant during the same period. This is because this would represent an ex-post adjustment of the allocation decision which, in accordance with Annex II, must have been agreed before the start of the period. This means that an allocation issued to a plant on 28th February 2011 must not be based on production data recorded during any of the previous years in the period, i.e. during 2008, 2009 or 2010. On the other hand, data from these years could have been used as a basis for allocation if it was the results of a plant-specific forecast, and not linked to the actual results. As has been pointed out above, practical considerations mean that such a method is not suitable.

Against the background of the above points, the Agency is of the opinion that the years 2000-2003 constitute a possible reference period for production-based benchmark allocation for the period starting in 2008. Bearing in mind the availability of statistical material, and the need to have calculated the benchmarks by 2005, the *benchmark years* should not include 2004. At the same time, it can be noted that this proposed period was somewhat warmer than normal (particularly in 2000), and initially received considerably more precipitation than normal (2000-2001), but with less precipitation than normal towards the end of the period (2003).

[25] KOM(2003)830, Final, Items 78-79.

6.3 Determining the size of the benchmarks

There are several methods available for calculating the necessary size of the benchmarks. The alternatives can be roughly divided up into national benchmarks, international benchmarks and benchmarks based on best available technique. Although the choice of approach is of decisive importance in determining the size of the benchmarks, perhaps the greatest difference between them depends on the fact that the benchmarks are, *de facto*, used for allocating emission allowances, together with the differences resulting from the plants and fuels covered by the benchmarking system.

Benchmarks are being used in Sweden for the 2005-2007 period to allocate allowances to new entrants producing electricity, heat and/or steam. They have been calculated on the basis of a national reference in the form of average specific emissions from electricity and heat production in some of the Swedish plants covered by the trading system. As a significant proportion of combustion-based electricity and heat production in Sweden is based on the use of renewable fuels, and as the rules for application of the benchmarks are such that it is only the fossil-based proportion of additional production from the new entrants that is entitled to a benchmark-based allocation, this has meant that the allocation is more restrictive than would have been the case if it had instead been based on best available technique. This shows that it is the rules for how the benchmarks are to be applied that can be more important than how the actual benchmarks themselves are constructed.

International benchmarks

An internationally harmonised method of allocation of benchmarks would have the clear advantage of requiring only one set of benchmarks to be developed, and of ensuring that plants within the same sector would be operating under common conditions that would not distort competition. However, as - in its present form - the Directive does not prescribe that the methods of allocation employed in the various states must converge towards a common format, it is felt that it is unlikely that it would be possible, in the short term, to achieve widespread application of common benchmarks throughout the EU. Member states have been assigned individual commitments for the 2008-2012 period under the terms of the EU's burden-sharing agreement[26]. However, the various member states differ in their closeness in terms of reaching their commitments, and thus also have different values to consider when allocating emission allowances. Nevertheless, this does not mean that it would be necessarily impossible to obtain voluntary agreements in particular sectors, e.g. between countries sharing the same market.

When deciding upon its allocations, each country has to attempt to strike a balance between national objectives and the requirements of the various sectors,

[26] Decision (2002/358/EC) concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

fitting within the emissions range available to the country. As far as the commitments to be decided for the years *after* 2012 are concerned, the EU can consider the need of treating companies in the same way, regardless of in which country their plants are situated. It could be, for example, that future burden-sharing within the EU could be based on production sectors, rather than on purely national considerations, which would improve the prospects for reaching agreement on a set of harmonised and obligatory benchmarks.

The burden-sharing on which the national commitments for the 2008-2012 period were based took regard of the countries' different potentials for reducing emissions from the energy sector. This means that countries having low carbon dioxide intensities have generally been given commitments that are milder than the overall reduction objective for EU-15. There are therefore some conditions in place for the application of common benchmarks to all countries as early as 2008, such that plants in some countries would be given allocations that exceed their absolute emission levels, while corresponding plants with higher specific emissions in other countries would receive an allocation that is less than their emissions. This would produce a situation that is at the same time both competition-neutral (i.e. with the same benchmarks for all parties), and which would also ensure that all winners and losers would be within the group of plants covered by comparison with the benchmark.

Despite the fact that, in Sweden, it is the non-combustion-based production that makes the greatest contribution to the fact that, in an international comparison, Sweden has a relatively low carbon dioxide intensity from the electricity sector, combustion-based production of electricity and heat also uses a very high proportion of renewable fuels when seen in an international perspective. This would mean that, assuming a non-fuel-dependent benchmarking principle with international values, the Swedish energy sector would receive an allocation of emission allowances that would considerably exceed its needs.

The Agency feels that there is a greater need for applying internationally harmonised benchmarks governing the allocation of emission allowances in the energy sector for electricity production than there is for heat production, and particularly wishes to emphasise that it is the rules governing allocations to *new entrants* that have by far the greatest effect on the competition situation, and that it is therefore these that are the most important to harmonise.

National benchmarks

An allocation principle using benchmarks based on national statistics is an alternative to an approach based on international benchmarks until sufficiently many countries have come together with a harmonised allocation procedure. The need for common benchmarks is manifested primarily by the electricity-producing portion of the energy sector that is exposed to northern European competition. In addition, it is the rules governing allocations to new entrants that have the most noticeable effect on the investment climate in the sector. There is not the same

need behind selection of the allocation principle for units producing only heat for local markets as there is for units producing electricity. For combined heat and power production, however, it is necessary to consider the fact that it can operate on several markets, and that the electricity-producing part of the plant is indirectly affected by the benchmarks used for hot water and steam.

