REPORT

Harmonising New Entrant allocation in the Nordic Energy Sectors

- current principles and options for EU ETS phase II

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B1679

The report approved
2006-05-12

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Organization	**Report Summary**
IVL Svenska Miljöinstitutet AB	**Project title**
Address Box 21060 100 31 Stockholm	**Project sponsor**
Telephone +46 (0)08-598 563 00	The Swedish Energy Agency, with additional funding from the Nordic Council of Ministers

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Title and subtitle of the report

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Keyword

Emission trading, new entrants, allocation

Bibliographic data

IVL Rapport B1679

The report can be ordered via

Hemsida: www.ivl.se, e-post: publicationservice@ivl.se, fax 08-598 563 90, eller via IVL, Box 21060, 100 31 Stockholm

Summary

In the EU Emission Trading Scheme (EU ETS), the treatment of new entrants to the scheme has proven to be one of the most contentious issues. It is also one of the areas where policies among Member States differ the most in the first set of National Allocation Plans (NAPs). This report analyses options for allocation of emission allowances to new entrants in the Nordic energy sectors, and give recommendations for harmonised allocation principles for use in the 2008-2012 NAPs of the Nordic countries.

The study finds that current allocation rules does have an impact on investment decisions, and can significantly distort competition if they remain unchanged. Under current allocation rules the annual value of the allocation is comparable to the fixed investment costs for a new installation and it has the same order of magnitude as the expected revenues from sales of energy from the installation.

There seems to be no fundamental obstacles in any Nordic country to change the allocation system to new entrants as part of a harmonising process, but any decision on allocation to new entrants should take into account what choices are made in other countries on the northern European energy market. Germany, Poland and Estonia are of particular importance since the transmission capacities to those countries are relatively large.

Harmonising allocation is a higher priority for electricity generation than for heat, due to the higher sensitivity of electricity generators to competition. Further, since the energy sector can pass on the majority of the cost for emission allowances to clients, a stringent allocation is easier to justify in this sector than in others.

As a first best solution, we recommend that the Nordic countries do not allocate free allowances to new entrants in the energy sector. Instead operators would have to buy allowances, either from the government or on the open market. This should be combined with adjusted rules on allocation to existing installations in order to avoid putting new installations at a disadvantage compared to existing installations. Another important condition for this recommendation is that Germany and Poland[1] also radically decreases its allocation to new entrants.

The second best solution, which could be used if Germany and/or Poland and Estonia continue to allocate free allowances to new entrants, would be to use harmonised fuel and technology independent benchmarks based on output. This would give incentives to invest in efficient technologies and low carbon fuels. The allocation should be kept as stringent as possible, in particular for heat producers. There should also be harmonised assumptions and guidelines on how forecast production.

A third option is to use harmonised, fuel- and/or technology dependent benchmarks, still keeping the allocation as stringent as possible. This would probably meet less resistance from stakeholders than the first or second best solution. It would also fulfil the objective of removing distortion of competition from the allocation. However, this option would create perverse incentives for investments, and the benefits of having harmonised allocation methodologies would have to be weighed against those negative effects.

Finally, we recommend that the Nordic countries investigate what options are available to provide greater certainty in the allocation, for instance through allocating allowances for longer periods into the future.

[1] We base our recommendation on the figures given in the Polish NAP submitted to the Commission in July 2004. These may be altered in response to the Commission decision, but to what extent remains unclear.

Sammanfattning

I EU:s system för handel med utsläppsrätter (EU ETS) har behandlingen av nya anläggningar visat sig vara en av de mest omdiskuterade frågorna. Det är också ett av de fall där de nationella tilldelningsplaner (NAP) skiljer sig mest åt. Den här studien analyserar alternativ för tilldelning till nya anläggningar i det nordiska energisystemet och ger rekommendationer för harmoniserade tilldelningsprinciper i de nordiska länderna för perioden 2008-2012.

Studien visar att nuvarande tilldelningsmetoder kan ha betydelse för investeringsbeslut, och att de kan ha betydande snedvridande effekter på konkurrensen mellan länder om de får kvarstå oförändrade. Under nuvarande tilldelningsregler är värdet på den årliga tilldelningen jämförbart med de fasta investeringskostnaderna för en ny anläggning, och det är i samma storleksordning som de förväntade intäkterna från såld energi från anläggningen.

Det tycks inte finnas några grundläggande hinder för att ändra tilldelningsreglerna i de nordiska länderna för att nå en harmonisering, men alla beslut om tilldelningen måste ta hänsyn till valen som görs i andra länder på den nordeuropeiska energimarknaden. Tyskland, Polen och Estland är av störst betydelse eftersom överföringskapaciteten till dessa länder är relativt stor.

Harmonisering är viktigare för elproduktion än för värmeproduktion eftersom elproducenter är mer utsatt för internationell konkurrens. Eftersom energisektorn kan överföra en stor del av ökade kostnader på sina kunder är det lättare att motivera en strikt tilldelning här än i andra sektorer.

Vi rekommenderar i första hand att de nordiska länderna inte ger gratis tilldelning till nya anläggningar i energisektorn. Istället bör operatörerna få köpa utsläppsrätter från staten eller på den öppna marknaden. Detta bör kombineras med förändrade regler för tilldelning till existerande anläggningar för att undvika att nya anläggningar missgynnas jämfört med redan existerande. Ett annat viktigt villkor för den här rekommendationen är att Tyskand och Polen också radikalt minskar sin tilldelning till nya anläggningar.

I andra hand rekommenderar vi att harmoniserade bränsle- och teknikoberoende riktmärken används. Detta skulle ge incitament att investera i effektiv teknik och koldioxidsnåla bränslen. Tilldelningen bör göras så strikt som möjligt, i synnerhet för värmeproducenter. Det bör också tas fram harmoniserade antaganden och riktlinjer för produktionsprognoser. Detta alternativ rekommenderas i det fall Tyskland och Polen inte drastiskt minskar sin tilldelning till nya anläggningar.

Ett tredje alternativ är att använda harmoniserade bränsle- och/eller teknikberoende riktmärken, med en så strikt tilldelning som möjligt. Detta alternativ skulle troligen möta minst motstånd från energisektorns aktörer. Det skulle också uppfylla målet att undvika att tilldelningen snedvrider konkurrensen. Fördelarna med en harmoniserad tilldelning måste dock vägas mot nackdelarna med de perversa incitament för investeringar som skapas genom användningen av bränsle- eller teknikberoende riktmärken för tilldelningen.

Slutligen rekommenderar vi att de nordiska länderna undersöker möjligheterna att öka långsiktigheten och minska osäkerheten i framtida tilldelning, till exempel genom att göra tilldelningen för längre framtida tidsperioder.

Content

1 Introduction

In the EU Emission Trading Scheme (EU ETS), the treatment of new entrants to the scheme has proven to be one of the most contentious issues. It is also one of the areas where policies among Member States differ the most in the first set of National Allocation Plans (NAPs). What is clear, given that all 25 Member States have set up provisions to give allowances to new installations free of charge, is that allocation to new entrants is a political priority.
Decisions about allocations to new entrants involve considerations about investment incentives, perceived fairness, economic efficiency and national competitiveness. Harmonising regulations should thus be a priority, and this report aims to facilitate that process.

1.1 Objectives

The report analyses options for allocation of emission allowances to new entrants in the Nordic energy sectors, and give recommendations for harmonised allocation principles for use in the 2008-2012 NAPs of the Nordic countries.

1.2 Methodology

As a starting point of the analysis we have calculated the allocation to two hypothetical standard energy installations if they were to be localised in Denmark, Finland, Sweden, Germany, Poland, Estonia, Latvia or Lithuania. In order to understand the importance of the allocation, and to what extent differences in allocation methodology can affect where investments in new capacity is made, the value of the allocation is calculated and compared to estimated fixed costs and annual revenues for the standard installations.

The main discussion is focussed on effects on relative competitiveness between the Nordic countries and between the Nordic countries and Germany, Poland and the Baltic States. We have sought the input from authorities and energy industry representatives in the Nordic countries in order to get a better understanding for the rationale behind chosen current methodologies and the possibilities that exist for a harmonised allocation methodology.

As requested by the Nordic Council of Ministers, we compare our findings with those from the BALTREL task force report on Emission Trading (BALTREL, 2004). Please see Appendix A.

1.3 The need for harmonisation

Decisions about allocations, in particular those on new entrants and installations that close, also involve considerations about national competitiveness. For a politician it is hard to introduce policies that would be more favourable to the closure of installations in one's own country and make new investments less attractive than in neighbouring Member States. The government of a

Member State may be faced with incentives that lead to a decision that is not the efficient solution for the trading program as a whole. The possibility that Member States could obtain a better outcome by individual action that undermines the outcome for the broader ETS constitutes the well-known "prisoner's dilemma."

Given that the treatment of new entrants can affect the efficiency of the entire trading scheme, one could argue that the best solution would be to regulate at the EU level. Harmonising the rules in the Nordic counties would be an important step in this direction. Further, given the structure of the Nordic energy market, with limited transmission capacity to the rest of the EU, a Nordic harmonisation may suffice to avoid the most serious distortions of competition, at least in the short term.

Further, it is important to be aware of the close link between treatment of new entrants and rules on closures. As discussed below, the policy on closures that dominates in the current NAPs, i e that installations that close lose their allocation, constitutes a subsidy of existing installations and thus puts new entrants at a relative disadvantage.

Finally, a question that is beyond the scope of this report but is important to understand, is *why* it is important to have the same incentives for new investments across member states. In an integrated electricity market like in the Nordic countries, it makes economic sense and is intuitively appealing to harmonise incentives. But when markets are only semi-integrated, like the northern European electricity market, or even completely separated like the market for district heating, there may be other considerations that are more important when designing the allocation, for instance security of supply and the structure of the energy system.

2 Current allocation methodologies to new entrants in the energy sector

This section describes the current allocation methodologies to new entrants in the energy sector in the Nordic countries (Sweden, Finland and Denmark), the Baltic states (Estonia, Latvia and Lithuania), Germany and Poland. Also amendments or other requirements stated in the decisions upon the NAPs made by the Commission are given. In the 'energy sector' we include both heat and power generation.

