An Early Assessment of National Allocation Plans for Phase 2 of EU Emission Trading

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Short Summary

Based on 18 National Allocation Plans (NAP) for phase 2 (2008-2012) of the EU Emission Trading Scheme (EU ETS), we explore to which extent individual Member States (MS) intend to use the ETS effectively and efficiently to reduce CO_2 emissions.

Our analyses at the macro level of these NAPs show that on average the ET-budgets in phase 2 are only about 3 % lower than the budgets in phase 1 (2005-2007), historical emissions in 2005 and projected emissions in 2010. While on average, the old MS intend to reduce emissions by about 10 %, compared to projected emissions, the implied excess allocation in the new MS is more than 20 %. When compared with a cost-efficient split of the required emission reductions, the ET-budgets in the EU-15 MS are generally too large. Thus, the burden for non-trading sectors (households, tertiary and transport) will be too high. Noteworthy are also the high shares of governments' intended and companies' possible use of Kyoto Mechanisms, which challenge the traditional position held by the EU on supplementarity.

In general, our analyses at the micro level of the allocation methods (across countries and phases) suggest that MS tend to stick with the concepts and methodologies developed in phase 1, unless these actually contradict rulings by the European Commission. Thus the progress made towards more efficient and more harmonized allocation rules is generally small. With some variation, all NAPs include persistent inefficient rules for closures and new installations which distort dynamic innovation incentives and tend to preserve existing production structures. Observed improvements include a (rather small) increase in auctioning and the use of benchmarking for existing and new installations. Also, the NAPs of a few old MS have simplified special provisions for process-related emissions or combined heat and power. In contrast, new MS have often introduced such provisions in phase 2.

We conclude that potentials to improve environmental effectiveness and economic efficiency are far from being tapped. Improvements crucially hinge on the outcome of the European Commission's review process.

1 Introduction*

In January 2005, the European Union launched an EU-wide trading scheme (EU ETS) for CO_2 emissions, covering approximately 11,500 installations from the energy industry and other carbon-intensive industry sectors. These installations account for nearly 45 % of total CO_2 emissions, and about 30 % of all greenhouse gases in the EU (CEC 2005a). As its key climate policy instrument, the EU expects the EU ETS to help its Member States (MS) meet their greenhouse gas emission targets cost-efficiently. In the Kyoto Protocol, the EU has committed to reducing emissions of the greenhouse gases CO_2, CH_4, N_2O, SF_6, PFCs and HFCs by 8 % by 2008-2012 compared to 1990/1995 base year levels.[1] In the subsequent Burden-Sharing Agreement (CEC 2001), this EU-15-target was broken down into differential targets for individual MS. The average reduction target for the ten new Member States is usually 8 %, with the exceptions of 6 % for Hungary and Poland, and no targets at all for Cyprus and Malta. The first trading period of the EU ETS lasts from 2005 to 2007 (phase 1). The second trading period (phase 2) runs for five years — as do all subsequent periods — and thus coincides with the 2008-2012 Kyoto commitment period.

Rationale for using emission trading to address climate change

The prime purpose in using an emission trading system for climate policy is cost-efficiency, i.e. to achieve a given emission target at minimum cost. The costs to reduce emissions will eventually be reflected in the market price for EU emission allowances (EUAs) and induce demand for innovative, energy/carbon saving processes, products and services. This increased demand should in turn lead to more research and development (R&D), and the invention, adoption and market diffusion of such innovations (dynamic efficiency). In contrast to other environmental instruments, emission trading systems also assure that a particular environmental target is met. Since the quantity of allowances allocated (emissions budget or cap) corresponds to the emission target for a particular period, the number of greenhouse gases emitted may not be higher than the number of allowances allocated. For these reasons, emission trading systems are often considered to be superior to other regulations.

The rate and direction of the technological change induced by the EU ETS crucially depends on the design of the scheme (Gagelmann, Frondel 2005; Schleich, Betz 2005). The general design of the EU ETS is governed by the EU Emission Trading

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1 The base year for CO_2, CH_4 and N_2O is 1990; for SF_6, HFCs and PFCs, it is 1995.

Directive 2003/87/EC (CEC 2003b) and the country-specific design features are determined by the National Allocation Plans (NAPs) of individual MS.

The role of National Allocation Plans in the EU Emission Trading Scheme

National Allocation Plans (NAPs) are the centrepiece of the EU ETS: at the macro level, NAPs state the total quantity of allowances available in each period (ET-budget); at the micro level, they determine how these allowances will be allocated to individual installations.

In order to ease the negotiations around the directive and because MS differ considerably in terms of their Kyoto or burden-sharing emission targets, their reduction potentials and the progress made so far, the Directive leaves it up to the individual MS to decide about the allocation and how their Kyoto targets are going to be met. Thus, at the macro level, the NAPs determine to what extent the individual MS may rely on the EU ETS to achieve its emission target. That is, NAPs establish how to “split the pie”: How many allowances should be allocated to the installations covered by the EU ETS trading sectors (i.e. from energy and industry sectors), and which emission reductions are expected from sources in the household, services and transport sectors, which are not covered by the EU ETS (non-trading sectors)? The combined emission budgets for trading and non-trading sectors also determine to what extent MS rely on domestic efforts and on the Flexible Mechanisms to meet their Kyoto targets. The Kyoto Protocol allows countries to use International Emission Trading, the Clean Development Mechanism (CDM) and Joint Implementation (JI). However, the Marrakesh Accords require that "…the use of the mechanisms shall be supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party included in Annex I…." (UNFCCC 2001, p. 3).

Finally, macro plans provide a first indication of the additional efforts necessary to meet medium- and long-term emission reduction targets. For example, the EU Council considers greenhouse gas emission reductions of 15-30 % (compared to 1990 levels) by 2020 a necessary mid-term target for industrialized countries in order to limit the mean global temperature increase to 2° Celsius compared to pre-industrialized levels (European Council 2005). Taking into account the projected increase in emissions in developing countries, many climate experts call for even more stringent long-term targets, e. g. 80 % reductions by 2050 for the group of industrialized countries (Federal Environmental Agency Germany 2006). Similarly, the long-term reduction targets for industrialized countries recommended by the March 2005 Environment Council (European Council 2005) range between 60 and 80 % compared to 1990 levels.

While the size of the ET-budget at the macro level of the NAPs indicates whether the EU ETS is environmentally effective in terms of reducing CO_2 emissions, the allocation rules specified at the micro level govern whether the emission reductions can be achieved at low cost to society. In particular, the allocation rules for existing and new installations and for closures govern incentives for innovation and long-term investments in low-carbon energy technologies and in energy-efficiency in the industry sectors. In terms of distribution, the micro plan also predetermines the winners and losers of emission trading.

All NAPs need to be approved by the European Commission based on the criteria specified, among others, in Annex III of the Emission Trading Directive (CEC 2003b).[2] The deadline for submission of phase 2 NAPs was 30 June 2006, which was only kept by two MS (Germany and Estonia). At the time of writing (mid-October 2006), 16 NAPs have been submitted (Belgium, Cyprus, Estonia, France, Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Slovakia, Sweden and the United Kingdom).[3] In our analysis, we focus on those MS where the ET-sector accounts for substantial quantities of CO_2 emissions. Therefore we also include, whenever possible, data from the draft NAPs of Italy and Spain. At times we omit data on Cyprus and Malta, which are not subject to a Kyoto obligation and only have a very limited number of installations covered by the EU ETS. Therefore this study covers 16 NAPs and 2 draft NAPs with a total proposed budget of EUAs for approx. 1,892 Million EUA p.a.[4] In phase 1, these 18 countries hold 87% of all allowances allocated in the EU ETS and are likely to make up a similar share in phase 2.

In this study, we provide a comprehensive first analysis and evaluation of these NAPs. The structure of the study is as follows:

- Section 2 consists of the **macro-level analysis**. Criteria for our assessment are progress made by the MS towards meeting their Kyoto-targets, and comparisons of phase 2 ET-budget using historical emissions, the size of phase 1 ET-budgets and projections as benchmarks. We also explore the intended use of Flexible Mechanisms by governments and companies. Finally, we appraise the split of the required emission reductions between the ET-sectors and the

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2 In addition, the EU Commission specified further guidance on the design of National Allocation plans in the so called NAP guidance (CEC 2004a; CEC 2005a).

3 See http://ec.europa.eu/environment/climat/2nd_phase_ep.htm.

4 For the remainder of this report one EUA corresponds to one tonne of CO_2e.

remaining sectors (including non-CO_2 sources) from a cost-efficiency perspective.

- Section 3 includes the **micro-level analysis**. We assess the allocation rules for existing and new installations, for closures and for clean technologies based on insights from economic theory. The micro-level analyses also cover the use of provisions for process-related emissions, early action, small emitters and special reserves. These rules are also compared to the NAPs for phase 1. The main features of the micro plans are summarized in a comprehensive overview in Annex I[5].

- Section 4 concludes with an extensive **summary assessment** of the NAPs, points to areas of improved harmonization and efficiency and provides guidance for the future design of the EU ETS and its possible application to other sectors and regions.