Despite the fact that, due to gaps in statistics and uncertainty concerning coverage of the Emissions Trading Directive in Sweden, the number of plants on which benchmarks have been based was relatively limited at the time when the national benchmarks for electricity and heat were being calculated in March 2004, these values nevertheless give a relatively clear picture of what a Swedish set of national benchmarks might look like. It consists essentially of six sets of benchmarks, calculated on the bases of different assumptions concerning such factors as the role of biofuels, distribution of emissions from the various combined heat and power plants during the benchmark years and the ability of using the alternative method[27] for calculating the size of the benchmarks on the basis of separate electricity and heat production, without inclusion of CHP, despite the fact that CHP, too, receives an allocation based on the benchmarks.

Best available technique

Another alternative is to calculate benchmarks on the basis of Best Available Technique, or on the basis of the 10 % of most energy-efficient plants in the world. Such an approach would ensure that the allocation had good prospects of fulfilling Criterion 3 in the Directive's Annex III, concerning the potential for reducing emissions, and Criterion 8 concerning the use of clean technology.

By definition, benchmarks based on best available technique are technology-dependent, but are also fuel-dependent as it is always possible for energy conversion processes producing electricity or heat to reduce carbon dioxide emissions to zero tonnes of fossil carbon dioxide per product. This means that it is necessary to determine a certain number of benchmarks for different combinations of production technologies and fuels. However, the actual work of constructing the benchmarks is simplified by the fact that the calculations are based on only a small number of reference plants, as opposed to the case for benchmarks that are based on national or international averages.

Benchmarks for carbon dioxide can be calculated for different products on the basis of such factors as values formulated in terms of energy efficiency, electricity yield etc. in the IPPC's BREF document for large combustion installations[28]. The *European Integrated Pollution Prevention and Control Bureau* (EIPPCB) is developing standards in connection with Directive (96/61EC) concerning

[27] Corresponds to the methodology recommended by the Swedish Environmental Management Council for environmental declarations.

[28] Draft Reference Document on Best Available Techniques, *Integreted Pollution Prevention and Control (IPPC)*, November 2004.

Integrated Pollution Prevention and Control (IPPC), which must be applied in connection with processing concession applications for new and modified installations with effect from 1999, and for existing installations with effect from 2007. These values can be converted to benchmarks for carbon dioxide using the emission factors for the respective fuels. In practice, benchmarks based on the BAT values can be made very detailed, reflecting such factors as the size of the plant, the fuel mix, application area and the exact technology used.

In principle, allocation based on benchmarks defined by best available technique means that plants cannot receive any initial surplus of emission allowances. Only if a plant belongs to the group having the most energy-efficient plants on the market will it receive an allocation that amounts to its actual need of emission allowances. However, application of the values can be combined with a transition phase which gives the plants time to adjust to an allocation based on the BAT-equivalent benchmarks, as shown in Figure 4. Although the benchmarks at all times have a direct relationship to best available technique, the allocations converge linearly towards the target value for the particular product concerned, with allowance for the fuel and technology with which it is associated.

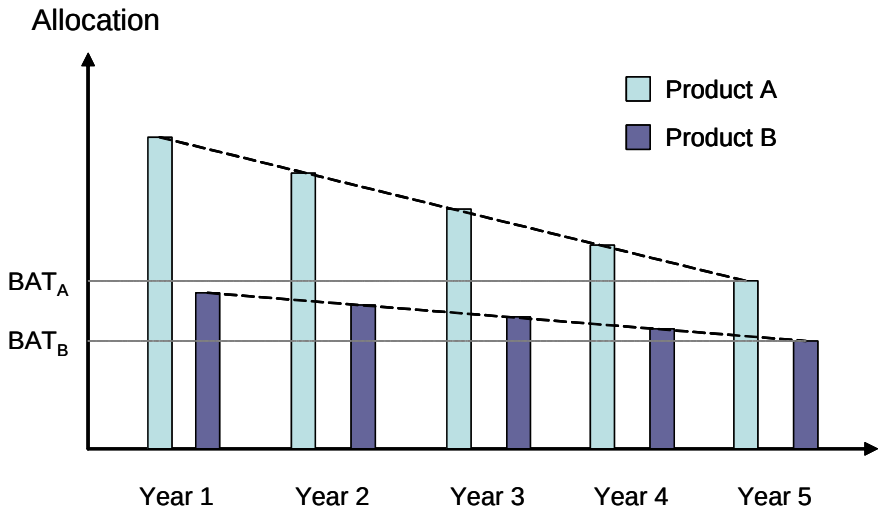


Figure 4. Allocation based on benchmarks constructed from best available technique for various products, including a progressive adjustment of benchmarks towards the actual BAT levels.

In the longer term, and as the total allocation declines in accordance with stricter commitments in combination with presumably improved productivity, there will be increasing pressure for lower specific emissions (tCO_2/product), which may mean that even BAT values will seem to be unnecessarily generous.

There is little reason, within the framework of allocation based on BAT benchmarks (or on a reducing path down towards these values), to adjust allocations on the basis of, for example, some predetermined ceiling. One reason for this is that part of the thinking behind choosing a BAT-based approach would be lost if the size of the benchmarks was adjusted on a top-down basis.

Nevertheless, if adjustment is required due to the limited emission space, the relative relationships between BATs for different products can still be maintained. This difference is still important, as it means that the benchmarks can still maintain the differences between the technologies, reflecting the different potentials of the groups concerned to reduce their emissions.

6.4 Benchmarking principles applied for the first trading period (2005-2007)

When allocating emission allowances for the 2005-2007 trading period, several countries have elected to use benchmarks as the basis for the energy sector. However, these have been almost exclusively applied to new entrants, although there are examples of countries that have used benchmarks for both new entrants and existing plants.

This section provides a very short description of how a selection of northern European countries apply benchmarks, and of the bases for determination of the sizes of the benchmarks.

Finland

New entrants in the Finnish energy sector receive an allocation based on the installed capacity of the plant, coupled with a general assumption of its expected utilisation (depending on the type of technology) and on whether the plant is in the energy sector or in industry.