2.1 Denmark

2.1.1 Overview

Total amount of allowances to be allocated in first period:
On average 33.5 Mt/yr will be allocated to the Danish installations. The total amount during the first period (2005 – 2007) is 100.5 Mt distributed as 40%, 30% and 30% during the three years (i.e. 40.2 Mt 2005 and 30.15 Mt/yr in 2006-2007). The reserve for new installations and installations with significant expansion is set to 3.0 Mt for the period 2005-2007 (~3% of total allocation).

In Denmark 95 % of the allowances will be allocated for free and 5% of the allowances will be allocated by auctioning (5.025 Mt for the whole period). The auctions will be announced nationally and internationally and is open for everybody, not only Danish installations.

If an installation is closed before or within the period 2005-2007 the emission allowances for that installation is incorporated in the reserve for new installations and production expansions.

Allocation methodology for new installations
In Denmark there are two sets of installations treated as new installations,

- new installations or significant expansions that started operation after base period but before the introduction of the Danish Law on CO_2 allowances, i.e. between 2nd January 2002 – March 31st 2004

- new installations or significant expansions that started operation after March 31st 2004.

The first group can be regarded as old installations since they were known and in operation as the EU ETS started on 1st January 2005. The allocation to those installations will be based on installed capacity at the specific installation and the average allocation per unit of capacity to existing installations (benchmark) in the same sector that were in operation during the base period.

For an electricity-generating installation with the primary objective to deliver electricity and possibly heat to the collective net, 1589 allowances are allocated annually per installed MW fossil electricity capacity (265 t/GWh [2]) and 530 allowances per installed MW fossil heat capacity (88 t/GWh [2]).

New installations after March 31st 2004 will be allocated allowances according to the Danish Law on CO_2 allowances. Allocation will be made per unit of installed capacity based on BAT technology (benchmark).

For new installations in the energy sector the following benchmarks will be used:

A new power producing installation will be allocated 1710 allowances annually per MW_e installed power production capacity, as well as 350 allowances annually per MW installed heat-production capacity.

The benchmark used for electricity production corresponds to the allowance need for a natural gas based, combined-cycle production unit with power efficiency of 60%, utilisation time of 5000 hours, and an emission factor of 56.9 g CO_2/MJ of input fuel. If it is a question of a co-generation unit, the electricity capacity is calculated with full heat production. This means that, for extraction plants, electricity capacity is calculated with maximum heat yield as opposed to capacity in condensing mode.

A new heat-generating installation which does not generate electricity and the primary objective of which is to generate heat for the collective net is allocated 205 allowances per installed MW of heat capacity per year the unit is in operation.

2.1.2 Commission Decision

There were no objections to the Danish NAP.

2.2 Estonia

2.2.1 Overview

Total amount of allowances to be allocated in first period:
The total amount of allowances to be allocated is 56.859 Mt. The reserve for new entrants is set to 568 590 t, which corresponds to approximately 1 % of the total amount of allowances.

100% of allowances will be allocated for free.

The unused numbers of allowances in the reserve for new entrants will be realised by the Government. Installations that close down during the three years trading period covered by the NAP will not receive further allowances for the next year. (Kallaste, 2005)

[2] Corresponding value given per output. The unit conversion includes an assumption of 6000 hours of operation annually.

Allocation methodology to new entrants
It is stated in the Estonian national allocation plan that new installations will have to be treated equally to existing installations that will enlarge their capacity. When a new installation has received all necessary permits (for the new installation) it can be allocated emission allowances in the same way as existing installations.

Allocation methodology to existing installations
The emission allowances at installations level set no definite restrictions. Individual development and trends at each installation justified both by market demand an introduction of new technologies were taken into consideration in the preparation of the national allocation plan.

The allocation to energy installations were based on estimated emissions during the trading period, which were calculated based on historic data. A reference value was determined by calculating the average value of the three years with the largest emissions of carbon dioxide during the base period. The base period differed between heat producing installations and other installations.

The following base periods were used:

Nine-year period for heat installations 1995 – 2003

Four-year period for electricity installations (and other installations) 2000 – 2003

If the reference value differs significantly from the emissions during the 2002 and 2003, due to for example changes in production, the reference value has not been used. The national allocation plan based the predictions of carbon dioxide emissions growth on the calculations of predicted growth of production prepared by the installations themselves.

2.2.2 Commission Decision

The total amount of allowances in the Estonian NAP was reduced from the initially submitted plan to the final. The analysis presented here is based on the final version of the Estonian NAP, unofficially translated by the Commission.

2.3 Finland

2.3.1 Overview

Total amount of allowances to be allocated in first period:
On average 45.5 Mt/yr will be allocated to the Finnish installations. 2.5 Mt is reserved for new installations during the first period. This corresponds to ~1.8% of the total quantity allocated. 100% of the allowances will be allocated for free.

Allocation is terminated upon closure and the allowances are transferred to the new entrants reserve.

Allocation methodology to new entrants
In the Finnish law on emission trading (The Emission Trading Act 638/2004) the following formula for calculating the emission allowances to new installations is given:

Emission Allocation = rated thermal input * number of operational hours per year * specific combustion emission coefficient for the reference fuel

The following values are used as the annual running times of new entrants:

1) base load production for district heating and the electricity connected to it; 6000 h/ year.
2) condensing plants (electricity only) 6000 h/year
3) gas turbines for top load, reserve capacity for district heating or heat or steam within the industry or other sporadically driven unit, 500 h/year.

There are two levels of emissions factors, one for solid fuels and one for liquid or gaseous fuel. The following specific emission coefficients are used for the calculation of emission allowances:

- If the installation has been designed for the combustion of liquid or gas fuel, the specific emission coefficient applied is 56.0 g CO_2/MJ.
- If the installation has been mainly designed for the combustion of solid fuel, the specific emission coefficient applied is 74.2 g CO_2/MJ, which corresponds to a mixed fuel with 70 % of peat and 30 % of wood

2.3.2 Commission Decision

The Finnish allocation plan will have to be amended according to the Commission decision. The list of installations and the number of allowances to be allocated to them was not complete. However only installations within the territory of the Åland Islands and new installations should be affected by the amendments.

2.4 Germany

2.4.1 Overview

Total amount of allowances to be allocated in first period:
Germany will in total allocate 499 Mt/yr. The reserve for new entrants is set to 3 Mt/yr, which corresponds to 0.6% of the total amount.

100% of the allowances will be allocated for free. If the operation of an installation is terminated, no allowances will be issued the following year[3], and the allowances not issued will be placed in the new entrants reserve. If the reserve for new entrants is insufficient, the Government intends to buy allowances at the market in order to accommodate for further new installations.

[3] Unless the allowances are to be transferred to a new installation that the operator is starting.

Allocation methodology to new entrants
New installations or installations with a significant expansion that were started during 2003 and 2004 will be allocated allowances based on reported specific emissions per product unit (ex. in t CO_2/MWh). The reported specific emissions have been determined for installations with similar production. The compliance factor = 1 will be used [4].

New installations or significant expansions after January 1st 2005 will be allocated according to the general methodology for new entrants. The allocation to new installations in the energy sector is described by the following formula:

EA = N * T * BM * DL/DT * a [t CO_2]

EA = emission allowances [t] (for entire three-year period)
N = installed capacity, [MW]
T = planned annual average utilisation of unit [h/yr]
BM = benchmark [(based on BAT) t CO_2/MWh]
DL = the number of days left within the trading period from the start of the installation [day]
DT= total number of days in trading period [day]
a = number of years in the trading period. [yr]

The benchmark used for electricity production plants (BM_E) will be maximum 750 g CO_2/kWh (0.75 t/MWh) and minimum 365 g CO_2/kWh (0.365 t/MWh). An installation will not be allocated more allowances than necessary for producing according to best available technology.
750 g CO_2/kWh (assuming an efficiency degree of 44%) corresponds to approximately 91-92 g CO_2/MJ (thermal input), which is the approximate emission factor given by IPCC for coal.
365 g CO_2/kWh (assuming an efficiency degree of 56%[5]) corresponds approximately to an emission factor of 56.7 g CO_2/MJ (thermal input), which is the approximate emission factor for natural gas (56.5).

For CHP installations the following formula will be used:

EA = (P_E * BM_E + P_H * BM_H) * DL/DT * a [t CO_2]

Where:
P_E = Electricity production for the installation [MWh][6]
BM_E = Benchmark for electricity production (based on BAT) [t CO_2/MWh]
P_H = Heat production for the installation [MWh]
BM_H = Benchmark for heat production (based on BAT)[t CO_2/MWh]

Heat production[7] will be allocated 215 –290 g CO_2/kWh depending on fuel used. New CHP installations will be allocated emissions based on both the electricity benchmark and the heat benchmark.

[4] In Germany a bottom up approach has been used and in order to keep the allocation within the total cap a compliance factor is used. The compliance factor used for existing installations is 0.9755, which reduces the emission allowances with 2.45%
[5] 58% efficiency results in an emission factor of 58.8 g CO_2/MJ.
[6] This was planned to be determined ex-post but that was not accepted by the Commission. It seems as the German law on allocation "Gesetz über den nationalen Zuteilungsplan für Treibhausgas-Emissionsberechtigungen in der Zuteilungsperiode 2005-2007" Zuteilungsgesetz 2007 – ZuG 2007) as if the allocation will be based on projected emissions. How projected emissions will be determined is not stated.

Transfer rule and time period considered as new installation
Allocation of an old decommissioned installation may be transferred to a new installation for 4 years. Following the transfer period the installation will be allocated allowances using a compliance factor = 1 for 14 years. New entrants commissioned after January 1st 2005 which do not replace an old installation will be allocated allowances based on BAT-benchmark for 14 years with compliance factor = 1.

Special features of allocation rules
According to the German law of NAP a new installation will be granted emissions allowances according to the methodology for new entrants during 14 years (18 years for new installations replacing old installations).