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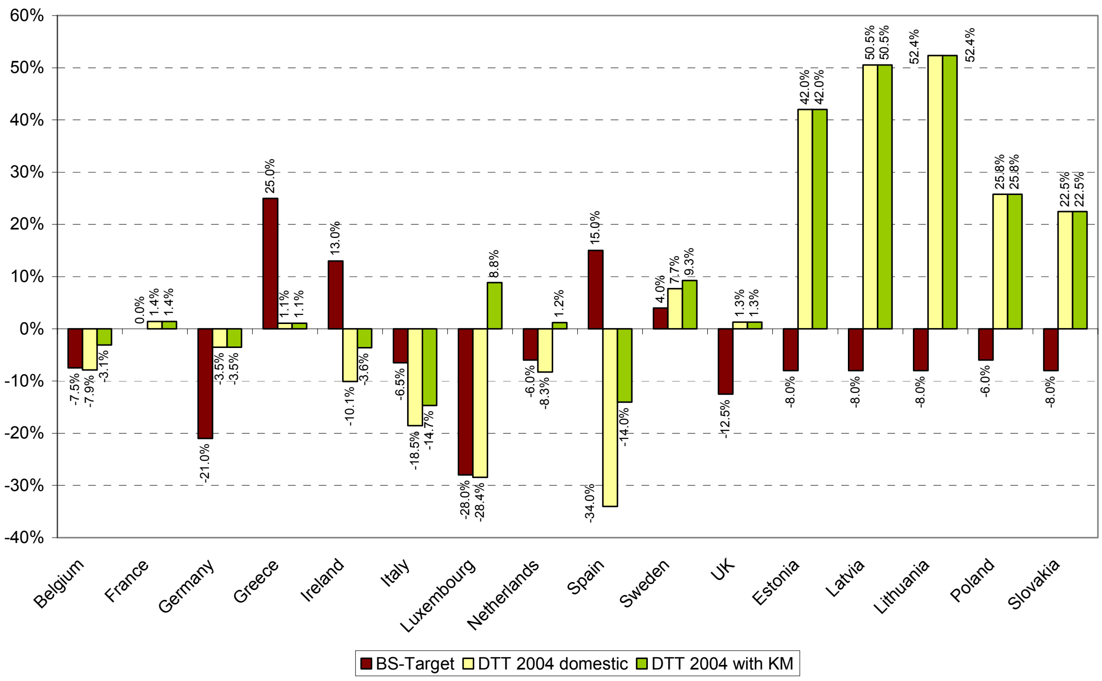
5 More details on the NAPs will be provided in additional summary tables under http://www.isi.fraunhofer.de, http://www.ceem.edu.au as well as http://www.climate-strategies.org/.

2 Macro-level Analysis of National Allocation Plans

2.1 Progress towards Kyoto: Distance-to-target analysis

To provide some background information for assessing the ET-budgets as set in the NAPs we examine whether Member States are on track to meet their individual burden-sharing or Kyoto targets. To underline the significance of governments' use of the Kyoto Mechanisms (KM), we distinguish two cases: Member States' emission targets with and without relying on these mechanisms.

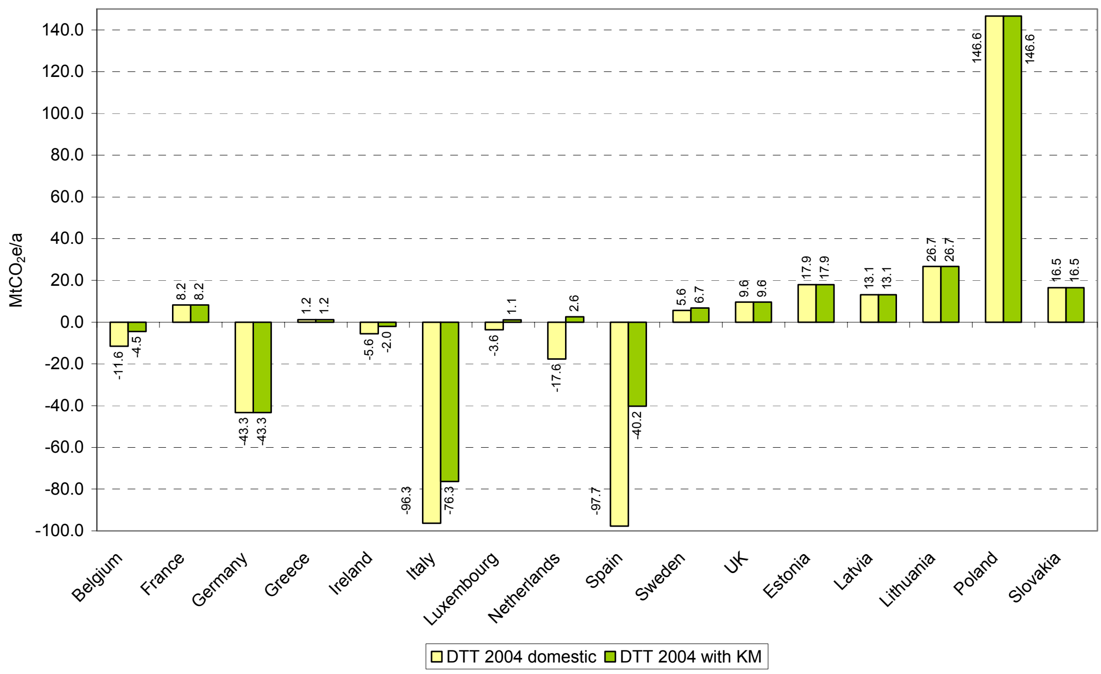
Figure 1: Kyoto burden sharing and distance-to-target analysis (in %) (as of 2004)



Source: Fraunhofer ISI, based on UNFCCC national inventory reports and its common reporting format 2006 (NIR/CRF)

The dark red bars in Figure 1 reflect each EU Member State's burden-sharing or Kyoto commitment (in % of base year emission levels), while the bright yellow bars indicate the distance to achieving these targets as of 2004 (in %, and in $MtCO_2e/a$ in Figure 2). Greenhouse gas emission data are based on the most recent UNFCCC National Inventory Reports for 2004 (UNFCCC 2006) excluding Land-Use, Land-Use Change & Forestry (LULUCF). According to these figures, apart from the new Member States which will easily manage to comply with their emission targets, only France, Greece, Sweden, and the UK have already reached their Kyoto target, while most other old MS require substantial additional efforts to do so.[6] The green bars in Figure 1 and Figure 2 reveal how this distance-to-target (DTT) indicator improves for Belgium, Italy, Ireland, Luxembourg, the Netherlands, Spain and Sweden (see FN 8), which are the MS in the sample intending to buy credits from Kyoto Mechanisms. In total these MS intend to purchase CERs, ERUs or AAUs for emissions of approx. 114 $MtCO_2e/a$, which represents a share of 3.1% of the Assigned Amount of the eleven EU-15 MS[7] under consideration (for the 7 MS using KM: 8.8 % of the Assigned Amount) or 45.5 % (50.3 %) of these Member States' aggregate gap to reach the Kyoto target in 2004 (DTT_{2004} approx. -251 $MtCO_2e/a$, or -227 $MtCO_2e/a$, respectively).[8]

Figure 2: Distance-to-target analysis (in $MtCO_2e/a$) (as of 2004)



Source: Fraunhofer ISI, based on UNFCCC national inventory reports 2006 (NIR/CRF)

6 In absolute figures, Spain and Italy stand out with both missing approximately 100 $MtCO_2e/a$, followed by Germany with some 43 $MtCO_2e/a$. In terms of percentage and without considering the intended use of Kyoto Mechanisms, Italy, Ireland, Luxembourg and Spain have the longest way to go to reach their Burden Sharing target.

7 In this report we use the terms "EU-15 MS" and "old MS" interchangeably.

8 Intended governmental use of Kyoto Mechanisms: Belgium 7 $MtCO_2e/a$, Italy 20 $MtCO_2e/a$, Ireland 3.6 $MtCO_2e/a$, Luxembourg 4.7 $MtCO_2e/a$, the Netherlands 20 $MtCO_2e/a$, Spain 57 $MtCO_2e/a$ and Sweden 1.1 $MtCO_2e/a$. Since Sweden is on a reduction path aiming at -4%, it is unlikely to use these credits in 2008-12. When setting its ET-budget, Sweden did not base its calculations on its purchase of Kyoto Mechanisms.

In addition to the use of the Kyoto Mechanism on the national level by governmental purchases, the Linking Directive (CEC 2004b) allows companies to use credits from projects under Joint Implementation (JI) and Clean Development Mechanism (CDM) to cover their emissions under the EU ETS. Based on the supplementarity requirements of the Marrakesh Accords and the Kyoto Protocol, the EU ETS Directive also requires that the use of these Mechanisms needs to be supplementary to domestic action (see Article 30.3, CEC (2004b)). In line with the Linking Directive, MS specified the use of the Mechanisms by companies as a percentage of allocation in their National Allocation Plans (Article 5, CEC (2004b)). Since these credits and EUAs can be traded without restrictions between companies, the total available amount within the EU-27 will be the overall limit.[9] Credits from CDM and JI projects used by domestic firms need to be added to the amount of Kyoto Units (AAUs) the governments intend to use to meet their Kyoto-/Burden-Sharing targets.