Cold condensing power stations and district heating plants intended for base load supply receive an allocation based on 6000 h/year utilisation time, while a unit such as a standby boiler would be given an allocation based on an annual utilisation time of 500 hours. Production of heat or steam in industry receives an allocation based on 5000 h/year.

A distinction is made between gaseous/liquid fuels and solid fuels, with different specific emissions being used in calculating the benchmarks for each of them. Plants burning gaseous or liquid fuels receive an allocation based on an emission factor for natural gas (56.0 gCO_2/MJ), while plants burning solid fuels receive an allocation based on an assumed 70 %/30 % combination of peat and biofuels (74.2 gCO_2/MJ). This means that a new plant burning only biofuels receives an allocation based on the same benchmark as a new peat-fired or coal-fired plant.

Lithuania

The Lithuanian allocation plan is of particular interest, as it allocates emission allowances based on benchmarks for both new entrants and existing plants in the energy sector. The benchmarks, which are production-based, amount to 576 tCO_2/GWh_{el} in cold condensing power stations, 421 or 779 tCO_2/GWh_{el} for

combined heat and power plants, and 250 or 289 tCO_2/GWh_{heat} for heat production, with the alternative values depending on whether the plant can use natural gas or not.

The allocation-qualifying years are the same as those for which the allocation applies (2005-2007), which means that the production values are forecast values. The magnitude of the benchmarks has been calculated on the basis of expected average specific emissions per product from combustion plants in 2005-2007. Allocation is based on benchmarks, regardless of from what fuel the electricity or heat is generated, i.e. the benchmarking principle is not fuel-related.

The Commission states, in its decision to approve the Lithuanian allocation plan, that it has assessed the plan as compatible with Criterion 5 in the Directive[29]. The Decision expressly states that if assessed in accordance with Article 88(3) of the Treaty, the public subsidy which the allocation can come to provide for individual installations is probably compatible with the common market.

Denmark

The Danish electricity and heat plants that fall within the definition of new entrants receive an allocation based on their expected capacity. These benchmarks have been based on a reference in the form of a natural gas-fired combined cycle plant using best available technique and with an assumed utilisation of 5000 h/year. Electricity capacity from combined heat and power plants is calculated when the plant is operating with full heat production.

The benchmark for electricity is 1710 tCO_2/MW, while that for heat production is 350 tCO_2/MW, constituting an annual allocation. District heating plants that do not produce electricity are instead given an annual allocation on the basis of a benchmark amounting to 205 tCO_2/MW. For electricity production, it is only the fossil-based part of the additional capacity that is allocation-entitling[30].

Germany

The emission allowance allocation to new entrants in the German energy sector is based on benchmarks calculated from specific best available technique emissions for different products. A plant producing electricity can receive an allocation based on a benchmark of 750 tCO_2/GWh_{el}, but never more than what is needed to meet its emission allowances requirements. These benchmarks are calculated as the weighted mean value of specific emissions from electricity production in modern power stations burning brown coal, energy coal or natural gas. There is also a lower limit of 365 tCO_2/GWh_{el} which corresponds to the specific emission

[29] Decision K(2004)5292 of 27th December 2004.
[30] The Act (493) Concerning CO_2 Quotas.

from a modern natural gas-fuelled power station. Production of hot water is given a benchmark in the range 215-290 tCO_2/GWh_{heat}.

Combined heat and power stations receive a special bonus in addition to the above values, based on a benchmark of 27 tCO_2/GWh for the total of electricity production and useful heat. A somewhat higher benchmark is applied for process steam than for hot water, amounting to 225-345 tCO_2/GWh, depending on the fuel used.

Netherlands
The Dutch allocation of emission allowances is based largely on the long-term agreements concerning improvements in energy efficiency that (in principle) all energy-intensive installations have entered into with the state. These agreements mean that, by a given timepoint, the companies will have improved their efficiency of energy use to a level such that they among the 10 % most energy-efficient companies in the world. The allocation of emission allowances to existing plants is based not only on historical emissions from 2001-2002, but also on how well the companies are progressing towards this target.

New entrants in the energy sector also receive an allocation based on benchmarks derived from reference values taken from the performance of the world's 10 % most energy-efficient plants. An installation producing electricity receives an allocation based on a fuel-dependent benchmark of 404 tCO_2/GWh_{el} for natural gas or 872 tCO_2/GWh_{el} for coal. New entrants in the hot water or steam product sectors receive an allocation based on a benchmark of 224 tCO_2/GWh_{heat} for natural gas. New CHP plants receive an allocation based on a combination of these benchmarks.

Sweden

See Section 5.1 for a description of how the Swedish benchmarks have been applied for the 2005-2007 period.

6.5 Treatment of new entrants

6.5.1 New entrants in relation to existing participants

A feature of the benchmarking principle that is often put forward as an advantage is that, as opposed to methods based on historical emissions, it is possible to apply the same principle for existing plants as for new entrants. Although it is correct that this ensures that allocation within individual activities is clearer and more consistent if it is based on the same set of benchmarks, even though it can require different activity years being applied for the two groups, it is not equally clear as to whether the same treatment means that the allocation becomes 'fairer'. This is

determined instead by whether the existing plants can be regarded as suffering from stranded costs or not, and by how other countries deal with new entrants.

According to economic theory, free allocation of emission allowances to new entrants should be avoided. This is because it can result in investments in technologies that are not properly matched to the restriction on greenhouse gas emissions that is associated with the requirement to surrender an amount of allowances corresponding to the actual emissions from the installation. Free allocation to new entrants means that operators do not always consider the full price of emission allowances when deciding on their investment, which is because (in practice) these emission allowances have a reduced alternative cost. If the company had chosen a technology intended for use with a less carbon dioxide-intensive fuel (which might have been justified by the price of the emission allowances), it would have received a reduced initial allocation of emission allowances. This means that that portion of the new entrant's emissions covered by the allocated allowances is not included in the marginal cost calculation of reducing carbon dioxide emissions, with the result that it can lead to sub-optimisation and an investment decision on a partly incorrect basis. From this, it follows that an auction would be the most efficient way of allocating emission allowances that might be needed for increased production from new and existing plants.