The benchmark used to determine allowances for new entrants (installations not replacing old ones) will remain unchanged for 14 years. All new entrants will be granted an allowance for 2005-2007 and for 2008-2012 derived from BAT-based specific emission value. This value will remain unchanged for 14 years. No compliance factor will be used during those 14 years.

2.4.2 Commission Decision

The intention of Germany to make ex-post adjustments for new entrants contravenes criterion 5, because the application of such ex-post adjustment would unduly favour new entrants compared to operators already included in the NAP.

Also the intention to adjust the allocation of allowances to an installation when another installation (related to the first one) closes down contravenes criterion 10.

No ex-post adjustment is allowed. Germany had several suggestions about that including:

- adjustment to be made if an installation experiences lower capacity utilisation than predicted
- adjustment if the emissions from an existing installation would be reduced by more than 40% compared to the base period.
- The installation is benefiting from an additional allocation for combined heat and power and generates a lower amount of power production from combined heat and power than in the base period.

[7] In the "Verordnung über die Zuteilung von Treibhausgas-Emissionsberechtigungen in der Zuteilungsperiode 2005 bis 2007" nothing is said about the benchmark for new district heating. The only thing mentioned is a benchmark for hot water, which will be in between 290 – 215 g CO_2/kWh depending on technology.

2.5 Latvia

2.5.1 Overview

Total amount of allowances to be allocated in first period:
The total allocation according to the Latvian NAP is 13.7 Mt for the whole period (approximately 4.5 Mt/yr). The reserve for new entrants is 1.6 Mt, which is approximately 11.7% of the total amount of allowances to be allocated.
100% of the allowances will be issued from the new entrants' reserve for free based on a first-come-first-served principle.

Allocation methodology to new entrants
New entrants will be allocated allowances based on projected production (installed capacity and estimated number of working hours), fuel-dependent benchmark in the form of a carbon dioxide emission factor and efficiency.
Necessary annual amount of allowances for new co-generation plants are calculated with the following equation:

$EA = N*T*BM*100/ \eta$, [t CO_2]

Where:
N = total installed capacity, [MW]
T = planned annual average utilisation of unit [h/yr] (5000 h is assumed where no other data is available)
BM = benchmark (emission factor) [t CO_2/MWh]
η = coefficient of efficiency, % (in the case of lack of data, 80% is assumed if coal or peat is used and 85% if natural gas is used)

Necessary allowances for new condensation plants are calculated with the following equation:

$EA = N_{el}*T*BM*100/ \eta$, [t CO_2]

Where:
N_{el} = total installed electric capacity [MW_{el}]
T = number of working hours, [h/year] (5000 is assumed where there are no other data)
BM = benchmark (emission factor) [t CO_2/MWh]
η = coefficient of efficiency, % (in the lack of data, 40% is assumed if coal or peat is used and 50% if natural gas is used)

The emission factors used in Latvia are fuel specific and hence, there are separate emission factors for every fuel. The emission factors are the ones used by the Latvian Environment Agency. The value varies between 0 - 0.371 t CO_2/MWh (wood fuel – peat).

The methodology for new entrants differs from that applied to existing operators in two ways:

The coefficients of efficiency for new installations used in calculations are higher in order to ensure best available technological principles, whereas for the installations of existing operator data from the plant logbooks are used

The operating time of new installations is assumed to be 5000 hours per year (where no other data is available), whereas for existing operators MWh produced is determined by measurement.

Other issues concerning new entrants
The forecast on the amount in the reserve for new entrants in Latvia is based on the information prepared by the Ministry of Economics on planned installations. The Ministry of Economics forecasts that seven co-generation plants with a total capacity of 220 MW, boiler houses and industrial enterprises where natural gas, peat or coal will be used as the fuel would start operation in the period 2005-2007. In addition several operators have applied for allowances. They plan to install additional boilers or co-generation plants in heating stations.

2.5.2 Commission Decision

The Commission required that Latvia in accordance with the amendments made to the initial national allocation plan reduce the number of allowances with 1.8 Mt/yr. The analysis presented here is based on the revised version of the Latvian NAP, amended on 19 May 2005, including the adjustments required by the Commission.

2.6 Lithuania

2.6.1 Overview

Total amount of allowances to be allocated in first period:
36.8 Mt will be allocated during 2005-2007. 1.8 Mt is reserved for new entrants (corresponds to 5% of total amount of allowances). 98.5% of allowances will be allocated free and 1.5% of allowances will be allocated by auctioning.

When the reserve for new entrants is empty allowances will have to be purchased on the market. The allowances from installations closing down will be transferred to the reserve intended for new market entrants.

Allocation methodology to new entrants
New power plants will be allocated 2500 t/MW of installed electric power generating capacity and new heat generating installations will be allocated 600 t/MW[8] of installed heat generating capacity. New combined heat and power generating installations will be allocated allowances according to the same rules, i.e. both for the heat and the power production. Capacity increases at existing installations are allocated by the same methodology as new entrants.

According to Valuntiene, 2005 (personal communication) there is still discussion on the allocation principles for new installations in Lithuania so the final decision might look different.

[8] If the produced heat is supplied to industrial process the allocation will be 1000 t/MW of installed heat generating capacity

2.6.2 Commission Decision

According to the Commission Decision, the Lithuanian NAP was first notified to the Commission on 6th May 2004. Amendments have then been made by letters dated 2 September 2004, 9th November 2004 and 8th December 2004. Among other things these amendments made clear that Lithuania reduced the initially announced amount of allowances by 1.3 Mt/yr. The analyses presented here is based on the NAP updated 2004-12-15.

2.7 Poland

2.7.1 Overview

Total amount of allowances to be allocated in first period:
The total amount to be allocated according to the Polish NAP that was submitted to the EU Commission (29 July 2004) is 286.2 Mt/yr[9] (858.6 Mt 2005-2007). A reserve for new entrants (and migration of emissions between trading and non-trading sector, JI/CDM projects, unidentified sources etc.) is set to 8.8 Mt/yr 3.3 Mt/yr of these are reserved for new entrants (which corresponds to 1.2% if the total amount).

Allocation methodology to new entrants
New installations will be allocated enough allowances to cover their emissions needs, defined on the basis of verifiable production plans, provided BAT standards are fulfilled. Allowances will be allocated from the new entrants' reserve on the first-come-first-served basis.

Transfer rule
Poland has constructed a transfer rule (as has Germany). In a situation where the production in a closed installation will be replaced by the production in a new installation, allowances will be allocated as for the old installation for the part corresponding to the transferred production. Allowances for the emission from the production exceeding the production in the old plant will be allocated according to the new entrant allocation rules. The operator of a new installation replacing the old one has a right to be allocated allowances according to the historical emissions form the old installation.

2.7.2 Commission Decision

The Commission registered the Polish NAP on 22 September 2004.
Certain aspects of the national allocation plan have been found incompatible with the criteria in Annex III to the Directive.

The Commission adopted a decision where the following amendments had to be made:

- the total amount to be allocated for the Community scheme is reduced by 47.1 Mt per year.

[9] According to the Commission Decision the allocated amount will have to be reduced by 47.1 Mt to 239.1 Mt /a (during 2005-2007).

- No special reserves should be set aside for allowances dedicated to existing coke-oven operators, to unidentified installations and to cover increased emission from the sectors covered by the Community scheme (with particular reference made to district heating operators).

- The quantity of allowances allocated to a new entrant is not subject to ex-post adjustments,

- Information is provided on the manner in which new entrants will be able to begin participating in the Community scheme, in a way that complies with the criteria of Annex III to the Directive and article 10 thereof. (article 10 says that the member states shall allocate at least 95% of the allowances during the period 05-07 for free and at least 90% of the allowances during the next period).

The Commission writes in their decision that Poland will have to make amendments on how new installations can start participating in the scheme and the information on the methodology proposed for allocation to new entrants and the eligibility criteria for accesses to allowances need to be further defined. No amendments had reached the Commission by 2005 10 24 (personal communication Peter Zapfel, 2005.)

The analysis presented here is based on the unofficial translation of the Polish NAP, approved by the Leadership of the Ministry of Environment at the session on 21st July 2004.

2.8 Sweden

2.8.1 Overview

Total amount of allowances to be allocated
According to the Swedish NAP 22.9 Mt will be allocated annually during the first trading period. A total of 1.8 Mt/yr are reserved for new entrants. 1 Mt is reserved for installations that already have permits according to Swedish law (tillstånd enligt miljöbalken). 0.8 Mt is reserved for installations that do not have permits according to Swedish law or are unknown to the authorities. The allowances will be allocated on a first come-first serve basis.

100% of the allowances will be allocated for free on a first-come-first served basis.

Allocation methodology to new entrants in the energy sector
Allowances will only be given to CHP-installations based on the following formula:

Allocation = projected production x benchmark x scaling factor.

Where:
Benchmark for electricity: 265 ton/GWh;
Benchmark for heat 83 ton/GWh;
Scaling factor = 0.8

The benchmarks have been calculated by the following equation:

$BM_{group,\ base\ year} = E_{group,\ base\ year} / P_{group\ base\ year}$

Where BM stands for the benchmark, E stands for the carbon dioxide emissions from a group of installations and P the production (of heat and electricity) for the same group during the base year period 1998-2001. All fuels except waste, blast furnace gas and LD-gas have been included when calculating the benchmarks, i.e. coal, coke, coke oven gas, peat, oil, diesel, LPG, natural gas and biofuels.

When determining the benchmarks the electricity production in CHP installations was weighted by a factor of 2.5 and the heat production by a factor of 1.0. This means that if a CHP plant produced equal amounts of electricity and heat 5/7 of the emissions was allocated to the electricity production and 2/7 of the emissions was allocated the to the heat production.

When determining the projected production for new installations only fossil production is considered (valid for both electricity and heat production). This means that a new plant only using biofuels would not receive any allowances and a new installation partly using biofuels would only receive allocation for the fossil part.

2.8.2 Commission Decision

The Commission had no objections to the Swedish national allocation plan (some amendments were made before the decision was taken but after the submitting of the Swedish NAP).