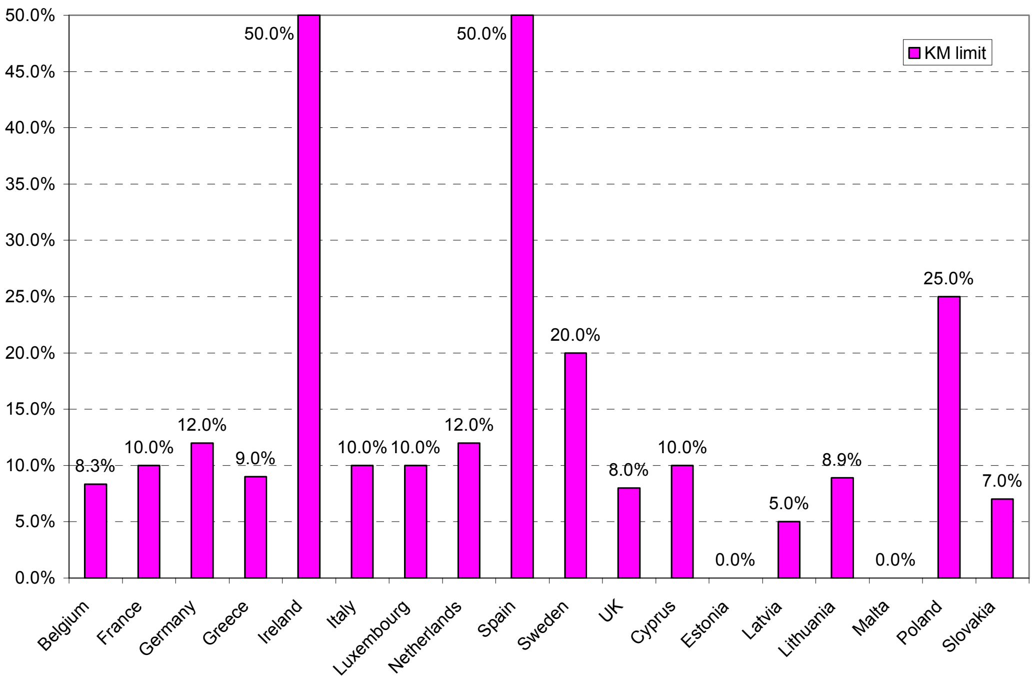
As shown in Figure 3, the maximum share (i.e., limit) of credits MS allow their companies to use varies substantially across countries and ranges from 4 % and 5 % in Wallonia and Latvia, respectively, to 50 % in Ireland and Spain. There are also differences in how the limits will be implemented. First, some MS (e.g. UK) require the limits to be met in every year, but allow for banking. Other countries (e.g. Germany, Luxembourg) allow for banking and borrowing, so that the limit has to be met for the five year trading period only. Second, the limits are mainly implemented at the level of installations but for some at the level of the entire ET-sector (e.g. Slovakia) under a first-come-first-served policy. Greece permits shifting these limits across companies, i.e. other operators may use the remainders of other installations' percentages. Flanders has implemented different limits for the power and industry sectors in order to compensate the power sector for a more stringent allocation. Since companies may trade credits from JI or CDM projects for EUAs, any restrictions on the use of these credits are expected to be binding at the aggregate level, rather than at the levels of MS, sectors, or installations.

The sum of companies' maximum use and governments' intended purchases from the Kyoto Mechanisms are 403 Mt CO_2e/a. This figure relates to a distance to target (as of 2004) of the 18 MS examined of some 30 Mt CO_2e/a only, which clearly shows that for these MS – due to the intended and permitted use of KM – there would be no need for domestic reductions at all. Again, there are substantial differences across MS, and some MS (notably Ireland, the Netherlands, and Luxembourg) appear to be at odds with the supplementarity rule. The Netherlands plan to purchase up to 50 % of the re-

9 Bulgaria and Rumania will join the EU ETS in 2007.

maining distance to target (DTT) externally (if based on 2004 figures, this percentage increases to almost 115 %) and intend to allow their companies to use Kyoto Mechanisms for up to 12 % of their allocation (which corresponds to some 67 % of the DTT figure for 2004). However, the criteria specified in Article 30.3 of the EU ETS which quotes and refers to the supplementarity requirement originally formulated in the Kyoto Protocol (e.g. Article 17) and the Marrakesh Accords are qualitative rather than quantitative. Therefore it remains to be seen to which extent the European Commission intends to apply any quantitative criteria, including the one it originally proposed by the EU in the international negotiations (European Council 1999) leading to the Marrakesh Accords.[10]

Figure 3: Kyoto Mechanisms compliance limit for installations (in %)



Source: Fraunhofer ISI, based on phase 2 NAPs

10 The EU's original quantitative proposal that was reached under long internal negotiations – 30 different formulas were considered – within the EU-15 is the following: "Net acquisitions of emission rights by an Annex B Party for all three Kyoto mechanisms together must not exceed the higher of the following two alternatives:

Formula 1: $5\% \frac{(emissions_{baseyear} * 5 + AssignedAmount)}{2}$ or

Formula 2: $50\%(emissions_{anyyear1994to2002} * 5 - AssigendAmount)$ " (European Council 1999).

Note: the Assigned Amount is 5 times base year emissions multiplied by the Kyoto target.

These figures need to be kept in mind when assessing the ambition level of the proposed emission budgets for phase 2 of the EU ETS.

2.2 Stringency of national ET-budgets

The stringency of the combined national ET-budgets determines the relation between supply and demand and therefore also the prices of EUAs in the market. Most notably, prices for EUAs remained around € 26/EUA from January 2006 until the end of April 2006, but plummeted to around € 10/EUA as a response to the publication of verified emission data for 2005, which indicated a surplus of about 44 million EUA for 2005 (see Figure 4, which compares actual allocation[11] and actual emissions in 2005[12]). Only very few countries allocated quantities of EUAs in 2005 below the actual 2005 emission levels of the ET-sector (Austria, Greece, Italy, Ireland, Spain and the UK).

The factors leading to a generous allocation – apart from political economy aspects – primarily include uncertainties about the actual recent and future emission levels of the installations covered. For example, (i) the emission reduction levels compared to available historical (verified) emission levels were unknown, (ii) the methodologies for monitoring varied widely (EU Monitoring Guidelines had not been approved at the time of data collection), (iii) the definition of installations covered by the Directive did not correspond to existing sector definitions for data collection (e. g. energy balances or national inventory reports), (iv) uncertainty prevailed about which installations were covered by the Directive, (v) the emission levels at installation level used for allocation were not verified, and – maybe most importantly – (vi) the emission projections which determined the size of the ET-budget in many MS relied on overly optimistic economic growth rates. Also, especially in the new MS, the average distribution of the total allocation over the trading period can distort the picture because of ongoing growth, thereby contributing to a surplus of allowances in early years of a trading phase, while the picture might change towards the end of that phase. Since France and Poland allowed restricted banking of allowances from phase 1 to the phase 2, the (lack of) strin-

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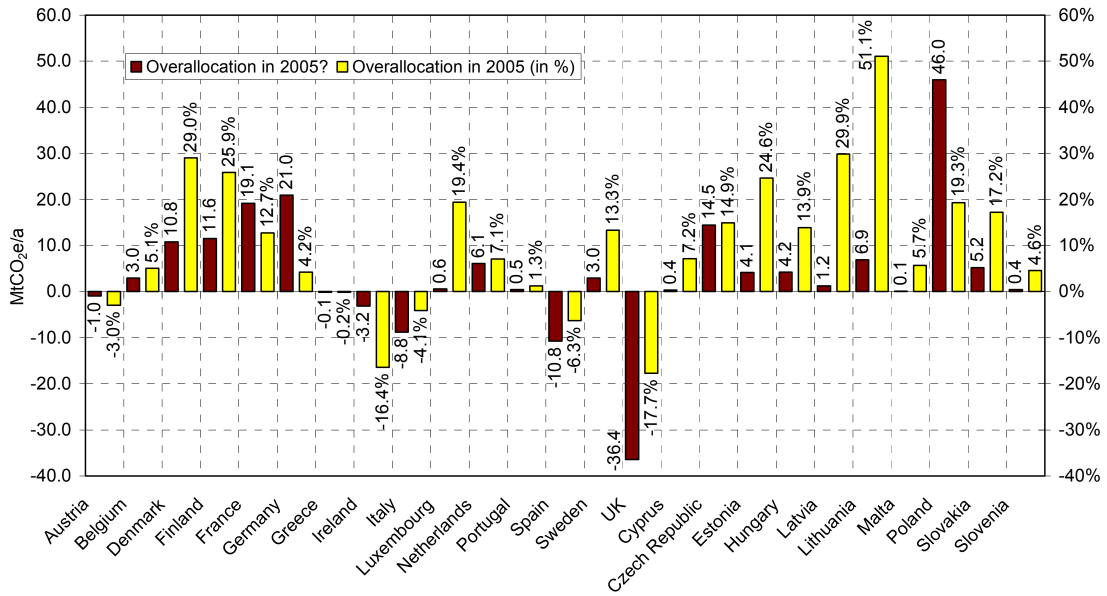
11 Actual allocation excludes opt-outs, includes opt-ins and new entrants in 2005 (CITL data as of October 23, 2006).

12 The CITL data for Poland still only covers less than 60% of the cap set in Poland's first NAP because not all installations are connected to the registry. We therefore took the cap in phase 1 (excluding NER, 238.3 million EUA) as a proxy for the actual allocation in 2005, and estimated the actual emissions of all Polish installations covered by the EU ETS by applying the same percentage of surplus allocation as that of the installations already registered in CITL (140 million EUA actual allocation vs. 113 million EUA actual emissions in 2005, yielding a surplus allocation of 27 million EUA or some 19% (for 461 installations)). As a result, we estimate an over-allocation of approx. 46 million EUA in 2005.

gency of the first period may – if banking is actually implemented – have a (small) impact on the stringency of the second period.

Figure 4: Comparison of allocation 2005 vs. emissions 2005 (in $MtCO_2e/a$ and in %)



Source: Fraunhofer ISI, based on NAP and registry data (CITL as of October 23, 2006)

While not all of these factors could be overcome in time to set up the second round of NAPs, MS and the Commission can at least rely on VET 2005 data. However, the time between the release of the Verified Emissions Data (May 2006) and the deadline to submit the NAP 2 (end of June 2006) was very short.

To assess the stringency of the ET-budgets for NAP 2 we relate their sizes to three criteria which can be used to determine the cut in emissions by MS: historical emissions, the size of the ET-budgets in phase 1 and projected emissions of the ETS-installations for 2008-2012.