In practice, there are several reasons that indicate that new entrants should nevertheless receive an allocation. Article 10 in the Directive states that almost all emission allowances must be allocated without charge, which means that many existing plants will be compensated over and above what is needed for their stranded costs. In order to avoid putting obstacles in the way of new technology, new entrants should therefore be treated in the same way as existing participants in the scheme. The second reason is that other EU countries choose to allocate emission allowances to new entrants in an amount corresponding to their needs. As has previously been pointed out, it is very important in this context that harmonisation of the treatment of new entrants should be achieved, either through agreement or, if necessary, by unilateral change, as the rules for new entrants affect the differences in the investment climate between countries in the single market.

If other countries support new fossil-based electricity and heat production during the next trading period as well, certain new entrants in the Swedish energy sector should receive corresponding free allocation of emission allowances. In order to avoid an adverse effect on the Swedish plants, this should be done by treating both renewable-fuelled production and fossil-fuelled production in the same way if it is the intention to neutralise distortion of competition when determining the principles for allocations to new entrants.

The Agency is of the opinion that, as far as possible, it should be the price of emission allowances, rather than their allocation, that should affect the choice of

fuel used by a plant. This is a prerequisite for the system's ability to steer the emission reductions to where they can be achieved at minimum cost, which in turn ensures cost efficiency in systems in which the marginal cost curve of emission reductions varies from one plant to another. As has previously been pointed out, the allocation to new entrants tends to affect investments and the choice of intended fuel for a plant. Treating biofuelled plants in the same way as fossil-fuelled plants is therefore one step towards neutralising the negative environmental impact resulting from the allocation to new entrants.

Due to the defined number of emission allowances, total emissions will be the same regardless of the allocation principle. The downside of an allocation that affects the way in which a plant is operated is instead that it results in reduced cost efficiency in the system. Under certain conditions, it will be possible to justify such a cost if it was incurred in order to achieve other long-term energy policy objectives. One such example could be of not allocating free emission allowances to new cold condensing plant, if allocation to other types of plants steers results towards other objectives, which in this case would be more efficient use of energy.

As opposed to the situation for new entrants who produce electricity, there is not the same need to allocate free emission allowances to plants that produce only heat and which use biofuels. Such plants do not face international competition, and allocation of emission allowances would not have any environmental benefit if the allocation rules have been correctly drafted. In this report, we are not taking a stance as to whether the non-fuel-dependent benchmarks should also apply for *existing* plants, but we do note that this would, to some extent, contribute to a more transparent and simpler principle of allocation.

When presenting the final report, the Agency intends to return to this question of how the requirements applicable to a benchmarking principle are affected by other policy measures. In this context, one of several important aspects is the question of possible changes to carbon dioxide taxation that may be relevant in the trading sector.

6.5.2 Constructing benchmarks for new entrants

As even a benchmarking principle must be based on data from one or more activity years, and as new entrants can provide relevant data only after the plant has been established or expanded, allocation to *new entrants* must of necessity be based on a forecast. As described above, it is not suitable to choose a general allocation principle that requires individual forecasts to be considered when calculating allocations for all *existing plants* in the energy sector. This means that the activity years used as references for new and existing plants cannot be the same.

In accordance with earlier conclusions, the *allocation-qualifying parameter* for new entrants should also be different than that for the existing plants. In the Nordic countries, both Denmark and Finland have elected to employ *capacity-based* benchmarks for new entrants for 2005-2007. This method means that allocations can be calculated on a parameter that can better be forecast, although at the same time it requires the use of assumed values for annual capacity utilisations by different technologies and application areas.

The Agency is of the opinion that a starting point for determining the size of the benchmark for electricity to be applied to new entrants should be such that it results in harmonisation of the rules in those countries sharing the same electricity market. One way of doing this can be to start from the allocation needs of a particular type of plant, e.g. a high-efficiency natural gas combined cycle CHP plant.

The present rule that new entrants in the electricity and district heating sector must be of high-efficiency type, as defined in the CHP Directive, must remain a requirement in order to receive an allocation. It fulfils the intention in Bill No. 2004/05:18 that new condensing power stations must not receive any free allocation, and that the heat-producing plants that have a significant proportion of their activities coupled with the electricity market receive an allocation that allows for the effects of international competition.

Work on developing interim reference values to provide a basis for calculation of what constitutes high-efficiency utilisation of the fuel is in progress as part of the work of the District Heating Commission (N 2003:03). The Commission is due to present international reference values in February 2006 that can be used by the countries.

6.6 Distinction between the energy and industry sectors

A clear distinction was made when deciding the Swedish allocation for the 2005-2007 trading period between the electricity and district heating sector and other industry. Regardless of whether those receiving allocations are new or existing participants, the calculated allocation must be multiplied by a factor of 0.8 if their main activity is to produce electricity or district heating, but not if it is included in an industry specified in Section 2, Paragraph 1 of the Act (2004:1199) Concerning Trading in Emission Allowances, if it is in other manufacturing industry or in agriculture, forestry or aquaculture.

In this report, we have not stated a view as to whether this distinction should be maintained within the framework of a benchmark-based allocation. However, until further notice, the starting point is that benchmarks developed in the future

must also be applied for industrial combustion plant producing electricity, heat or steam.

7 The EU Commission requirements and benchmarks

7.1 Annex III of the Emissions Trading Directive

One of the more important aspects for practical applicability of any allocation principle is what the criteria in Annex III of the Directive represent in terms of potentials and restrictions. Help for interpretation and application was provided by the Commission in January 2004 by publication of guidelines for application of the criteria in the Annex[31]. The following is a description of the criteria that could affect the feasibility of using a benchmarking principle, and comments on them.