3 The current allocation methodologies compared

This section presents an overview of the distinct features of the respective countries' allocation methodologies. It also gives a quantitative description of these differences by showing the allocation for two hypothetical standard installations. Finally, it attempts to illustrate the relative importance of the value of the allocation compared to the fixed costs associated with the installations and to the expected annual revenue from sales of electricity on the Nordic electricity market.

3.1 Characteristics and distinct features of each country's methodology

Table 1. Overview of new entrant reserve in relation to total allocation in each country

Country	Total allocation 2005-2007 [Mton]	New Entrant Reserve [Mton]	New Entrant reserve's share of total allocation [%]
Denmark	100.5	3.0	3.0
Estonia	56.9	0.6	1.0
Finland	136.5	2.5	1.8
Germany	1497		9.0 0.6
Latvia	13.7	1.6	11.7
Lithuania[10]	36.8	1.8	4.9
Poland[11]	858.6	9.9	1.2
Sweden	68.7	5.4	7.9

[10] In addition to this reserve, Lithuania has set aside 1.5% of the total allowances, which will be sold to participants, including potential New Entrants.
Of these, 3 Mton are reserved for installations that are already known to the authorities and have permits for operation according to Swedish environmental regulation.
[11] All numbers for Poland are based on the NAP of July 29 2004. This was not approved by the Commission, but what amendments that have been made by Poland in response to the Commission decision is not yet clear.

Table 2. Distinct features of current allocation methodologies.

Country	Parameters used when determining allocation	Special features of allocation	Benchmarks as given in NAP[12]
Denmark Output-based	Fuel-independent benchmark [ton/$MW_{e\ or\ heat}$] × installed producing capacity [$MW_{e\ or\ heat}$] (Benchmark includes estimate of operational hours, plant efficiency and fuel emission factor)	5 % of allowances will be auctioned. The auctions will be announced nationally and internationally and is open for everybody, not only Danish installations.	Benchmark for electricity = 1710 ton/MW_e Benchmark for heat in CHP = 350 ton/$MW_{fossil,\ heat}$ Benchmark for only heat production = 205 ton/MW_{heat}
Estonia	Emissions and projected production. The emissions are determined based on the CO_2 emission factor of the fuel.		Benchmark for natural gas 15.3 tC/TJ anthracite 26.8tC/TJ
Finland Input based	Fuel-specific benchmarks [g CO_2/MJ] × Rated thermal input [MW] × operational hours [h]. (Benchmark is a carbon dioxide emission factor. A default value on operational hours is used.)	Default hours: Condensing plant 6000 h/a Base load district heating 6000h/a Reserve capacity 500 h/a	Benchmark for liquid or gaseous fuels: 56.0 g CO2/MJ Benchmark for solid fuels (coal or peat): 74.2 g CO2/MJ
Germany Output-based	Fuel-specific benchmarks [g CO_2/kWh] × installed capacity [MWe or heat] × operational hours [h] Operational hours estimated by operator (?) (Benchmarks includes estimate of plant efficiency and fuel emission factor)	New installations granted allowances according to fixed benchmarks for 14 years. The new installations will be allocated allowances based on how many days that are left in the trading period when they start operation.	Electricity production 750 –365 g CO2/kWh. Heat production 290-215 g CO2/kWh .
Latvia Input-based	Fuel-specific benchmark [t CO2/MWh] × installed capacity [MWe or heat]/ efficiency (η) × operational hours CO_2 emission factors are used as benchmarks. (Installation specific estimates of operational hours, efficiency are used.)	Default values of efficiencies and number of operational hours for different types of installations are given but installation specific values could be used if available.	Benchmarks: natural gas 0.199 t CO_2/MWh Coal 0.331 t CO_2/MWh Peat 0.371 t CO_2/MWh Fuel oil 0.274 t CO_2/MWh
Lithuania Output-based	Fuel- independent benchmarks [ton/MW], installed capacity		Benchmark for electricity production = 2500 ton/MWe Benchmark for heat production = 600 ton/MWheat
Poland	Not available		
Sweden Output-based	Fuel-independent benchmark [t/GWh], projected production [GWh] scaling factor.[10] Installation specific production estimates.	In the energy sector only new CHP installations will be allocated allowances.	Benchmark for electricity generation 265t/GWh. Benchmark for heat production 83 ton/GWh.

[12] For comparative values of benchmarks see table 3 and 4 below

Table 3. Comparisons of benchmarks for heat production in new installations, calculated based on the NAPs. In the comments column we have given data on assumptions on number of operational hours, plant efficiency or other that we have made in order to recalculate the benchmarks to standard units.

Country	Benchmarks as given in NAPs	Converted to standard unit [ton /MW] (installed capacity)	Converted to standard unit [ton /GWh] (output energy)	Comments
Denmark	205 ton/MW_{heat}; 350 ton/MW_{heat}	205; 350	34; 58	Higher value is used for heat production in CHP, lower value is used for heat production in other installations than CHP.
Estonia	15.3 – 26.8 tC/TJ	1346 - 2358	224 – 393	Assuming 6000 h of operation annually and efficiency of 90%. Benchmark depending on fuel. Different BM for different fuels, given here are max and min, natural gas and anthracite.
Finland	56.0 g/MJ_{input}; 74.2 g/MJ_{input}	1344; 1781	224 – 297	Assuming 6000 h of operation annually and efficiency of 90%. Two benchmarks used one for gaseous and liquid fuels (lower value) and one for peat and coal (higher value).
Germany	215-290 g/kWh (ton/GWh)	1290 - 1740	215 – 290	Assuming 6000 h of operation annually. Benchmark depending on fuel, min and max values are the only ones given.
Latvia	199-371 t/GWh	1327-2473	221 – 412	Assuming 6000 h of operation annually and efficiency of 90%[13]. Benchmark depending on fuel. Different BM for different fuels, given here are max and min, natural gas and peat.
Lithuania	600 ton/MW_{heat}	600	120[13]	Assuming 6000 hours of operation annually.
Sweden	83 ton/GWh	415	83 (66.4)[14]	Assuming 6000 hours of operation annually

[13] In the Latvian NAP default values on efficiency for different types of plants using different fuels is given to be used in case o flack of other data. We here assume that we know the true efficiency of the plant. The default value of the efficiency for this type of plant is 85%.

[14] This will be the effective benchmark since Sweden also uses a reduction factor of 0.8. This benchmark is only applied for heat production in CHP plants. Among new installations in the energy sector in Sweden only CHP plants will be allocated allowances.

Table 4. Comparisons of benchmarks for electricity production, calculated based on the NAPs. In the comments column we have given data on assumptions on number of operational hours, plant efficiency or other that we have made in order to recalculate the benchmarks to standard units.

Country	Benchmarks as given in NAPs	Converted to standard unit [ton /MW] (installed capacity)	Converted to standard unit [ton /GWh] (thermal output)	Comments
Denmark	1710 ton/MW_e	1710	285	Assuming 6000 hours of operation annually
Finland	56.0 g/MJ_{input}; 74.2 g/MJ_{input}	2016; 3562	336 - 594	Assuming 6000 h of operation annually. Two benchmarks used; one for gaseous and liquid fuels (lower value) and one for peat and coal (higher value). In the peat and coal installations 45% efficiency has been assumed.
Estonia	15.3 – 26.8 tC/TJ	2020 - 3538	337 – 590	Assuming 6000 h of operation annually and efficiency of 60%. Benchmark depending on fuel. Different BM for different fuels, given here are max and min, natural gas and anthracite.
Germany	365-750 g/kWh (ton/GWh)	2190-4500	365 – 750	Assuming 6000 h of operation annually. Benchmark depending on fuel, min and max values are the only ones given.
Latvia	199-371 ton/GWh	1990-4947	332 – 824	Assuming 6000 h of operation annually and efficiency of 60%[15] for natural gas (lower value) and 45% for peat (higher value). Benchmark depending on fuel. Different BM for different fuels, given here are max and min, natural gas and peat.
Lithuania	2500 ton/MW_e	2500	417	Assuming 6000 hours of operation annually
Sweden	265 ton/GWh	1590	265 (212)[16]	Assuming 6000 hours of operation annually.

[15] In the Latvian NAP default values on efficiency for different types of plants using different fuels are used in case specific data is missing. However, in our calculations we assume 60 % efficiency.

[16] This is the effective benchmark since Sweden also uses a reduction factor of 0.8. This benchmark is only applied for electricity production in CHP installations since among new installations in the energy sector in Sweden only CHP plants will be allocated allowances.

3.2 Quantitative differences across countries

In order to quantitatively compare the allocation methodologies between the different countries, we have calculated the allocation that would be awarded to two hypothetical installations if they were to be started (table 5). The first installation type is taken from an ongoing Elforsk project (Ekström et al. forthcoming). The second is modelled closely after the CHP currently planned by Göteborg Energi, scheduled to start operations during fall 2006.

Table 5. Hypothetical standard new installation

Fuel	Technology	Power efficiency	Total efficiency	Production capacity	Operational hours
Natural gas	CC condensing	58%	58 %	400 MW_e	6000 h/a
Natural gas	CHP	50%	92,5%	261 MW_e, 294 MW_{heat}	5000 h/a

Below there are two diagrams showing what allocation the two installations described above would receive if they were built in the respective countries.