Criterion 1: Second phase ET-budgets compared to historical emissions

The historical emissions of the installations covered in the Member States are the first benchmark used to assess the stringency of ET-budgets. In principle, there are two sets of historical data available that might be used: CO_2 emissions by the ET-sector in the various country-specific base periods as published in the NAPs, or the actual historical emissions of installations covered by the EU ETS, for which data is already available for the first year 2005 (VET 2005). In this study, we use 2005 VET data, since they are the most recent, are deemed to be of higher quality (verified rather than estimated) and may be consistently compared across countries. We compare these data with the ET-budget for 2008-12 (without the New Entrant Reserve for installations going online in 2008-12).

However, there are three major caveats: the extended scope, opt-outs and opt-ins. First, the VET 2005 data do not incorporate the extended scope of the EU ETS in most Members States in phase 2, an outcome of the European Commission's efforts to harmonize the types of installations included in the EU ETS across countries.[13] So far, these additional installations correspond to an increase of approximately 35.5 million EUA p.a. in the allocation in 2008-12.[14] We therefore increase 2005 data by these estimated additional installations. Second, some MS (the UK and the Netherlands) have applied opt-out rules in phase 1, so that their VET 2005 data do not reflect the emissions of installations that have been temporarily excluded from the scheme. For phase 2, the EU ETS Directive does not foresee such opt-outs. As a consequence, for these two MS we correct 2005 data by the estimates for opt-outs.[15] Third, Article 24.1 of the EU ETS Directive allows Member States to include further sources and gases in addition to the opt-in possibilities in phase 1, depending on approval by the Commission.[16] In order to allow for consistent comparisons of the data across phases, we did not consider the allocation intended for these new opt-ins. The aforementioned data limitations should be kept in mind when interpreting the results.

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13 More specifically, the NAP guidance for phase 2 states that "…Member States should therefore in any case include also combustion processes involving crackers, carbon black, flaring, furnaces and integrated steelworks, typically carried out in larger installations causing considerable emissions" (CEC 2005b, p. 9).

14 This figure is based on the following estimates provided in NAPs and supporting documents: Belgium 5.7 MtCO_2e/a, France 5 MtCO_2e/a, Germany 11 MtCO_2e/a, Ireland 0.4 MtCO_2e/a, the Netherlands 4.15 MtCO_2e/a, Slovakia 1.05 MtCO_2e/a, Spain 6.77 MtCO_2e/a, Sweden 2 MtCO_2e/a and the UK 9.5 MtCO_2e/a. Some other MS, such as Lithuania, have not yet provided a proxy for the size of emissions or the allocation to additionally covered installations.

15 Opt-outs for the UK were approx. 30 MtCO_2e/a, and for the Netherlands about 7.8 MtCO_2e/a.

16 So far, three MS (France, Netherlands and the state of Wallonia in Belgium) plan to include additional installations with N_2O emissions from adipic and nitric acid, glyoxalic and glyoxal production. The intended number of allowances for N_2O emissions from these opt-ins – Wallonia did not provide any details yet - is rather small: France 5.44 MtCO_2e/a, Netherlands 1.43 MtCO_2e/a...

Criterion 2: Second phase ET-budgets compared to first phase ET-budgets

We use the ET-budgets of phase 1 as the second benchmark to assess the stringency of the ET-budgets for phase 2. For this comparison we include the reserve for new entrants (and reserves for other purposes, such as legal claims, but not JI set asides) in both ET-budgets. Also, if the ET-budget for phase 2 already includes the allocation for additional installations, we adjusted the ET-budget for phase 1 by the estimates for these installations that were provided in NAPs and supporting documents. Furthermore, both ET-budgets need to equally incorporate the foreseen allocation levels for opt-in and opt-out installations in phase 1. Again, we abstract from allocations to additional opt-ins which might be foreseen for 2008-12 because these additional installations have not been covered in phase 1.

Criterion 3: Second phase ET-budgets compared to projected emissions

Finally, to evaluate the stringency of the ET-budgets in phase 2 we also look at projected emissions for 2008-2012 of the installations covered by the EU ETS in each Member State. When available, we use the projections for the ET-sector provided in the NAPs. Where these were not included in the NAP, they were estimated based on a country's projection for all GHG from their NAP (Ireland, the Netherlands, Spain's draft NAP) and the ratio of CO_2 emissions of the ET-sector from VET 2005 (plus additional installations and phase 1 opt-outs) relative to total GHG emissions in 2004 (from UNFCCC 2006). This procedure implicitly assumes that this ratio will remain constant in phase 2 which might not be the case, especially in economies undergoing structural change. But it still represents a sufficiently robust estimate of projected emissions. We used projection figures from external sources only if the NAP did not provide any data on projected emissions for 2008-12.[17]

The results of the evaluation using these three criteria are displayed in Figure 5 and Figure 6 and may be summarized as follows.

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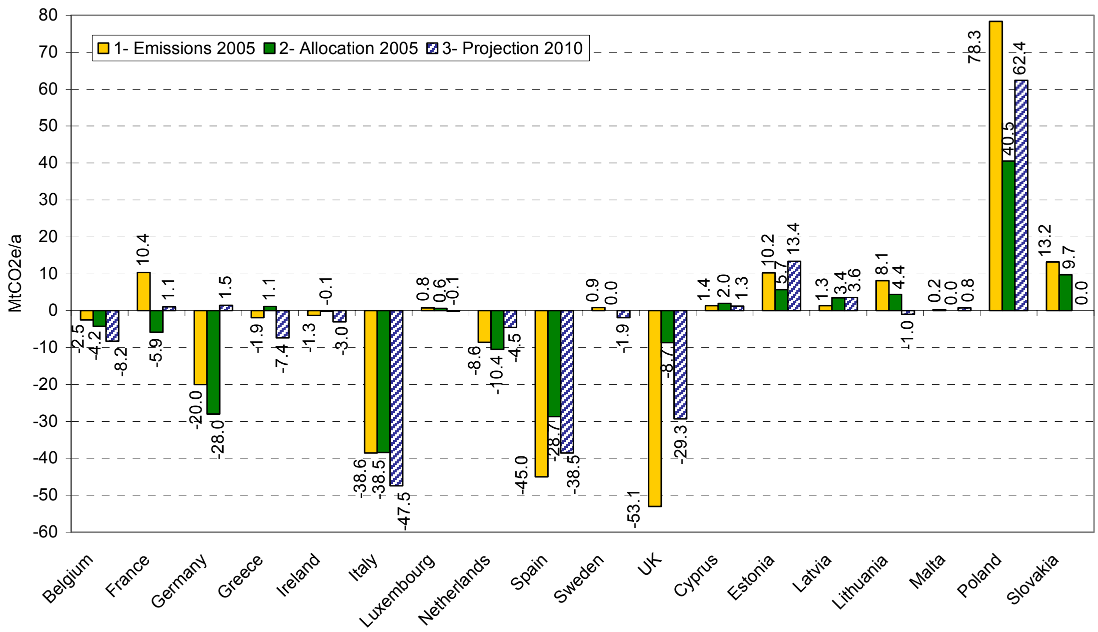
17 For Estonia, Germany and Poland we used the recently published data from the EEA (2006) with which we calculated the projection for the ET-sector by using the EEA figure with the ratio of CO_2 emissions of the ET-sector from VET 2005 (plus additional installations and opt-outs in phase 1) relative to total GHG emissions in 2004 (UNFCCC 2006).

Figure 5: ET-budget for phase 2 compared to emissions in 2005, allocation for 2005 and emission projection in 2010 (in $MtCO_2e/a$)



Note: Due to missing data on projected emissions for the ET-sectors in the NAPs for Ireland, the Netherlands, Spain, Estonia, Germany and Poland, criteria 3 was assessed using our own calculations (based on EEA 2006).

Source: Fraunhofer ISI (based on CEC 2006; UNFCCC 2006 and NAPs I+II of MS)

1. *Historical emissions in 2005* (bright yellow bar in Figure 5 and Figure 6): This criteria yields different results for the old MS compared to the new MS. With the exception of France, Luxembourg and Sweden, all EU-15 MS reduce their phase 2 ET-budget compared to actual emissions in 2005, while the new MS included in this study decided in favour of a budget larger than VET 2005 data. The MS with the most significant decrease of their new ET-budget compared to actual emissions in 2005 are Italy, Spain and the UK (both in absolute and percentage figures).[18] Poland has the largest overshoot of 2005 emissions in absolute terms, but this figure needs to be interpreted with caution as it is based on an estimate for 2005 data (see footnote 12).