The benchmarks are based primarily on consideration of whether any surplus of emission allowances that might accrue to certain energy-efficient and low-emission plants (at the 'cost' of the least efficient and most carbon dioxide-intensive plants), resulting from the application of non-fuel-dependent benchmarks, is fully compatible with all the criteria.

Criterion 2

The second criterion is automatically fulfilled if the total quantity of allowances does not exceed the actual and forecast level of emissions that is compatible with the country's commitment under the burden-sharing agreement. As far as this criterion is concerned, the fact of not exceeding actual or forecast values is applicable only at system level, and thus not in relation to individual plants.

Criterion 3

The third criterion is obligatory in that the allocation must allow for differences in the technical potential for reducing total levels of emissions between the trading and non-trading sector. On the other hand, it is voluntary in terms of also considering the difference in the achievable progress of different activities. There is nothing in this criterion limiting the applicability of benchmarks at plant level: on the contrary, the criterion clearly states that member states may base their distribution of allowances on "*average emissions of greenhouse gases by product in each activity and [on] achievable progress in each activity*".

The Commission's guidelines for application of Criterion 3 in Annex III of the Directive also include the following:

[31] KOM(2003)830, *Benchmarks for the application by member states of the criteria in Annex III of Directive 2003/87/EC concerning a System for Trading in Emission Allowances of Greenhouse gases* […]

"For example, achievable progress with coal-fired electricity generation is an acceptable basis for the determination of benchmarks. What is achievable by different coal-fired technologies is more limited than what may be achievable in the case of fuel-switching from coal to natural gas. However, the incentive for fuel switching to less carbon intensive fuels would not be affected."[32]

As the potential for reducing emissions from, say, coal-fired power production is less if this potential is not allowed to include conversion to use of a less carbon-intensive fuel, it would fall outside the recommendation for the plant to be allocated benchmarks that are calculated on the basis of average emissions including (for example) biofuels or natural gas.

Just what is to be regarded as *achievable* is not exactly defined: instead, it is simply pointed out that the potential is reduced if the possibility of changing the fuel is disallowed. The Swedish energy sector has many plants that incorporate a fuel flexibility which means that, in practice, it is relatively easy to change to a less carbon-intensive fuel. In other words, this would represent a reduction in emissions that would be easily achievable for such plants, and which would also be a more cost-efficient way of reducing specific emissions from the plant than would be measures intended to improve efficiency.

Item 26 of the guidelines states that "*More might be asked of activities that can make cheaper reductions, and less might be asked of activities whose reductions are expensive*". Against the background of the above reasoning, this seems to support the impression that the fuel used by the plant is not a given starting point when dividing plants into groups for application of benchmarks.

The Commission's claim in the final sentence of the above extract from the guidelines – that the incentive to change fuels is not affected – is correct if we consider a trading period in isolation. However, what it does not consider is the incentives that a fuel-dependent benchmarking principle could create in the long term as a result of problems associated with classification of a converted plant in the next trading period.

Criterion 5

The fifth criterion, on non-discrimination, is obligatory at the overall level and at sector and plant level. Its content is that allocation must not unduly favour any activities or undertakings in accordance with the requirements of the Treaty. The Commission has previously said that "*a party is unduly favoured if it receives an over-allocation in relation to its expected needs without having made any efforts to reduce emissions*", e.g. in the form of previous improvement measures. This means that the Commission recommends a system of allocation which, as far as possible, goes to where the greatest emissions are, which can be seen as serious consideration of the need to provide compensation for stranded costs. Other

[32] KOM(2003)830, Item 28.

reasons can be that, to some extent, it can be easier to ensure a deficit in the system if surpluses at *plant level* are forbidden, and possibly that the consequences of possible operation of market forces will be reduced if those having the greatest need of emission allowances are also those with access to allowances from the beginning.

Reference to (for example) the guidelines (2003/C37/03) for public support for measures intended to protect the environment, indicate that it can be permitted to issue emission allowances for renewable energy production in the trading system, despite the fact that there is not actually need for such allowances. As far as consideration of allocation of allowances to biofuelled plants is concerned, the Commission has, on a number of occasions, expressly stated that such allocation cannot be accepted, while in other contexts stating that it can be allowed and be justified. The application or otherwise of public subsidy is considered from case to case at plant level, and it is therefore not sufficient to show that the sector as a whole is not receiving a greater allocation than it would have got through application of some alternative method of allocation, e.g. emissions-based grandfathering.

A non-fuel-dependent benchmarking principle means that the most carbon dioxide-intensive electricity and heat production receives a lower allocation, while the least carbon dioxide-intensive production receives a higher allocation, when compared with an allocation principle based on the magnitude of plant emissions. There are therefore clear similarities with the levy system on the emission of NO_x, which covers about 300 Swedish combustion plants. In exactly the same way as for a non-fuel-dependent allocation, the net economic results of the refunding on the NO_x levy, which is calculated and applied in proportion to useful production, and the requirement to pay a fee in proportion to the magnitude of emissions, is dependent on how specific emissions from the plant relate to the average value of emissions within the entire group of plants affected by the scheme.

From an environmental point of view, an initial redistribution of the number of emission allowances within a sector does not raise any questions, as the fact that individual plants may receive a surplus of allowances does not mean either that the sector as a whole has been favoured or that total emissions increase. Nor does the size of the allocation to an existing participant have any effect on the fuels used by the plant: the component in the trading system that does affect the choice of fuel is the *market price* of the emission allowances.