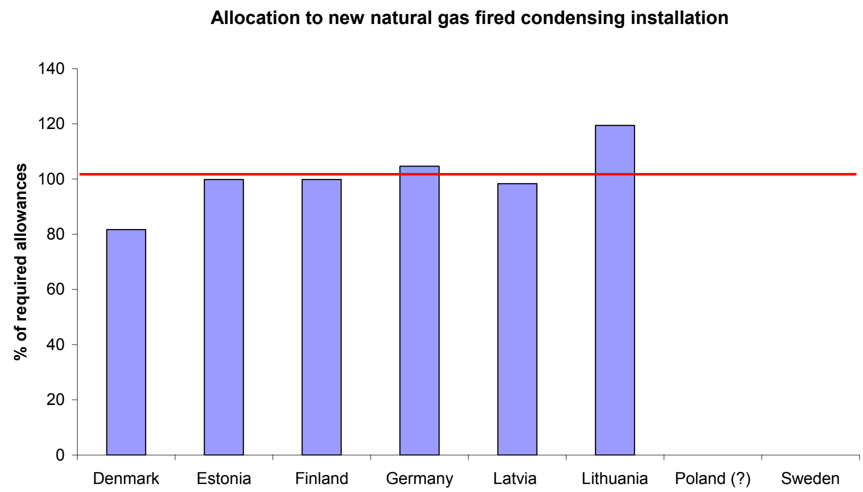

Figure 1. The allocation to a new natural gas combined cycle electricity production unit (no heat) in different member states. Results presented as percentage of annual emissions covered by the allocation.

The Danish allocation to the natural gas combined cycle condensing plant (NGCC) cover approximately 82% of the estimated annual emissions. The main reason for the 20 % shortfall is that the estimated number of operational hours is 20% higher in our example than what was assumed when calculating the benchmark used in the Danish NAP.

In Estonia the installation would receive 100% of the required allowances.

In Finland the installation would receive 100% of the required allowances.

In Germany the installation would receive 105% of the required allowances. The reason for the allocation being larger than 100% is that the minimum benchmark in Germany is based on an installation with lower efficiency than our comparative installation. It is interesting to note that

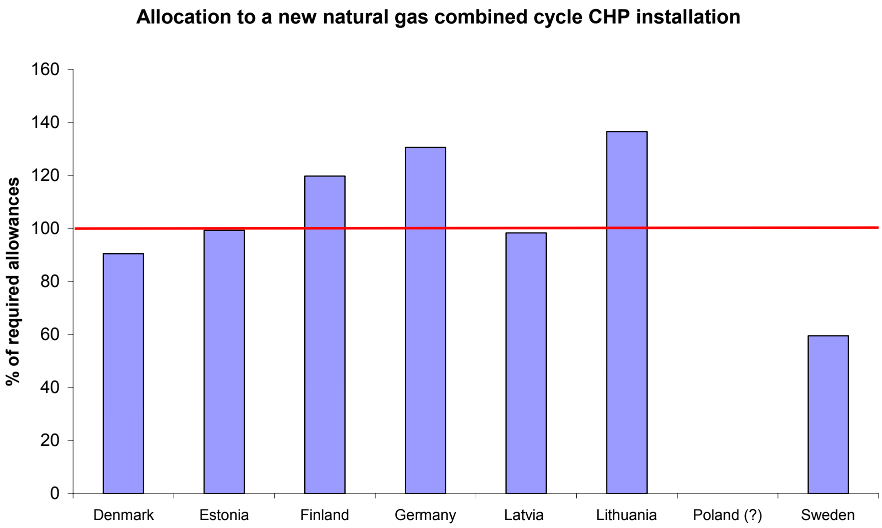

Figure 2. Allocation to a new natural gas based combined cycle CHP plant assuming location in different countries. Results presented as percentage of annual emissions covered by the allocation.

In Denmark the CHP installation would receive approximately 90% of the needed allowances.

In Estonia the installation would receive 100% of the required allowances.

In Finland the installation would receive approximately 120% of the required allowances. The 20 % over allocation can be explained by comparing the underlying assumptions. IVL assume 5000 hours of operations annually, while Finland in the NAP assumes 6000 hours of operation per annum.

In Germany the installation would receive approximately 130% of the required allowances.

In Latvia the installation would receive approximately 98% of the required allowances.

In Lithuania the installation would receive approximately 137 % of the required allowances.

For the same reasons as mentioned for the condensing plant we have not been able to calculate the allocation for a Polish case.

In Sweden the installation would receive 60% of the required allowances.

3.3 Does the allocation matter?

A key determinant of whether the allocation actually has an impact on investment decisions and to what extent the observed differences between countries can distort competition, is the relative value of the allocated allowances compared to other costs and sources of revenue of the firm. In table 5 the absolute values of the allocation to the two standard installations are shown for the respective countries. In figure 3 these values are compared to the annualised fixed costs of the installations, i e the annualised investment costs plus fixed operation and maintenance costs. Finally, in figure 4, the relative value of the allocation to the condensing plant compared to estimated annual revenue from the sale of power from this plant.

Table 6. Estimated selected costs and revenues. The calculations on investment costs are based on data from Elforsk (2003)

Fixed annual costs NGCC:	19.5 million €.
Fixed annual costs gas fired CHP:	15.7 million €.
Annual sales revenues NGCC	74.4 million €.
Underlying assumptions :	
Depreciation rate:	20 years
Real interest rate	6 %.
Investment costs NGCC:	560 000 €/MWe
Investment costs gas fired CHP:	690 000 €/MWe
Fixed operation and maintenance costs:	2% of investment cost
Power price:	31 €/MWh
Annual power generation NGCC:	2.4 TWh

Table 7. Value of annual allocation for standard installation. Million euro. EAU price 20 €.

	Value of annual allocation [million €/yr]	
	NGCC	CHP
Denmark	13.7	11.0
Estonia	16.7	12.1
Finland	16.7	14.5
Germany	17.5	15.8
Latvia	16.5	11.9
Lithuania	20.0	16.6
Sweden	0	7.2

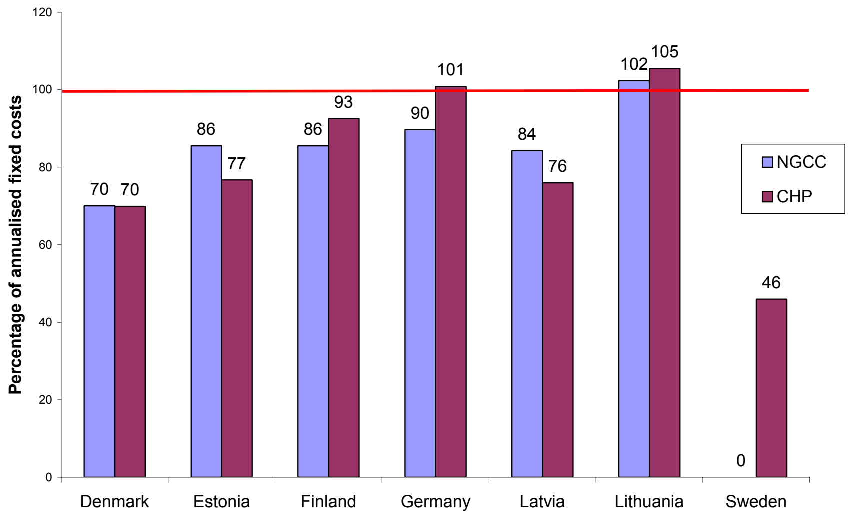

Figure 3. The value of the annual allocation shown as percentage of estimated annualised fixed costs of the installations. Assumed real interest rate is 6 %, depreciation time 20 years. EAU price 20 euro. Data on investment costs and fixed operation and maintenance taken from Elforsk (2003). Assumed allowance price 20 euro/ton.

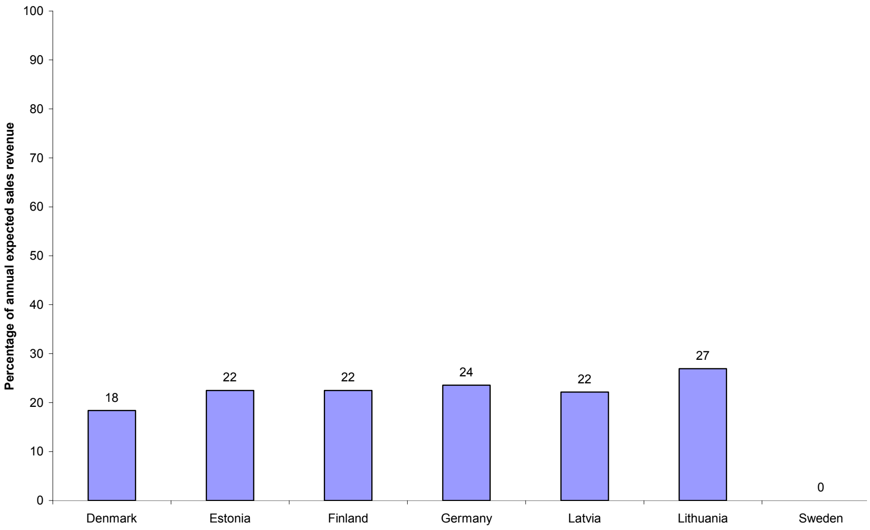

Figure 4. The value of the annual allocation shown as percentage of estimated annual sales revenue from electricity for the standard NGCC installation. Assuming 2 400 GWh annual electricity generation, electricity price 31euro/MWh.

4 Discussion

4.1 Are New Entrants discriminated compared to existing installations?

There is an ongoing debate on how allocation to new entrants should be done, and to what extent allocation affects company behaviour and decisions. A basic question is whether new entrants should receive free allowances at all. A second question concerns to what extent free allocation actually affects the investment decisions of operators.

Some observers claim that the denial of free allowances would discriminate against new entrants compared to existing installations, thus inhibiting new investments. Opponents point out that the main argument for free allocation to existing installations is to compensate them for sunk costs (i e costs for investments that were made before the ETS was constructed and that are now less profitable because of the carbon price). Since new entrants have no such sunk costs and operate with full knowledge on the ETS, the justification for free allocation is lost.

In our view there are three significant arguments for why free allocation to new entrants can be justified:

First, capital markets discriminate in the price they charge firms for acquiring new capital in response to observable accounting measures such as debt, liquidity, and cash flow and also due to uncertainties such as exposure to price volatility in factor inputs, including emission allowances. Since firms are capital constrained and the cost of capital varies with the amount of capital needed, the free allowances reduce the need of the firm to go to the bank to borrow money to buy allowances. The lower requirement to obtain capital may lower the firm's cost of capital and convey economic advantage to owners of incumbent installations relative to investors in new installations.