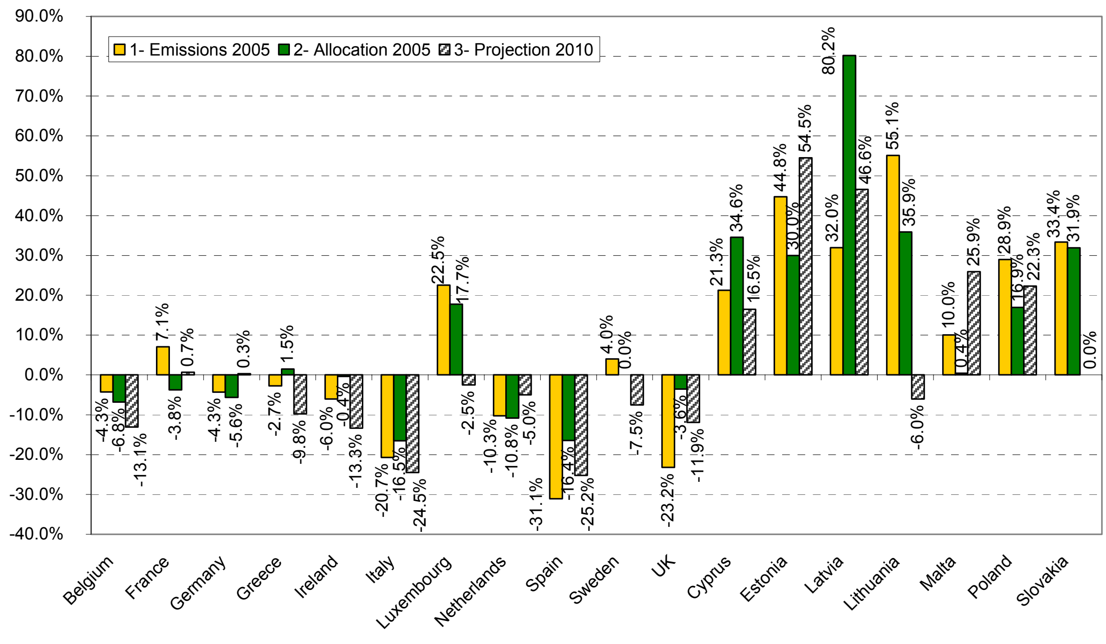
2. *ET-budget of previous phase 2005-2007* (dark green bar in Figure 5 and Figure 6): The same differentiation in allocation decisions between old and new MS is demonstrated by criteria 2. In the EU-15, only Greece and Luxembourg, and both only

18 Notably, these MS were (together with Ireland and Greece) the only MS in our sample where allocated quantities in phase 1 were below VET data in 2005 (see Figure 4).

to a limited extent, increase their phase 2 ET-budget when compared to the budget in phase 1. All other EU-15 MS have decided in favour of a stricter ET-budget compared to the previous one. The analysis shows that, in absolute terms, Italy, Spain and Germany exhibit the largest reductions. In percentage terms, Spain, the UK and Italy show the largest cuts in their ET-budgets. In contrast, all new MS show large upward deviations in their ET-budgets, led by Poland (in absolute terms) and Latvia (in relative terms).

3. *Projected emissions* (striped white-blue bar in Figure 5 and Figure 6): This criteria again resulted in a two-sided picture: The old MS choose an ET-budget that is lower than projections (with the exceptions of France and Germany), while the new MS intend to allocate more than the projected emissions (with the exceptions of Lithuania and Slovakia). This appears particularly troublesome as we used projections provided in the NAP. It would be worthwhile to compare projections in the NAPs with expert judgements because projected figures are always somewhat subjective and thus the picture might be even worse (see Neuhoff et al. 2006).

Figure 6: ET-budget for phase 2 compared to emissions in 2005, allocation for 2005 and emission projection in 2010 (in %)



Source: Fraunhofer ISI (based on CEC 2006; UNFCCC 2006 and NAPs I+II of MS)

Only six MS, all of them EU-15, fulfil all three criteria, namely Belgium, Ireland, Italy, Spain (the latter two according to their draft NAPs), the Netherlands and the United Kingdom.

In total terms, criteria 1 (ET-budget phase 1 vs. VET 2005) suggests that the new total ET-budget of the EU ETS is just below 2.7 % or some 46 million EUA p.a. below actual emissions in 2005 (old MS: -11.1 % or -158.9 $MtCO_2e/a$; new MS: +31.3 % or 112.8 $MtCO_2e/a$). Criteria 2 (ET-budget phase 2 vs. ET-budget phase 1) provides a similar picture, again with a clear distinction between new and old MS: the 18 MS under consideration have set their ET-budgets 3 % or approx. 57 million EUA p.a. below the phase 1 ET-budget (old MS: -7.7 % or -122.8 million EUA p.a.; new MS: +21 % or 65.7 million EUA p.a.). Finally, the overall picture for criteria 3 (ET-budget phase 2 vs. projections) shows very similar results: the phase 2 E-budget of old MS is approx. 9.1 % or 138 million EUA p.a. lower than the projection, while the new MS intend to allocate approx. 21.1 % or 80.4 million EUA p.a. more than projected emissions. In sum, the overall ET-budget of the 18 MS under investigation is just 3 % or 57.6 million EUA p.a. lower than projected emissions for the ET-sector.

These figures suggest that the intended allocation for the ET-sector in 2008-12 will not require significant reductions – given the error of margin on the data, actual emissions may even be well below the intended allocation. As a consequence, the price for EUAs and innovation incentives for low-carbon technologies are likely to be low as well.

2.3 Cost-efficiency of ET-budget

While the first three criteria address the stringency – or lack thereof – of the ET-budgets for the installations covered by the EU ETS, we now examine to which extent Member States rely on the EU ETS to meet their Kyoto burden-sharing targets. In particular, we attempt to gain some insights into whether the sizes of the EU ET-budgets are consistent with an efficient distribution of reduction efforts between the trading and the non-trading sectors.

Cost efficient size of budget for ET-sector

From an economic perspective, the size of the budgets for the ET-sector and the non-ET-sector should be determined such that (before international trading starts) the total abatement costs are minimized, i.e. that the marginal costs of the abatement measures which are realized in the trading sectors and the non-trading sectors are equal. Thus, sectors with cheaper reduction measures should contribute more reductions (relatively) to achieving a country's emission target. At least to some extent, criterion 3 of Annex III of the EU ETS Directive – i.e. the potential to reduce emissions – addresses this issue.

According to the NAP Guidance (CEC 2004a), this "criterion will be deemed as fulfilled if the allocation reflects the relative differences in the potential between the total covered and total non-covered activities", where "potential" also means economic, and not only technical potential.

Criterion 4: Hypothetical allocation scenario (HAS) between ET- and non ET-sectors for 2008-12

As an indicator for the relative contribution of the ET-sector to achieving a country's emission target, we relate the size of the ET-budget in the NAPs to a "hypothetical allocation scenario between ETS and non-ETS" (HAS). To calculate this HAS we multiply a Member State's burden-sharing or Kyoto target with the share of the ET-sector's CO_2-emissions relative to total greenhouse gas emissions (using the most recent data of 2004/05).[19] Thus, the HAS represents the budget resulting for the trading sector (biggest parts of energy and industry) if all sectors contributed proportionally to achieving a country's emission target. In principle, the same caveats as described in the previous criteria apply with respect to calculating the share of ETS emissions relative to all GHG emissions. For example, estimates rather than verified emission data had to be used for installations which were opted out in phase 1 but are to be included in phase 2 of the EU ETS.

In our analyses of the HAS of MS purchasing Kyoto Mechanisms (Belgium, Italy, Ireland, Luxembourg, the Netherlands, Spain and Sweden[20]), we distinguish two scenarios: a *domestic action scenario* where we calculate the HAS without the governments' intended use of Kyoto mechanisms; and a scenario where these mechanisms result in an increase in the national emission budgets (and consequently also in the HAS).

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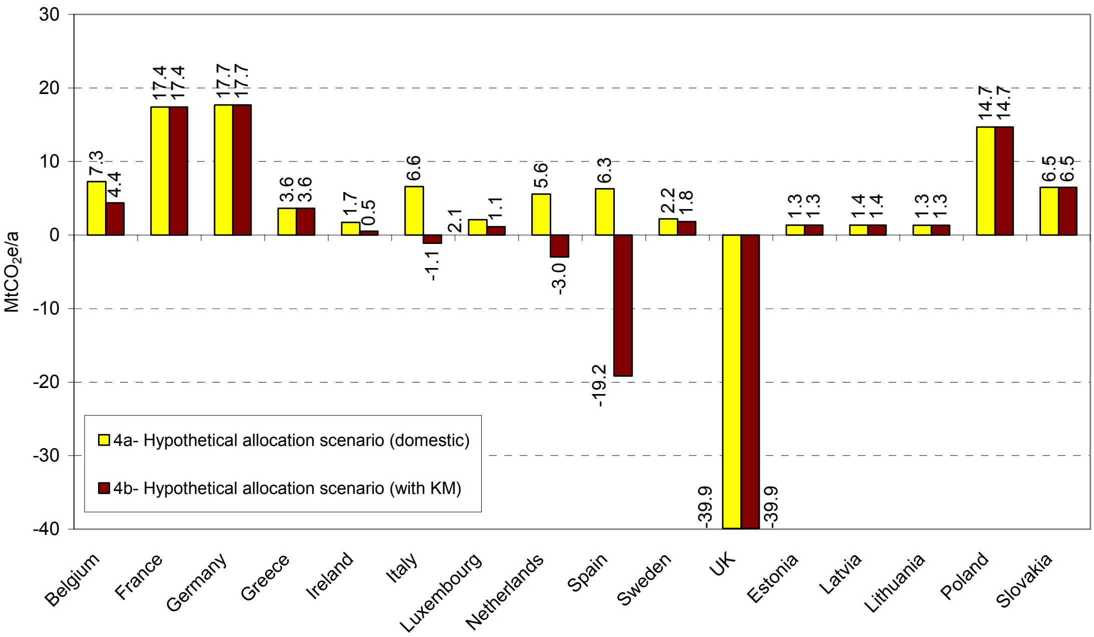
19 To compute the share of the ET-sector we divide total (verified) CO_2-emissions from the ET-installations in 2005 (CEC 2006) – adjusted upwards by emissions of additional installations and opt-outs – by the total GHG emissions of a country using National Inventory Data for 2004 (UNFCCC 2006), excluding (as always) emissions from LULUCF.

20 The second scenario is not relevant for Sweden because – although it intends to purchase credits from Kyoto mechanisms – the decision on the actual use of these credits for 2008-12 is still pending, and the amount intended to be purchased was not taken into account when setting Sweden's ETS-cap for phase 2.