The Agency is of the opinion that it is important to perform a thorough analysis of the various ways of deciding initial allocation of emission allowances through the use of non-fuel-dependent benchmarks. This is important not least from the point of view of public subsidy, and bearing in mind the implications of the method in respect of application of other policy measures. An analysis of public subsidies should consider, for example, whether new fossil-based production has any

stranded costs, whether the 'polluter pays' principle should apply and whether environmental support benchmarks etc. would be a more suitable basis for the determination of allocations.

The evaluation that *fuel-dependent* benchmarks are not an obligatory requirement is confirmed by the Commission's decision concerning allocation plans for the 2005-2007 period. An example of this is presented by the national allocation plan for Lithuania, in which allocation of allowances to both new and existing electricity-producing and heat-producing plants in the energy sector is based on production-based and non-fuel-dependent benchmarks. The Commission's decision states that the public subsidy that these benchmarks could represent for the individual plants is probably compatible with the requirements of the single market if considered against the requirements of Article 88.3 in the Treaty, and thus also with Criterion 5.

Criterion 7

Under the heading *The use of benchmarks* in the Commission's guidelines for Criterion 7, it is stated that a member state intending to employ a benchmarking principle should first divide plants that are similar to each other into groups, and then use separate benchmarks for each group. The plants in each group must be so similar to each other in terms of input and production that it is possible to apply the same benchmark to all of them.

This should mean that the allocations would still have clear links to the size of emissions, as a coal-fired plant would receive an allocation based on a more carbon dioxide-intensive benchmark than would a plant burning (for example) natural gas. For production-based and fuel-dependent benchmarking principles, it is primarily the efficiencies of the various plants that decide whether an individual plant will receive more or fewer emission allowances in relation to its emissions and in comparison with other plants within the group of plants using the same fuel.

The benchmarks represent a clear exhortation from the Commission that member states should preferably use fuel-dependent and technology-based benchmarks. This would accord with the expressed view that no plant should receive more emission allowances than it may need, with the exception of actual measures that have resulted in a reduction of emissions from the plant, and which can therefore be rewarded in accordance with (for example) Criterion 7 concerning early action.

However, provided that the allocation principle meets the requirements set out in Annex III of the Directive, member states are free to decide on the principles of allocation that they wish to use.

7.2 The Commission's review of the Directive

Under the terms of Article 30(2) of the Directive, the Commission shall draw up a report on the application of the Directive during the period 2005-2006 and shall consider the practical feasibility of developing benchmarks to be used as a basis for application by the entire Community. The Commission's review of the 2005-2007 trading period was that it was still not practically feasible to arrange for benchmarks for the entire Community to provide a basis for the first national allocation plan.[33].

Many member states have shown an interest in, as far as possible, introducing an allocation process based on benchmarks for the next trading period. However, there is little scope for establishing obligatory application of benchmarks through amendment of the Directive. Joint efforts are therefore being made in parallel with the Commission's review of progress, with the aim of developing benchmarks that the member states can apply *voluntarily* for the 2008-2012 trading period.

In its present form, the Directive is intended to regulate the 2008-2012 commitment period as well as the earlier periods, and no major changes are expected in connection with the Commission's 2006 review. Such changes would require a new decision in accordance with the co-decision procedure, which in normal cases takes several years to perform, although there are some exceptions when a decision has been reached in a shorter time. However, changes to any of the criteria in Annex III of the Directive can be made through the considerably simpler Committee procedure.

Scope for amending the Directive to introduce obligatory allocation is also restricted by the fact that, by not later then 30th June 2006, the member states must have notified their national allocation plans for the 2008-2012 allocation period. However, the Commission is free, at any time, to publish renewed *benchmarks* for application of the Directive.

[33] KOM(2003)830, Page 9.

8 Practical implementation

8.1 Description of the target groups

Of the installations covered by the trading system, it is combustion plant in the electricity and district heating sector, together with other industries that produce electricity, heat and/or steam, that can be entitled to allocations based on benchmarks. They produce a small number of homogenous products, that are sufficiently comparable to provide a basis for a production-based principle.

Under the provisions of Article 24 in the Directive, Sweden has elected unilaterally to include combustion installations below the 20 MW threshold value. This means that even smaller units, connected to a district heating system having a total installed capacity of at least 20 MW, were required to comply with the requirements of the Act (2004:1199) Concerning Trading in Emission Allowances. This has had the effect of bringing about 250 installations into the remit of the scheme without being specifically required to be so included by the Directive. In principle, all these installations are smaller heating plants, and thus entitled to an allocation on the basis of benchmarks. This means that, when taken together with other electricity-producing and heat-producing combustion plants, the benchmarking principle will cover a total of more than 500 installations.

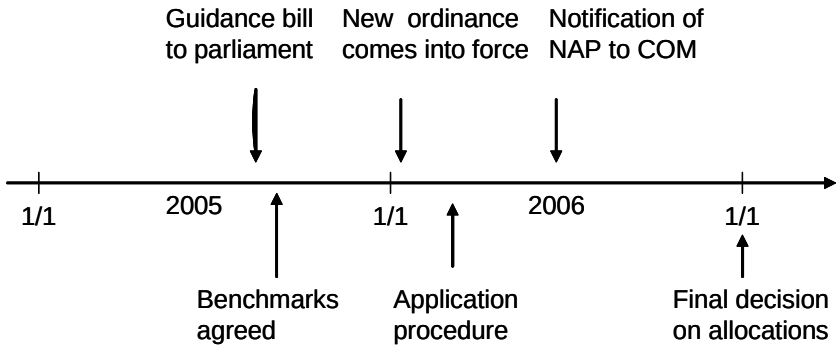
According to the definitive energy statistics for 2003, Sweden produced about 6.7 TWh_{el} and 17.0 TWh_{heat} in the country's about 60 CHP plants in the electricity and district heating sector. During the same period, about 40 industrial back-pressure plants produced 4.6 TWh_{el}. Among other electricity production, about 0.5 TWh_{el} were produced by cold condensing power stations, and about 0.1 TWh_{el} from gas turbines. The over 350 local heating plants produced about 14.3 TWh_{heat} of combustion-based heat during the year.