A second argument is simply to recognise that if new sources were not to receive an allocation then eventually the industry would be populated by two classes of installations, some of which receiving an indefinite valuable wealth transfer and some not. This may not be sustainable in the long run, and at some point adjustments would need to be made. In order to avoid this situation the allocation needs to be updated, which creates a number of other problems, notably through the introduction of perverse incentives. See the section "Transition from New Entrant to existing installation" for a more detailed discussion on this matter.

Finally, most Member States implicitly subsidise existing installations by withdrawing the allocation to existing installations that decide not to operate[17]. Under this policy the operator of an installation will not only maximise its profits with respect to the cost of production and market price of the products. He also has to take into account the value of the allowances that will be lost should the installations be closed. This puts new entrants, which could potentially replace existing installations, at a relative disadvantage.

[17] See Åhman et al (2005) for a detailed discussion on the interaction between rules on new entrants and closures.

It can be shown that if the value of the allowances that are lost equal the allocation to the new investment, this effect is diminished. The transfer rule used by Germany - that is, the withdrawal of allowances from an installation that closes unless the allowances are transferred to a new installation - is one approach that approximates this prescription. However, the transfer rule used in Germany provides little comfort to new installations owned by new investors. Bode et al. (2005) have argued that this transfer rule discriminates against new entrants and causes large profits for incumbent generators.

Thus we conclude that in order to avoid discriminating new investments, there may be some justification for allocating free allowances to new entrants, particularly considering the current rules on closures.

4.2 Does the allocation to New Entrants affect investment decisions?

At the core of this project lies the hypothesis that the allocation does have an impact on investment decisions and competitiveness. However, this hypothesis can be challenged. The EU Commission has stated that it is the price of allowances, not the allocation, which should drive new investment in CO_2 efficient technologies and changes in behaviour. According to this position, the allocation is a way to compensate for sunk costs and to facilitate the introduction of the trading scheme, not an instrument to drive technological change or strengthen the competitiveness of industry.

Behind this lies the view that since the allocation does not affect the variable costs for an installation, it has no significant impact of the competitiveness. However, this reasoning only holds as long as the allocation is not conditioned on the choices of an investor (for instance the choice to start operations or the choice of fuel or technology) and does not significantly affect the cost of capital for an operator.

The first assumption is negated by the fact that an operator can indeed affect the allocation to new entrant. First of all through the decision to start operations at all, and then, depending on what allocation methodology is used, the allocation could be affected through choice of fuel, technology etc. In this respect, the allocation to a new entrant is very different compared to allocation to existing installations based on historic measures, since the allocation can be directly affected by the operator's investment decisions.

The second assumption, that the capital costs are not a barrier to investment, is also unlikely to hold true. As discussed above, capital is a scarce resource for most firms, although the importance of this may vary between firms and settings. Furthermore, the value of the allocated allowances in relation to other costs must be understood in order to determine its importance for investment decisions.

In table 7, the annual values of the allocated allowances are presented. As shown in figure 4, the annual value of the allocation is in some Member States equal to, or even higher than, the estimated annualised investment cost for the installation. Further, we see significant differences between countries in the outcome of the allocation. This implies that the allocation is an important source of revenue for an operator of an installation.

However, in order to get more complete assessment of the importance of the allocation, one has to take into account several other factors, both costs and sources of revenue. While a full analysis is beyond the scope of this report, a few issues that are likely to be important can be pointed out:

- Uncertainty in the allocation. The operator can only be certain of receiving a five year allocation under current rules, with Germany being an important exception since they allocate up to 18 years into the future.

- Variable costs, such as fuel prices and salaries, are significant compared to the fixed costs.

- Market factors such as energy prices and access to customers vary over time and between countries, thus decreasing the role of the allocation in determining the investment decision. The large differences in power prices that currently exist between Germany and the Nordic countries are likely to have a significant impact on investment decision.

Hence it is difficult to precisely estimate to what extent the allocation will impact the decisions on where to invest and in what type of installations. But all this said, the sheer magnitude and value of the allocation leads us to believe that it does indeed have an impact on the attractiveness of an investment. It is also likely that the differences that exist in allocation affect the relative competitiveness between Member States, fuels and technologies.

We conclude that as long as the value of the allocated allowances remain high, allocation methodologies may have an impact on investment decisions and relative competitiveness of countries, firms and technologies. It seems likely that unless allocation methodologies are harmonised, it may have an affect on the structure of the future energy market in northern Europe, through its effects on investment decisions.

4.3 Benchmarking methodologies

All of the studied countries use some type of benchmarking methodology. Although in theory there are an infinite number of options for benchmarking, it is possible to structure these in a few different approaches:

- Input or output based
- Fuel neutral or fuel specific
- Technology neutral or technology specific, e g using different methodologies for electricity generated in condensing plant and in CHP
- Product specific or product neutral ('product' in this context being electricity or heat)

Depending on which approach is used, different types of incentives are created for investments. This will affect the relative competitiveness of different fuels, products and technologies. Even if two different approaches can result in identical allocation, for instance depending on what benchmarks are used, the incentives will still be different. Again it is worth pointing out that allocation based on benchmarks has a greater significance for new entrants than it has for existing installations.

For the competitiveness of a country, the total volume of allocated allowances for a given installation may be as important as what incentive structure is created by the allocation methodology. That is, an operator who has already chosen fuel or technology then only cares about how many allowances he will receive upon entering the market.

The studied NAPs contain examples of all the approaches listed above, in various combinations. In addition, even when the same basic approach is used, for instance output based, fuel specific benchmarking, the actual number of allocated allowances differ significantly between countries.

4.3.1 Input based vs output based

The output based allocation is the most commonly used in the investigated countries. In the Nordic countries both Denmark and Sweden uses output based allocation.

The major advantage of choosing output-based allocation over input based is that it rewards high efficiency technologies. However, it seems unlikely that an operator commissioning a new installation does not seek to maximise the efficiency, regardless of allocation methodology. Thus we do not believe the choice of input or output based allocation is likely to have a major impact of CO2 efficiency in new installations. A disadvantage with output based benchmarking is that it requires forecasts of production. This is not required for benchmarks based on for instance installed capacity.

4.3.2 Fuel specific vs fuel-independent

The major advantage with fuel independent benchmarks is that it would provide incentives to use low carbon fuels. Fuel specific benchmarking provides incentives that are similar to emission based benchmarking, thus does not encourage investments in low carbon fuels. However, an advantage of fuel specific benchmarking is that it would eliminate the risk of rewarding low carbon fuels twice; once through the introduction of a price on carbon and then again through the allocation. Fuel specific benchmarks also avoid great over allocation to certain fuels.

4.3.3 Technology specific vs technology-independent

There are two main arguments for using technology specific benchmarks: in order to promote one specific technology or to accommodate for the different conditions in which different technologies are used. The first argument has been used in many member states in order to promote investments in CHP. The second argument relevant for differences between e g base load and peak load installations, or for the differences between boilers used to support a specific industry processes and boilers used for energy generation only.

If the objective is to create incentives for least cost emissions reductions, however, there is little justification for technology specific benchmarks.

4.3.4 Product specific vs product neutral

In the context of competition for investments between countries, heat and power have very different characteristics. While electricity is sold on a Nordic market and production is determined by the demand from all of the Nordic countries, heat is produced and sold on a local market. This makes electricity generation more sensitive to distortions in competition. The advantage of using different benchmarks for heat and electricity is that it would allow for taking this difference into account. Harmonisation is a higher priority for electricity than it is for heat.

All of the Nordic countries apply different benchmarks for electricity and heat.

4.4 What about auctioning?

According to the Emission Trading Directive, a Member State only has to explain how new entrants can gain access to allowances, it does not need to provide special allocation to them. Further, up to 10 % of the total volume of allowances may be sold, for instance in an auction, in the second trading period. This means that there would be room to use full auctioning of allowances to new entrants. The directive also allows for forcing new entrants to buy allowances on the open market. The discussion regarding free allocation or not to new entrants is analogue to the one on whether new entrants are discriminated compared to existing installations held above. For a full discussion on the advantages of auctioning versus grandfathering, see for instance Cramton and Kerr (2002). The major advantages of auctioning are that it provides efficient incentives for investments in efficient technologies and low carbon fuels. It also eliminates the creation of windfall profits in the energy sector. Further, it avoids the problems getting accurate data that are associated with benchmarking methodologies. However, if allocation is not harmonised across Member States with a common energy market, competition for investments may be distorted. Thus free allocation to new electricity producers may also be justified to certain extent if other northern European countries continue to apply free allocation. Further, not having free allocation can put new entrants at a relative disadvantage to existing installations under current allocation rules, particularly those on closures.

4.5 The role of assumptions and forecasts

Forecasts and assumptions are used frequently in the NAPs. As shown above, the underlying assumptions, for instance on annual operating hours, which have a significant impact on the allocation, differ significantly across member states. Further, in some Member States the regulator produces the forecasts while other member states rely on operators to provide forecasts on which the allocation is based. This is likely to create potentially large differences in the allocation even if the principles on which it is based are the same.

4.6 Transition from New Entrant to existing installation

The treatment of new entrants is closely related to the general issue of updating allowance allocations over time. Although this does not directly affect the relative competitiveness between Member States, it is an important issue for the efficiency of the trading scheme as a whole. As such it should be addressed when discussing how to harmonise the allocation rules between the Nordic countries.

The question is for how long a New Entrant should receive allocation according to some special allocation methodology before it is regarded as an existing installation, and how the transition between different allocation methodologies could be done without opening up for gaming of the system. According to the EU Directive on Emission Trading (European Union 2004) a "New Entrant" is an installation that starts its operations after the NAP has been submitted to the EU Commission[18]. This would suggest that a new installation could only be regarded as a New Entrant for one trading period. However, Germany has put forward rules that set the allocation to a new entrant for up to 18 years into he future. Since the EU Commission did not object to this (in fact the Commission did only consider information relevant for allocation of allowances during the first trading period), it seems that allocation can be specified for more than one trading period at a time.