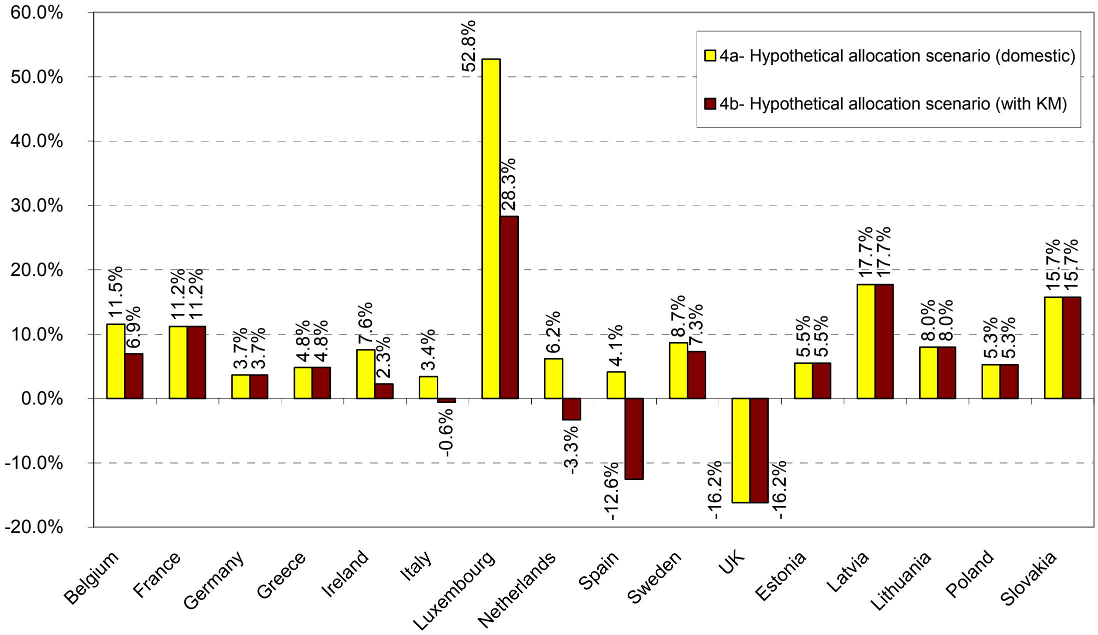
Figure 7: ET-budget for phase 2 compared to “hypothetical allocation scenario” (in $MtCO_2e/a$)



Source: Fraunhofer ISI (based on CEC 2006; UNFCCC 2006 and NAPs I+II of MS)

Figure 8 shows the results for the shares of the actual ET-budgets to the HAS. Apart from the UK, the emission budgets for the ET-sectors in all other Member States are significantly larger than a proportional contribution would suggest. Even if the governments’ intended use of the Kyoto mechanisms is taken into account, in addition to the UK only the ET-budgets of the Netherlands and Spain pass this test. In terms of cost-efficiency, this result insinuates that the “pie split” is not optimal in most countries. According to many studies (including Böhringer et al. 2005; Böhringer et al. 2006; Criqui, Kitous 2003; or Peterson 2006), the marginal abatement costs of the ET-sector are lower than the abatement costs of other sectors in the economy (even without considering the ETS-companies' option to use “cheap” credits from CDM or JI projects to fulfil their obligation under the EU ETS). Thus, from a cost-efficiency perspective, the ET-sectors should actually contribute more than would be proportional rather than less.

Figure 8: ET-budget for phase 2 compared to "hypothetical allocation scenario" (in $MtCO_2e/a$)



Source: Fraunhofer ISI (based on CEC 2006; UNFCCC 2006 and NAPs I+II of MS)

3 Analysis of allocation rules at the micro level

Similar to phase 1[21] of the EU ETS, most MS included in this study also allocate the entire ET-budget for free in phase 2 (see Annex I). Likewise, the majority of MS again apply a two step approach to determine the quantities of EUAs to be allocated to individual installations. In the first step, sector budgets (SB) are determined, usually based on a combination of historical emission levels or average benchmarks, growth projections, emission saving potentials (EF = efficiency factor) and a compliance factor (CF) to reach the overall ET-budget. In the second step, the sector budgets are then allocated to individual installations (IA = installation allocation), typically based on their emissions share in a base period (rather than on output or capacity). Technically, most old MS apply sector-specific compliance factors (see Annex I) to guarantee the consistency of the bottom-up allocation to individual installations with the sector budgets. In the simplest case, there are only two budgets: one for energy and one for industry.[22] Since most of the new MS (e.g. Estonia, Latvia and Slovakia) will easily reach their Kyoto-targets, they use a one step approach and do not have to apply compliance factors. In all MS these basic allocation rules are supplemented by special provisions to serve particular distributional purposes, for example, to account for clean technologies, process-related emissions, early action or small emitters. In addition, the micro plans include limits on the use of Kyoto Mechanisms by companies and may also provide information on special reserves. In the remainder of this section, we will analyse the allocation rules for existing installations, for new projects (including new entrant reserves) and for closures in more detail, drawing primarily on arguments from economic theory. The section also covers special provisions and special reserves.

3.1 Basic allocation rules for existing installations

As can be seen from Annex I, most MS allocate allowances to existing installations for free based on historical emissions in a fairly recent base period which typically consists of several years (conventional grandfathering).[23] But several countries like Belgium, Italy, Latvia, Spain, Sweden and the UK base allocation for some existing installations

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21 For overviews see, for example, Betz et al. (2004), Ecofys (2004), German Emissions Trading Authority (DEHSt) (2005), Matthes (2005).

22 In some countries the energy sector only includes power installations connected to the grid. In other MS, the energy sector also includes power installations in the industry sector (see Annex I for an overview). For simplicity we usually do not make this distinction when presenting the general results.

23 Conventional grandfathering is also the method applied in most other existing emission trading systems, see e. g. Boemare and Quirion (2002).

on benchmarks (BM) and France and Poland use average benchmarks to determine the size of the sector budgets. Apart from France, these countries did not use benchmarks to allocate EUAs to existing installations in phase 1. Under benchmarking, allocation is based on specific emission values per unit of production (e.g. kg CO_2/MWh electricity or t CO_2/t cement clinker) for a particular group of products or installations. The actual number of allowances can be derived from the specific benchmark multiplied by past or predicted activity rates of individual installations. In general, a benchmarking allocation on installation level favours carbon-efficient installations compared to less carbon-efficient installations, since operators of the latter need to purchase missing allowances on the market or have fewer excess allowances. Since average benchmarks are calculated as the activity-weighted average of emission values for a particular group, they are politically more palatable to existing installations than benchmarks based on the best-available technology (BAT-benchmarks). Benchmarks may be uniformly applied to all installations in a group or differentiated according to fuel inputs, technologies or products. Both types of benchmarks may be associated with high distributional effects compared to conventional grandfathering. Benchmarks to determine the sector budget will not have those effects, if allocation at the level of installations is based on the share of historic emissions.[24]

The majority of benchmarks are fuel and/or technology-specific average benchmarks rather than uniform benchmarks or BAT benchmarks.[25] Exceptions include Flanders and Wallonia in Belgium, where a uniform BAT-benchmark is applied for power installations, and Sweden, where allocation for basic oxygen steel furnaces is based on an EU-wide average benchmark.

Assessment: benchmarking versus grandfathering for existing installations

As long as full auctioning is not feasible (see next sub-section), benchmarking may be preferable to conventional grandfathering. In particular, conventional grandfathering may lead to undesirable distributional effects, since companies investing in abatement measures prior to the base period (early action) receive fewer allowances than those who did not invest in such measures. The latter companies are then able to reduce

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24 Note that if the emission budget for a particular group of installations is fixed, then a BM allocation implies that the allocation to an installation is in proportion to the share of the activity level of that installation. In particular, the allocation to an installation is independent of the level of the benchmark.

25 The Netherlands Flanders and Wallonia, where allocation is based on Covenants or voluntary agreements use BAT-benchmarks for existing installations. However, as in phase 1, they use benchmarks for calculating the efficiency factor (i.e. difference between BAT and actual efficiency) which is used in the allocation formula (see Annex I).

emissions at lower costs and sell the surplus allowances on the market. This problem could arise in future trading periods if base periods are updated to calculate allocation at the installation-level (Bode 2006). To limit the distributional effects, the benchmarks used for existing installations could be differentiated according to fuel use, technologies, installation size or application (e.g. load). Such differentiated benchmarks are generally likely to result in efficiency losses and higher overall mitigation costs; however, these losses would be smaller for existing installations (compared with new installations). As argued, for example, by Cremer and Schleich (2006), in the EU ETS, benchmarking could also provide additional incentives for modernization (compared with conventional grandfathering). For installations receiving fewer free allowances under benchmarking than under conventional grandfathering, benchmarking provides a higher incentive for substitution of inefficient installations if closures of installations lead to a termination of allocation (see also section 3.4 on closures). The tighter the benchmark, the higher this incentive would be. Finally, benchmarking would facilitate comparison across EU MS and may be seen as a first step towards harmonized allocation rules throughout the EU (Kruger, Pizer 2004). In fact, EU-wide benchmarks could also be used to determine the allowance budget at the sector level. Such a procedure would contribute to levelling the playing field for allocation.

The potential drawbacks of benchmarking include more stringent data requirements and the need to build benchmark groups (see, for example, Radov et al. 2005). Also, distributional effects, which may be high even if differentiated benchmarks are used, may render benchmarks politically infeasible compared to conventional grandfathering (Cremer, Schleich 2006). In phase 1, distributional aspects and the lack of sufficient data prevented the use of benchmarks for existing installations in many countries. In the NAP guidance for phase 2, the European Commission stated that “EU-wide benchmarking is not a sufficiently matured allocation method to be used for phase 2. Member States may however find appropriate use for benchmarking at national level for the installation level allocation in certain sectors and for new entrants, e.g. in the electricity sector.” (CEC 2005b, p. 8). The power sector, which is responsible for the vast majority of emissions in the EU ETS, seems particularly well suited to benchmarking since its output is fairly homogenous and it is easy to assign installations to benchmarking groups.