The use of fuels in CHP plants during the year amounted to about 39 % biofuels, 20 % coal, 12 % refuse, 12 % oil, 10 % peat and 8 % natural gas. The taxation regime for CHP production was changed on 1st January 2004, so that the heat produced in CHP plants pays the reduced CO_2 taxation level paid by industry, and no energy tax. When calculating the amount of tax due, the input quantities of fuels are apportioned appropriately to electricity and heat. In industrial back-pressure production, about 55 % of the fuels used in 2003 were biofuels (of which two-thirds in the form of black liquors, tall oil and pitch, 29 % oil, 9 % off-gases from the steel industry and 2 % coal. Local heating plants used about 63 % biofuels over the same period, together with 17 % oil, 13 % refuse and 8 % peat for their combustion-based production.

8.2 Legislative processes prior to the 2008-2012 allocation

The Directive requires member states to have submitted details of national allocation plans for the 2008-2012 trading period to the Commission by 30th June 2006. Parliament's decision on a bill setting out benchmarks for the allocation of emission allowances can have been made by the end of 2005, in connection with which a new ordinance will have to be issued. This means that all the data required for working out the indicative allocation needs to be available by not later than the start of 2006. Section 3, Paragraph 2 of the Act (2004:1199) Concerning Trading in Emission Allowances allows the Government or the public authority as decided by the Government, to require submission of the information needed in order to determine the Swedish allocation plan.

In principle, this can be done in connection with applications for allocations, provided that this procedure precedes the work on the allocation plan, which would minimise the administrative work for public authorities and companies. Although the method of allocation needs to have been decided by the time a decision on a new ordinance is made, it would be possible to decide scaling factors and the exact values of the benchmarks between the time of formal application for allocation and notification of the plan in June 2006. Before this, the entire allocation plan must have been circulated for comments from those affected by it and from the public, as required in accordance with Criterion 9 in Annex III of the Directive.



8.3 The need for statistics

The quantitative data needed in order to allocate emission allowances based on benchmarks depends to a considerable extent on how the benchmarks are to be calculated and on what rules are to be associated with their application. The need for statistical data can be roughly divided up into two parts: calculation of the benchmark values and determination of allocations at plant level.

Calculation of the benchmark values need not be particularly data-intensive if it starts from (for example) reference values in the form of best available technique, bearing in mind that these have already been produced. However, if the benchmarks are to be calculated instead from a national or international average of specific emissions in certain categories of technologies and fuels, there will be a greater need to process the necessary statistics. The most data of all will be required if it is intended to use technology-differentiated and fuel-differentiated benchmarks based on an international comparison of all plants in the system. Nevertheless, the relatively work-intensive input involved in an international benchmarking principle could probably be justified against the background of the broad application area for such a set of benchmarks, if it was known that they would be used by all member states.

Calculating national benchmarks for electricity and heat on the basis of data from Swedish plants would involve different amounts of work, depending on the number of benchmarks needed for each product. Although creating a single benchmark for electricity and another for heat requires a certain amount of work for acquiring and processing additional data, it does deal with already identified sources and known methods. Problems arise primarily if it is attempted to create benchmarks that are differentiated with respect to technology and fuel, and particularly so with the latter. At present, there is no given method for classification of installations based on their use of fuels and with allowance for their fuel flexibility. In addition, as previously pointed out, attempting to sort plants into different fuel classes depending on their main fuel is of dubious merit, as any alteration of the proportions of different fuels used could affect the actual amount of allocations at a later date, which would have the effect of reducing the system's incentive to reduce emissions to the extent justified by the price of emission allowances.

As far as application of the calculated benchmarks at plant level is concerned, it is likely – except in the case of benchmarks that have been calculated on the basis of data from a few reference plants – that much of the required data will already be available and have been processed in connection with calculation of the benchmarks. If the benchmark principle is fuel-dependent, the plants will already have been grouped at an earlier stage into their respective categories, as their production and emissions will be included in the calculations on which the various benchmarks have been based.

This means that, in connection with work on a national benchmark principle, most of the data needed to calculate the benchmarks would be the same as that needed for calculation of allocations at plant level, and which has therefore been submitted by the companies in connection with their applications for allocations. However, with some complementing of existing material, it should be possible right from an earlier stage to obtain a relatively good picture of what the benchmarks would look like. The most important consideration is that the

benchmarks (and any scaling factors) should have been determined before the national allocation plan has to be submitted to the Commission, which can be done with good accuracy using the definitive data from the operators if the application procedure is carried out during the early months of 2006.

Determination of the final allocation to the trading sector, or to some part of it, involves a decision that must allow for such aspects as the latest forecasts for the trading and non-trading sectors, the contents of applications for allocations and various commercial policy considerations. This can be effected by application of one or more scale factors to achieve any necessary adjustments of allocations. The constant does not need to be included in the benchmarks, but can be applied later when the relationship of allocations between different plants within the sector has been calculated.

Regardless of the allocation principle to be employed, the necessary forms and associated electronic system (SUS) for applications for allocations must be amended to suit prior to the 2008-2012 allocation. Exactly what details will have to be included in allocation applications in order to enable the necessary benchmarking principle to be applied will be described in the October submission of proposals for benchmarks.

One item of information of practical character in connection with processing the statistics for deciding on the value of benchmarks for the energy sector is the need to distinguish allocation-qualifying production from non-combustion-based production, e.g. electric boilers and heat pumps etc. in plants that also include combustion-based production. However, this information is identified in the national energy statistics, and can therefore be dealt with.

8.4 Statistics at present available

It is already possible, using existing statistical material, to calculate values for national benchmarks, and their apportionment at plant level, for most of the trading plants in the energy sector.