In general, the economics literature finds that changing or updating allowance allocations over time may have a distorting effect on company decisions. For example Burtraw (2001) and Fisher (2001) found that updating output-based allocation methodologies serves as an economically inefficient subsidy for production that lowers product prices for consumers. Similarly, in an analysis of a potential emission trading program in Alberta, Canada, Haites (2003) found that an output-based updating allocation provides an incentive for production.

These considerations have clearly guided the Commission's prohibition on updating within each phase of the EU ETS. Nevertheless, it is not clear how this should be applied to the treatment of new entrants. One option suggested by Åhman et al (2005) would be to introduce a ten year time delay in the allocation. Under such a scheme a New Entrant would first be allocated based on some projected measures, but then after ten years the allocation would be updated. For instance, an installation starting in operation in 2006 would receive free allocation based on forecasts until 2015. From 2016 onwards the allocation would be based on actual activity ten years previous. A ten year time delay would significantly weaken the tendency to of updating to produce perverse incentives for operators. A similar approach, but with a four year time delay, is used in the US NOxSIP call, a program that requires summertime reductions in NOx in the eastern half of the United States.

4.7 Input from authorities

In order to gain a better understanding of the rationale behind the current allocation methodologies and the potential changes that could be possible, input was sought from policy makers in Denmark (Sigurd Lauge Pedersen, SLP), Finland (Timo Ritonummi, TR) and Sweden (Truls Borgström, TB). All of them have extensive experience from working with the design of the current NAPs. The respondents acted in their personal capacity and were not asked to, nor could they or intended to, give the official position of their respective countries. We have summarised their comments in the sections below.

[18] The technical definition is given in article 3(h) of the Directive: "any installation carrying out one or more of the activities indication in Annex I, which has obtained a greenhouse gas emissions permit or an update of its greenhouse gas emissions permit because of change in the nature or function or an extension of the installations, subsequent to the notification to the Commission of the national allocation plan".'

4.7.1 Views on to what extent the allocation distort competition between countries.

There seem to be agreement that should the current allocation methodologies remain unaltered, it will distort competition between the Nordic countries. However, since allocation is only determined for a short period of time in relation to the life span of a power plant, it is difficult to judge the importance of the allocation compared to other factors determining investment decisions. Further, both SLP and TR expect that allocation will be decreased in coming trading periods, and thus its importance and impact on competitiveness will also decrease.

4.7.2 Can the current allocation methodologies be altered, in order to obtain harmonised allocation principles in the Nordic countries?

Recognising that ultimately this is a political question, there seems to be no fundamental or principal reasons that would prohibit the countries to adjust their allocation principles in order to harmonise them with each other. The main barriers are probably political. What other member states, in particular Germany, does, is very important for what is feasible in the Nordic countries.

4.7.3 Could it be an option not to allocate free allowances to new entrants in the energy sector, both politically and from a competitive point of view?

None of the respondents ruled out this option, although it will probably be politically difficult to purse, in particular if other neighbouring countries continue with free allocation.

4.8 Input from industry

We have been in contact with representatives from the energy associations from the respective countries; Danish Energy Companies (Charlotte Söndergren), Finnish Energy Industries (Jukka Leskelä) and Swedenergy (Maria Sunér Fleming). Again, the respondents were only asked to act in their personal capacity, and the input does not necessarily reflect the views of all the member companies of the respective organisations.

4.8.1 Views on to what extent the allocation distort competition between countries.

Current allocation methodologies do distort competition and harmonising them is of high priority. However, allocation is expected to be decreased in coming trading periods, thus this effect is likely to decrease. All respondents also pointed out that there are differences in other energy policies between the Nordic countries that strongly affects investment decisions, including taxation and application process. There is a need to harmonise other policies as well in order to obtain a level playing field.

4.8.2 Could there be support for other allocation methodologies in the Nordic countries?

The question was asked with the condition that the Nordic countries would in fact implement harmonised allocation methodologies. Since all allocation methodologies create winners and losers, it may be difficult to get general support for any system, but there seems to be no fundamental barriers to adjusting the allocation principles. Auctioning would probably meet great resistance unless at least Germany, Poland[1] and Estonia also radically decreased the allocation to new entrants.

4.8.3 What would you suggest as a harmonised allocation methodology to new entrants?

The first priority is to get a harmonised system, preferably across the entire EU or at least on the northern European energy market. A harmonised Nordic system would be a step forward, but the approach used in particular Germany should be considered. The exact design of the allocation is important but a secondary priority. It would probably be easiest to get wide support for a common benchmarking methodology that would take technology and fuel into account, thus avoiding the creation of major winners and losers, although all respondents did not favour this methodology.

4.9 Harmonise with whom?

Although it would be an important accomplishment if Denmark, Finland and Sweden could harmonise their allocation methodologies, the Nordic countries must also consider the other neighbouring countries. Although the transmission capacities with the Nordic countries are significantly higher than it is to other countries, the Nordic energy sector is already part of the larger northern European energy market. Hence a discussion with the other countries in the Baltic region regarding the phase II NAPs is highly relevant, in particular for new entrant allocation.

5 Conclusions

Given the current allocation methodologies, and the discussion above, several options for a harmonised allocation methodology exist. A few general conclusions can be drawn, however:

Current allocation rules does have an impact on investment decisions, and can significantly distort competition if they remain unchanged.

Under current allocation rules the annual value of the allocation is comparable to the fixed investment costs for a new installation. Further, it has the same order of magnitude as the expected revenues from sales of energy from the installation.

There seem to be no fundamental obstacles in any country to change the allocation system to new entrants as part of a harmonising process.

Any decision on allocation to new entrants should take into account what choices are made in other countries on the northern European energy market. Germany, Poland and Estonia are of particular importance since the transmission capacities to those countries are relatively large.

Harmonising allocation is a higher priority for electricity generation than for heat, due to the higher sensitivity of electricity generators to competition.

Since the energy sector can pass on the majority of the cost for emission allowances to clients, a stringent allocation is easier to justify in this sector than in others.

The primary reasons to allocate free allowances to new entrants in the energy sector are:

a. Level playing field visavi existing installations. Under current regulations on closures, Sweden excepted, incumbents are favoured over new entrants. If rules on closures are changed so that a plant that closes does not lose its allocation, this argument falls.
b. Level playing field visavi neighbouring countries. As long as neighbouring countries (in particular Germany, Poland and Estonia) allocate free allowances to new entrants, there may be reason to allocate free allowances to electricity producers in order to avoid discouraging investments in the Nordic electricity sector. For heat generation, the argument is less relevant since the market is local, although in the choice between investing in heat generation in two different countries the allocation may be a factor if capital is a constraining factor.
c. Simulate investments in new capacity. Since capital is a limited resource, allocating free allowances may have a positive impact on the rate of new investments. However, like all subsidies, subsidising investments through the allocation risks distorting the market in other respects. Setting a “correct” level of subsidy is difficult.

6 Recommendations

In this section we give our recommendations for allocation to new entrants in the energy sector. Although we include both electricity and heat generation in the 'energy sector', the need for a harmonised allocation methodology is greatest for electricity generation. However, as heat and power are often co-generated, and to some extent can be substituted for one another, a harmonised allocation methodology for heat generation would also carry advantages.

6.1 First best solution

IVL recommends that the Nordic countries do not allocate free allowances to new entrants in the energy sector. Instead operators would have to buy allowances, either from the government or on the open market. This should be combined with adjusted rules on allocation to existing installations in order to avoid putting new installations at a disadvantage compared to existing installations. Another important condition for this recommendation is that Germany and Poland[19] also radically decreases its allocation to new entrants.

A full discussion on allocation rules to existing installations is beyond the scope of this report. However, a stringent allocation to the entire energy sector can be justified considering the possibility of energy producers to pass on costs to clients. Further, a level playing field between existing and new installations and between technologies would be achieved if auctioning was used, if the rules on closures were changed or if identical, fuel and technology independent, benchmarks were used for both existing and new installations.

This solution would eliminate the distortion of competition between the Nordic countries and avoid the creation of windfall profits from the allocation to the energy sector. It would also provide incentives to invest in efficient technologies and low carbon fuels.

6.2 Second best solution

If Germany, Estonia and Poland[20] continue with a generous allocation to new electricity producers, free allocation may be justified to electricity producers in order to avoid distorting the competition in relation to those countries.

If free allocation is used, IVL recommend that the Nordic countries use harmonised fuel and technology independent benchmarks based on output. This would give incentives to invest in efficient technologies and low carbon fuels. The allocation should be kept as stringent as possible, in particular for heat producers. There should also be harmonised assumptions and guidelines on how forecast production.

[19, 20] We base our recommendation on the figures given in the Polish NAP submitted to the Commission in July 2004. These may be altered in response to the Commission decision, but to what extent remains unclear.

This solution would eliminate the distortion of competition between the Nordic countries created by the allocation. It would also give incentives to invest in low carbon fuels and efficient technology. However, there would still be windfall profits created the allocation to energy producers. Further, if other neighbouring countries continue to use fuel and/or technology specific benchmarks, there will still be distortion of competition between those countries and the Nordic Countries. However, the benefits of preserving correct incentives for investments could well be greater than the potentially negative effects created by some distortion in competition. A 'race to the bottom', where the Nordic countries apply allocation methodologies that create perverse incentives, in fear of losing investments to neighbouring countries, would be regrettable. In the long term, this would risk shifting the structure of the energy system in the wrong direction. Further, the magnitude of the distortion in competition, and what impact this will have on investments, depends not only on the allocation principle but also on the actual level of allocation.

6.3 Third best solution

A third best solution would be to use harmonised, fuel- and/or technology dependent benchmarks, keeping the allocation as stringent as possible. This would probably meet less resistance from stakeholders than the first or second best solution. It would also fulfil the objective of removing distortion of competition from the allocation. However, the incentives to invest in low carbon fuels and efficient technologies would be reduced, and windfall profits would still be created by the allocation. In this case, the benefits of having harmonised allocation methodologies have to be weighed against the negative effects of not having incentives to invest in low carbon energy generation.