3.2 Auctioning

While in phase 1 of the EU ETS, only four MS (Denmark, Hungary, Ireland and Lithuania) chose to auction off parts of their ET-budget (with an annual total of only 4.5 million EUAs), the analyses of the submitted NAPs for phase 2 suggest that more MS will do so. Similarly, the shares will usually be larger but tend to be well below the maximum share of 10 % allowed by the ETS Directive in phase 2.[26] More specifically, in our sample of 18 NAPs, seven include auctioning for phase 2, ranging from a share of 0.5 % in Ireland and Flanders to 7 % in the UK. In five of those MS there was no auctioning in phase 1.[27] Compared to the first period where the total number of EUAs auctioned p.a. is 4.5 million, this share is now about 24.5 million EUAs which correspond to 1.3 % of the ET-budgets (incl. reserves) for the MS included in this survey. The auction share would have been even higher if the French NAP, which now shows an auction share of zero, had kept the high share of up to 10 % as originally proposed in the draft NAP. The current NAPs provide sufficient information on the intended use of the revenues, but no information is given on the actual auctioning rules such as types, timing or frequency. In Flanders, Lithuania, Luxembourg and Poland auction revenues are supposed to finance further emission reductions internally or externally (via buying Kyoto units); in the Netherlands they are to benefit "low-volume users" of electricity in the ET-sector and other sectors (Dutch NAPII, p. 14), and in Ireland to finance the scheme's administrative costs. Poland and Luxembourg have plans to restrict participation in the auction to domestic operators, but this may violate EU competition regulations.

Assessment: auctioning versus free allocation

While the method of allocation does not – at least under ideal conditions such as the absence of market power – affect the market price for EUAs, participating companies are better off if allowances are allocated for free, since their wealth increases by the total value of these allowances. Thus allocating all allowances free of charge is politically more palatable which may explain the observed low shares of the ET-budgets that MS intend to auction off.

Auctioning off all allowances could avoid most, if not all, problems and distributional aspects which result in inefficient and complex rules in several Member States, for example those accounting for early action, expected growth or excess allocation[28], or for the treatment of new installations and closures (see subsequent sections for further details). Thus, if all allowances were auctioned off, the NAPs would be much simpler,

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26 In phase 1, a maximum 5 % of the ET-budget may be auctioned.

27 Since at the time of writing (October 2006) there was no NAP 2 available for Denmark, it could not be determined whether Denmark is continuing to use auctioning for phase 2. The draft NAP for Hungary includes an auctioning share of 5 %.

28 To prevent excess allocation some MS (Austria, Germany) had included so called ex-post adjustments of the allocation in phase 1. Since ex-post adjustments are at odds with the logic of emission trading (ex-ante principle of allocation), the European Commission has ruled against them.

more transparent and more efficient. In addition, the outcome of an auction may be perceived as “fair” because – in contrast to a free allocation of allowances- the “polluter-pays" principle holds.

Auctioning off part of the budget right at the beginning of the trading period may also generate robust early price signals for the actual scarcity in the market, since participants base their bidding behaviour on their marginal abatement costs (and expected prices in the secondary market). For example, Schmalensee et al. (1998) conclude that the auction share within the existing US EPA SO_2 Trading System facilitated the price discovery process and the development of the market. Similarly, based on results from “experimental” emission trading simulations with companies, Ehrhart et al. (2005) concur that auctioning off part of the ET-budget would generate an early price indicator, which would help participants develop their investment and trading strategies and thus lead to lower costs to society. Hepburn et al. (2006) argue that auctioning off and setting a minimum price (price floor) could lead to higher investor certainty.

Auctioning off allowances would also address “windfall profits”. Since companies try to pass on any additional marginal costs (opportunity costs) associated with emissions (i.e. price of allowances) to customers, extra profits (windfall profits) accrue if allowances are allocated for free.[29] In principle, whether allowances are auctioned off or allocated for free does not alter the opportunity costs (of additional emissions), but leads to very different outcomes in terms of the distribution of the scarcity rents associated with allowances. It should also be noted that, at least from a theoretical perspective, market power may result in higher or lower increases in the product price in response to the introduction of the EU ETS compared to perfect competition. The outcome depends, among other things, on the shape of the demand curve. In any case, empirical observations suggest that the power sector, which faces a fairly inelastic demand (at least in the short run), has managed to pass on a large part of the opportunity costs to its customers. As a consequence, the power sector was able to secure high windfall profits. Estimates of the pass-through rates are generally high. According to Sijm et al. (2006), these rates vary between 60 and 100 %, depending on the country, market structure, demand elasticity and CO_2 price considered. Clearly, windfall profits would disappear if allowances were auctioned off and inefficiencies would be reduced as well. Free allocation may also provide incentives to exert market power in the EUA market resulting in higher prices for EUAs and product output. In particular, companies'

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29 Note that opportunity cost pricing is not only sensible from an economic perspective, it is also essential for an ETS to send the correct price signals to provide adequate incentives to save emissions and to minimize total reduction costs. Thus, any attempts to directly regulate the price for EUAs, for example by setting a cap, would be counterproductive.

profits in the product market (e.g. electricity) would rise if prices for EUAs increased (above competitive prices) and if these increases could be passed on to consumers (Misiolek, Elder 1989). The observation that the price for EUAs in the (rather thin) spot market did not drop to zero, but instead remained around or above 10 to 15 € per EUA once excess allocation became common knowledge, is consistent with this view.[30]

Although not all countries use auctioning, most of the old EU MS address windfall profits by splitting the reduction burden unequally between industry and energy sectors. In principle, Germany, Italy, the UK and Sweden, for example, determine the size of the budget for the power sector as the residual of the ET-budget once allocation to other installations has been determined. The Netherlands apply an additional specific reduction factor of 0.15 to existing power installations to correct for windfall profits.

To sum up, for the reasons described above, MS should auction off as many EUAs as feasible under the current rules of the ETS Directive. In the future, the auction share should be 100 %. The auction revenues could also be used for other purposes, such as reducing distorting taxes leading to a “double dividend”: improved environmental quality and higher employment and/or GDP.[31]

3.3 Allocation rules for new projects

As was already the case in phase 1, in the second period all MS establish a New Entrant Reserve to allocate allowances to new projects (i.e. new installations and capacity extensions of existing installations) for free, usually on a first-come-first-served basis. The only exceptions are non-CHP plants in the Swedish power sector which have to buy all their allowances on the market. As in phase 1, gratis allocation in most MS is typically based on BAT-values for individual installations or on BAT-benchmarks for homogenous products (or technologies). Benchmarks are common in the energy sector, where they tend to be differentiated by fuel inputs. So far only Luxembourg, Sweden, Flanders and Wallonia in Belgium and the UK are applying uniform benchmarks. If BAT-benchmarks are used for new projects in industry sectors, they tend to be technology-specific, and often assume gas as the fuel input (e.g. Latvia, UK). Sometimes,

30 Of course, there are alternative or complementary explanations including uncertainty about future demand or regulatory uncertainty from pending legal procedures concerning allocation rules in several MS.

31 Recently, the US State of Virginia auctioned off NO_x allowances with the explicit intention of maximizing government revenue.

product groups are further split into sub-groups (e.g. different types of tiles or glass in Germany). France, which has applied average benchmarks for allocation to new projects in phase 1, now also plans to draw on BAT-benchmarks.

Assessment: allocation rules for new projects

Neither the Emission Trading Directive nor the NAP-Guidance make any recommendations on how new projects should be treated, even though the Commission would have preferred newcomers to buy allowances on the market, e.g. European Commission DG Environment (CEC 2003a). In principle, three methods are acceptable under the Directive: auctioning from a set-aside reserve, a purchase of EUAs on the market, or free allocation (from a reserve for new entrants). The logic of emission trading requires that all allowances for new projects be purchased at market prices, since investment decisions may then be based on the full social costs (i.e. private costs plus environmental cost). As already pointed out by Spulber (1985), allocating allowances for free to new projects amounts to subsidizing investments (and output), and thus increases – ceteris paribus – the total costs to society of achieving climate targets.

Having to buy allowances for new projects on the secondary market or at an auction would provide strong monetary incentives to implement energy-efficient, low-carbon technologies since these technologies require the purchase of fewer allowances. In contrast, if new projects receive free allowances, the incentives to use technologies with least emissions are weaker and depend on the actual allocation rules. Allocating allowances for new projects based on uniform BAT-benchmarks and uniform standardized projections of production or utilization rates for homogenous products would only be second best. In this case, investments in technologies which generate fewer specific emissions than the benchmark generate extra allowances that may be sold on the market. Thus, uniform benchmarks create strong incentives to invest in the most efficient technology within a given product group, independent of the level of the benchmark. In contrast, technologies which are less efficient than the benchmark cause additional costs through the purchase of allowances. Any additional differentiation (e.g. by fuels, processes, or by utilization rates) implies additional subsidization of particular installations and further reduces the cost-saving potential of the EU ETS. In particular, the more sub-benchmarks there are within a product group or within a technology group, the smaller the innovation effects, since innovation incentives are limited to the sub-groups.

As shown in Neuhoff et al. (2006), the allocated quantities of EUAs would vary substantially even for the same technologies and identical fuels for MS applying BAT-benchmarks for allocation to new power plants. To a large extent, these differences are the result of differences in the BAT-values and activity rates applied (projected output, standardized load factors). Thus, inefficiencies not only arise from differentiated benchmarks but also from differences in the activity rates used. Ideally, to avoid this additional source of inefficiency, identical activity rates would have to be used for all technologies or fuels. For example, Germany, Luxemburg and the UK apply the same activity rates for allocation to all power installations (connected to the grid) of 7500 hours, 6500 hours and 5600 hours, respectively. In addition, there are differences in the compliance factors applied to new projects across MS (e.g. Wallonia, Spain, UK), if used at all for new projects. Thus, to avoid possible competition distortion across MS arising from the different rules of allocation to new projects, not only the benchmark levels but also the applied activity rates and the compliance factors would have to be harmonized across MS.