Prior to calculation of the indicative allocation in the Swedish allocation plan for 2005-2007, which was completed in April 2004, the Cabinet Office and the Ministries instructed the Swedish Environment Protection Agency to carry out a questionnaire survey among those plants which, at that time, had been identified as to be included in the system. In addition to the quantities of input fuels during the period 1998-2002, this survey also produced information on the quantity of output products over the same period.

Statistics concerning the number of plants have become more comprehensive in connection with the formal application procedure for allocations for the 2005-2007 period, most of which were received during August/September 2004.

However, production details for the allocation-qualifying years (generally 1998-2001) have been given only in those cases where the companies have applied for extra allocations as new entrants, and then only in connection with forecasts of production and emissions for the 2005-2007 period. Production data for about 200 plants is included in the applications, but not all of them are in the energy sector. Bearing in mind the incomplete material in the form of production statistics, these applications can be used to some extent as a basis for determining benchmarks. It must also be added that this information is partly confidential, as it can only in special cases be used for purposes other than those for which it has been collected.

The country's official energy statistics include data for the production of electricity and heat at plant level which the Agency, in its capacity as the public authority responsible for statistics in this sector, can require Statistics Sweden to deliver, and can process for certain purposes. However, in this case, too, the information is confidential and should be used in principle only for such purposes as research. This production and emissions data for each plant would be more useful than, for example, the CO_2 emissions data for 1998-2001 (2003) that was included in the applications for the 2005-2007 period, particularly if the final choice of activity and benchmarking years is completely changed. It is also helpful to use production and emissions statistics originating from the same data source, as there may otherwise be differences arising from system boundaries.

It will not be possible to calculate the benchmarks that must be ready in October 2005 from statistics containing data for 2004. This is because the definitive energy statistics for 2004 will not be available until the beginning of 2006. However, this does not prevent 2004 from being used as an allocation-entitling year (activity year), as the allocation decision will be made at a time when information for the year will be available. As pointed out above, the size of the benchmarks does not necessarily have to be calculated on the basis of the activity year to be used. Bearing in mind the accuracy of forecasting, it may nevertheless be an advantage to use (for example) 2000-2003 as the activity years, allowing them to coincide with the benchmark years.

It is important, when using a benchmarking principle based on production at the plants, that the statistics for the quantities of electricity, heat and steam produced should be as accurate as possible. As far as the production of electricity is concerned, present procedures for metering and accounting are of good quality. The information is submitted on a monthly basis, and is based on requirements given in the Agency's regulations and the suppliers' metered data for billing. In addition, the introduction of the electricity certificate system has meant that many CHP and industrial back-pressure plants have improved the accuracy of their production metering.

District heating production is presented in the energy statistics in the same way as for electricity, while (for example) industrial steam and hot water production not

coupled to simultaneous electricity production is not totalled. This means that there is a complete lack of statistics for heat production in industrial boilers not connected to back-pressure turbines, and that such data is also incomplete for those back-pressure plants that sometimes produce only heat, with the turbine shut down. However, annual *use of fuel* in industry is recorded at plant level, except in those cases where the sites have only a few employees. This means that, if the benchmarks are to be based on production from the entire population of installations, it may be necessary to obtain data for a few individual parts of industry from other sources, or to employ a different method of calculation.[34]

In this context, it is worth noting that the production of electricity, heat and steam by industries named in Section 2, Paragraph 1, first sub-paragraph, Items 2-6 of the Act (2004:1199) Concerning Trading in Emission Allowances (e.g. pulp and paper mills), is not treated as production from a combustion plant in the normal meaning, but as production from a part of the industrial plant. This means that a new entrant producing electricity and heat is these activities receives an allocation based on an assessment of *best available technique* in accordance with Paragraph 31 of the Ordinance (2004:1205) concerning Trading in Emission Allowances, instead of being based on the *benchmarks* as referred to in Paragraph 30 of the same ordinance. Boilers in industries not included in Section 2, Paragraph 1 of the Act (e.g. in the chemical industry) are treated in essentially the same way as the rest of the energy sector, i.e. on the basis of applicable benchmarks, but with a difference in the scale factor that is applied.

Industrial boilers differ from other electricity and heat-producing units in that their products are largely used within the particular plant. In such cases, allocation based on the production of electricity, heat or steam means that it is based on an internal flow, the magnitude of which is considerably affected by the energy efficiency of the plant. The starting point should be that the principles for allocation of emission allowances must not be structured in such a way as to disadvantage companies wanting to improve the efficiency of energy flows in the various processes in their plant. It can therefore be appropriate to link allocation to the use of these products in the plant.

The Agency is of the opinion that the specific conditions, with internal use of products, and the somewhat incomplete statistics, mean that there is reason to continue to treat the industrial boilers included in the activities set out in Section 2, Paragraph 1, Items 2-6 of the Act (2004:1199) Concerning Trading in Emission Allowances as outside the energy sector, and thus excluding them from application of the benchmarks. However, industrial boilers in industries outside those specifically defined in the Act may need to be treated as combustion installations. An alternative would be to continue the use of emission-based allocation for this limited selection of industrial boilers.

[34] STEMFS 2005:1, The National Energy Agency's Regulations Concerning Information for Energy Statistics.

However, the Agency has taken as its starting point the requirement that the benchmarking system must be able to cover all plants that produce electricity and/or heat, but will continue in this work to develop the assessment of conditions for including all industrial boilers in the benchmarking system.

Against the background of better knowledge of the extent of the trading system in the energy sector, of statistics in the allocation applications for 2005-2007 and of the fact that there is now more time for the preparations than was available before the 2004 allocation plan, the Agency is now of the opinion that there are good prospects for achieving a set of benchmarks for allocation of emission allowances in the energy sector prior to the trading period starting in 2008.