6.4 The need for certainty

Although the allocation as shown in this study has a very large monetary value, it is only determined for, at the most, five years into the future. It is a recurring wish from industry that the level of certainty is increased. If auctioning is used for the allocation to existing installations as well as to new entrants in the energy sector, this issue is dealt with.

However, if free allocation is kept in some form to either existing installations or to new entrants, IVL recommend that the Nordic countries investigate what options are available to provide higher certainty into the future. Germany has chosen to allocate allowances to new entrants for 14 years into the future mainly to accommodate for this wish. Although IVL do not advocate adopting this method, it is worth mentioning since it may affect the ability to attract investments in the Nordic energy sector.

This also relates to the issue of how the transition from status as a new entrant to existing installation is to be done. If free allocation to existing installations is kept, IVL recommend that a new installation be treated as a new entrant in the allocation for two successive trading periods. This would weaken the perverse incentives to increase production and/or emissions otherwise created by the fact that introduced. For a full discussion of this topic, see Åhman et al (forthcoming). An argument against such an approach would be if there was an intention to move away from free allocation in coming trading periods. Such a transition may be more difficult to make if allocation to certain installations is determined many years into the future.

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APPENDICES

Appendix A – Differences compared to BALTREL Report

Differences in description of current allocation methodologies

Denmark
BALTREL declares NE reserve 2.7 Mt for the period 2005-2007, IVL states 3.0 Mt. The IVL figure is the one stated in the Danish Law on CO_2 allowances dated 9 June 2004.

BALTREL does not mention the two different categories of NE, they only mention the second category, i. e. installations started after 31 March 2004, receiving 1710 allowances per installed electricity capacity and 350 allowances per installed heat production capacity. IVL also mentions the benchmark given in the Danish Law on CO_2 allowances for new heat generating plants, 205 ton/ MW_{heat}.

Estonia
BALTREL states that total allocation will be 62.8, but this is from the first NAP, not yet assessed by the Commission. BALTREL also says that there is no specific methodology mentioned for the allocation to new installations.

Finland
BALTREL states that the reserve for new entrants in Finland is set to 2.4 Mt for the first trading period; IVL has used the number given in the Finnish final version of the NAP, which is 2.5 Mt (Finland, 2004).

Germany
No differences discovered.

Latvia
BALTREL states different assumed efficiencies. For CHP coal and peat they say 87 % (IVL 80%), CHP natural gas 90 % (IVL 85 %) condensing plant coal or peat no data (IVL 40 %), condensing natural gas 60 % (IVL 50 %). IVL has used the final version of the Latvian NAP, which has been amended two times after the initial version, latest time on May 19th 2005.

BALTREL refers to a source at the Institute of Physical Energetics (Gaidis Klavs) and published its report in November 2004. IVL reference to revised NAP from May 2005 more recent.

Lithuania
BALTREL states NE reserve to be 1.996 Mton (IVL 1.839). BALTREL states benchmarks used to be 1710 ton/MW installed electricity capacity (IVL 2500) and 350ton/MW installed heat capacity (IVL 600). BALTREL does not explain the equations for allocation to NE. IVL has used the revised version of the Lithuanian NAP, dated 15th December 2004. BALTREL refers to source Zita Veromejiene, External Relation and Information Department, Lietuvos Energija AB.

Poland
No differences discovered.

Sweden
BALTREL does not mention that only fossil based energy generation will get allocation.

Differences in calculation of allocation to standard installation

In BALTREL four different types of installations were compared. Of those, two are very similar to the ones we have compared. The following data describes these two installations used in the BALTREL report.

Gas combined cycle identical except for size. (BALTREL uses 100 MW fuel input, IVL 400 MW).

Gas CHP, BALTREL uses 6000 hours of operation, power efficiency is 38 %, IVL uses 5000 h of operation, 50 % power efficiency and total efficiency 92,5%.

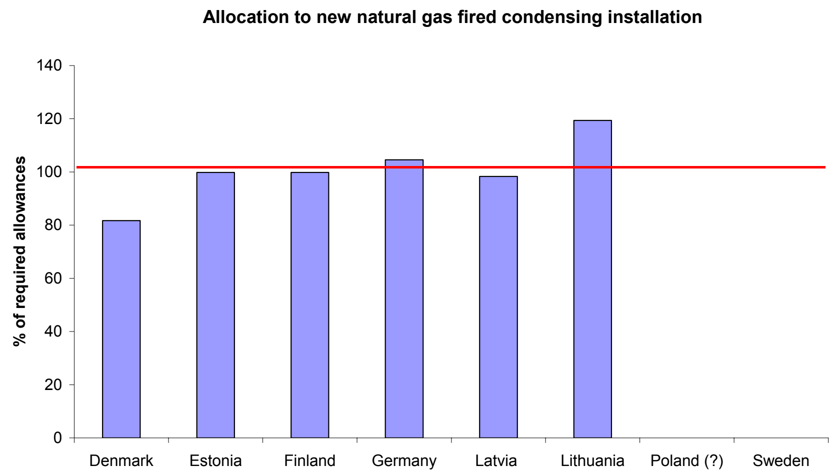

Figure 5. The allocation to a new natural gas combined cycle electricity production unit (no heat) in different member states. Results presented as percentage of annual emissions covered by the allocation..

The Danish allocation to a new natural gas fired installation is approximately 82% of the needed allowances. According to the same comparison in the BALTREL report the Danish installation would have received ~80%, the small difference is probably due to the use of slightly different emission factors and oxidation factors when calculating the actual need for the installation. The main reason for the Danish installation receives 20% less emission allowances than required is that the estimated number of operational hours is 20% higher than what was assumed when determining the Danish benchmark.

In Estonia the installation would receive 100% of the required allowances. Estonia was not included in the BALTREL study.

In Finland the installation would receive 100% of the required allowances. This was also the case in the BALTREL report.

In German y the installation would receive 105% of the required allowances. This was also the case in the BALTREL report. The reason for the allocation being larger than 100% is that the minimum benchmark in Germany is based on an installation with lower efficiency than our comparative installation. It is interesting to note that Germany are determined to allocate allowances to new installations according to these benchmarks for the coming 14 years. It is specifically mentioned that the benchmarks will not be changed during these 14 years.

In Latvia the installation would receive 98 % of the required allowances. This is also the approximate case in the BALTREL report. The reason for the allocation not being 100% is a difference in emission factor, in Latvia the CO_2 emission factor for natural gas is 55.2 while we have used 56.5 g CO_2/MJ when determining the emissions.

In Lithuania the installation would receive 119% of the required allowances. According to the BALTREL report the corresponding installation in Lithuania would have received 80%. The reason for the difference seems to be that Lithuania has changed the benchmarks for new entrants significantly in the latest version of the NAP.

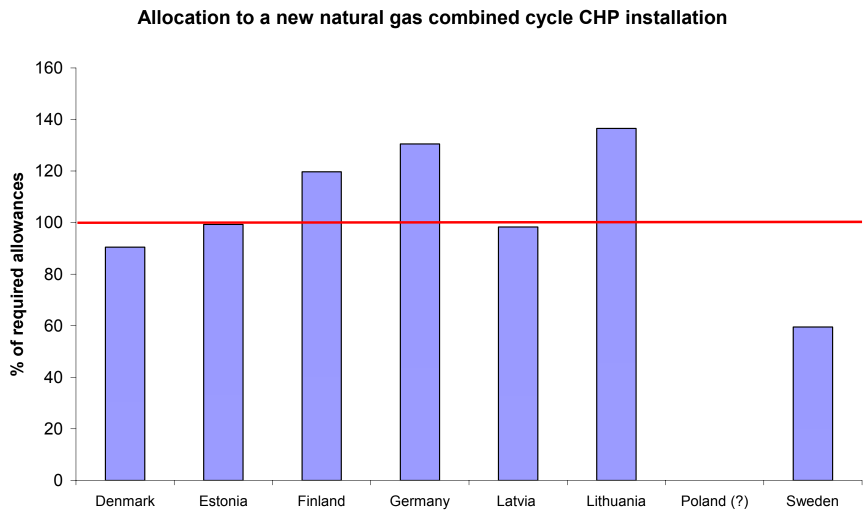

Figure 6 Allocation to a new natural gas based combined cycle CHP plant assuming location in different countries. Results presented as percentage of annual emissions covered by the allocation.

In Denmark the CHP installation would receive approximately 90% of the needed allowances. The corresponding installation in the BALTREL report would receive less than 70% of the required allowances. However our installation and the installation in the BALTREL report are different. The electricity efficiency is 12% lower in the BALTREL case. Swedenergy (2004) has made a comparison of allocation to a new CHP installation equal to ours and also states that in Denmark it will receive approximately 90% of the required allowances.

In Estonia the installation would receive 100% of the required allowances. BALTREL did not include Estonia in their study.

In Finland the installation would receive approximately 120% of the required allowances. BALTREL reported that the natural gas fired CHP installation would receive 100% of required allowances. The difference is due to a difference in assumed number of operational hours. In the

BALTREL report the CHP installation was assumed to be run for 6000 h/a, IVL has assumed 5000 h/a. Finland always assumes 6000 h/a, which is 20% higher than in the IVL case.

In Germany the installation would receive approximately 130% of the required allowances. In the BALTREL it would receive somewhat more than 120%. In the comparison made by Swedenergy the installation would receive 124%. The reason for the difference is probably that Germany has changed the benchmark for heat from 200 g CO_2/kWh to 215 g CO_2/kWh.

In Latvia the installation would receive approximately 98% of the required allowances. In the BALTREL report the CHP installation would receive 110% of the required allowances

In Lithuania the installation would receive approximately 137 % of the required allowances. According to the BALTREL report the CHP installation would receive less than 70%. The reason for the large difference is that Lithuania has changed its benchmarks significantly and that the BALTREL installation was assumed to be operated 6000 h/a compared to 5000 h/a in the IVL case.

For the same reasons as mentioned for the condensing plant we have not been able to calculate the allocation for a Polish case.

In Sweden the installation would receive 60% of the required allowances. According to BALTREL the CHP installation would also receive approximately 60% of the required allowances.