From a distributional point of view, the increased use of standardized activity rates in phase 2 compared to phase 1 also avoids the risk of "optimistic" projections by operators. Such installation-specific projections are primarily found in the NAPs of new MS. Germany has switched from relying on such individual projections to standardized utilisation rates. However, if these rates are rather high – as, for example, for energy installations in the German power and some industry sectors[32] – the use of standardized rates does not necessarily conserve the NER.

Assessment: NER – size and rules

If new entrants receive allowances for free, the amount of the reserve needs to be determined and rules drawn up on how to proceed if the reserve is too large (cancel remaining allowances, sell them on the market) or too small (e.g. first-come-first-served, buy further allowances to replenish the reserve).

The reserves vary substantially in size (see Annex I) ranging from circa 2 % of the ET-budget in Germany to approximately 45 % in Latvia. Germany again plans to replenish its NER reserve if it proves to be too small. In this case, an independent agency will purchase a sufficient amount of allowances on the market so that all new entrants receive allowances for free; part of the reserve in the third trading period will be earmarked to finance the agency. A similar set-up exists in Lithuania and Luxembourg, while France and the Netherlands may follow. Installations which would have to buy all their allowances on the market include non-CHP plants in the Swedish power sector,

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32 For example, the standardized load factors in all gas and coal fired power plants (except for gas turbines) in the power sector correspond to 7500 hrs.

and also new entrants in MS where the NER is too small and no replenishment mechanism exists.

In cases where the NER turns out to be too large, some countries like the UK and Poland will auction off their surplus, while others like Germany and Ireland intend to cancel any surplus allowances from the ET-budget. However, some countries like France, Latvia, the Netherlands and Sweden have not yet made a final decision on what they would do with a surplus in the NER. As in phase 1, where several new MS with rather large NERs failed to publish provisions for a surplus in their reserve, this situation translates into uncertainty about the supply of EUAs.

Finally, for some countries (France, Latvia and Lithuania), it seems not clear from the NAPs whether the size of the NER was determined by adding projected growth at the aggregate level and bottom-up information on planned new installations or capacity expansions. Clearly, this would amount to double counting leading to inflated NERs.

3.4 Allocation rules for closures

In most MS, the distribution of allowances ends with the year an installation closes. For phase 2, Cyprus, Flanders and Malta among others, joined Germany, Greece, Luxembourg, the Netherlands, Poland and the UK which continue to include so called transfer rules. To provide additional incentives for investments, a transfer rule allows the allocated allowances for a closed installation to be reassigned to a new installation. In most countries, allowances may only be transferred to the same activity or product (e.g. Germany, Poland), in some countries to the same operator, while countries like Cyprus or Greece require both these criteria to be met. MS continue to struggle with regard to the formal definition of a closure, and definitions vary widely across MS.

Assessment: closure rules

From an economic perspective, terminating the allocation of EUAs after a closure results in (economic) inefficiencies and disincentives for new investments. Since the opportunity costs of a closure are not accounted for properly, old plants may continue to be operated too long and new investments may be postponed. In fact, stopping allocation for closures corresponds to an output subsidy, and there will be too many companies in the market (Graichen, Requate 2005; Spulber 1985).[33]

The Emission Trading Directive requires that allowances can only be allocated to installations which operate under a permit to emit greenhouse gases (Article 11 in combination with Article 4, CEC 2004b). Thus, if closed installations cease to adhere to the permit or no longer hold a permit to emit GHG, allowances may no longer be allocated to that installation. Technically, the ETS Directive would have allowed independent permits for operation and for GHG emissions. Then, a closure would not have resulted in a loss in the permit to emit GHGs and allocation could have continued. In practice, however, most if not all MS decided to link existing operating permits with the permit to emit GHGs. In some MS a tight schedule for implementing the ETS Directive in phase 1 may have prevented the required changes in legislation. Also, MS may have been concerned that operators might shutdown their installations, keep the allocation, and open a new plant in another country. For phase 2, no change could be observed in the national implementations of the permit rules.

3.6 Other special features

Combined heat and power (CHP)

As in phase 1, several MS decided to include special provisions for clean technologies in phase 2, notably for new combined heat and power (CHP) plants but in some cases also for existing CHP (see Annex I). The number and types of rules to compensate existing CHP even increased. In phase 2 they include applying a different compliance factor (e.g. Belgium, Germany, Greece, Sweden and the UK) or a bonus (e.g. Lithuania), excluding CHP from special cuts to account for windfall profits (e.g. NL), special early action provisions for CHP (e.g. Estonia) or a “double benchmark” for heat and electricity (e.g. Latvia, Poland). Double benchmarks are used by other MS (e.g. Belgium, Germany, Ireland, Lithuania and Luxembourg) for new CHP plants only. Some MS (e.g. the UK, Wallonia and Flanders in Belgium) apply a less stringent compliance factor to new CHP installations. Finally, some MS which allocate gratis allowances to new projects on a first-come-first-served basis have established a special reserve for new CHP plants only (e.g. UK, Ireland).

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33 For example, the US EPA Acid Rain program for SO_2 and NO_x from power plants is governed by more efficient allocation rules for closures, and also for new entrants: closure of a plant will not terminate allocation and new projects need to purchase allowances on the market or via auctions. Linking allocation to operators as is practised in this program would have facilitated more efficient rules for closures and new entrants in the EU ETS.

Early action

Allocating allowances based on a recent base period implies that companies which invested in reductions prior to the base period will receive fewer allowances compared to those which did not invest. Therefore some countries (e.g. the Czech Republic, Germany and Hungary) included special provisions such as a higher compliance factor or an early action bonus to directly account for this so-called "early action" in phase 1, since the lack of data prevented the use of earlier base periods. A larger number of MS accounted for early action in a more indirect way by using longer or earlier base periods (e.g. Ireland, Luxembourg and Slovenia), applying efficiency factors (e.g. Netherlands, Italy) or benchmarks (France). In phase 2, none of the old EU-15 Member States accounts for any new early action in a direct way (Germany has retained the Early Action rules for those installations which were subject to the rules in phase 1). Only some of the new MS (Estonia and Poland) have kept special early action rules and Lithuania has even introduced a special early action bonus although it did not directly account for early action in phase 1.

Process-related emissions

The reduction of process-related emissions is believed to be either very expensive or technically not feasible for many applications, at least in the short term. Therefore, in phase 1 of the EU ETS, some MS have special provisions for installations with a higher proportion of process-related emissions (e.g. lime, cement clinker, steel or glass). These provisions may be applied either at the level of individual installations via less stringent compliance factors here (e.g. Germany), or at the level of sectors (e.g. France, UK) in the first phase. Most countries continue their special treatment of process-related emissions in phase 2 as before. Only Germany has switched from an installation-level to a sector-level approach and Luxembourg no longer has a special CF for process-based emissions but instead uses a uniform CF for all emissions and all sectors. Two MS, the Netherlands and Lithuania have introduced new, special rules for process-related emissions.

Treatment of small emitters

The inclusion of small emitters in the EU ETS has often been criticized on efficiency grounds (e.g. Betz, Ancev 2006). In particular, it was questioned whether the overall benefits from including small emitters would justify the transaction costs for data collection, reporting, monitoring and verifying (RMV) emissions, actual trading etc. In phase 1, only a few countries used the opt-out provisions of the ETS Directive (Art. 27) for small emitters. In particular, the Netherlands exempted emitters with annual emissions below 25,000 t CO_2e/a from participating in phase 1 of the EU ETS.[34] But starting from phase 2 onwards, the ETS Directive no longer allows opting-out. In the NAPs for phase 2, several EU-15 countries have introduced provisions to either exclude or compensate small-scale installations. For example, the UK and the Flemish region in Belgium apply a de minimis threshold for installations below 3 MW and for emergency plants if there is no installation on the site exceeding 20MW_{th} [35]. The aggregation rule for capacities (Annex I, EU ETS Directive) is not applied to these installations. The Netherlands interpret the aggregation rule in such a way that it applies only to a site where at least one installation exceeds 20MW_{th} but not sites where several installations are below this threshold. If each individual installation is below 20 MW_{th} but would exceed 20 MW_{th} in the aggregate, their operators may choose to include these installations in the EU ETS voluntarily. Finally, in Germany, the allocation for installations with average base period emissions below 25,000 t CO_2e/a is subject to a compliance factor of 1.0 rather than 0.9875 (industry, CHP) or 0.85 (power sector).[36]

In terms of the distribution of allowances, exempting 50 % of the smallest installations would still leave 98 % of the allowances in the EU ETS (e.g. Betz, Ancev 2006). Thus, a threshold in the ETS Directive based on emissions rather than on installed capacity (20 MW_{th}) might have been more appropriate from the very beginning. Since starting this process prior to phase 2 would have put other regulations in the ETS Directive at risk, the European Commission decided not to proceed in this respect. Also, as for example argued by (Buchner et al. 2006), some of the transaction costs are sunk (historical data collection), reduced over time (RMV) or may be lowered by outsourcing. Thus, the economics for judging whether small emitters should be included have changed since phase 1. In addition, alternative regulations would also incur transaction costs. So far, there is no broad empirical basis for a conclusive assessment on whether to include or exclude small emitters.

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34 It should be noted though that installations with low emissions are not necessarily small or owned by small companies. In particular, energy installations may be large but operated during peak hours or as reserve capacity only. Likewise, they may be only one of several power plants operated by a large utility.

35 An emergency or stand-by installation may be excluded from the aggregation if it is proven that it cannot be physically operated at the same time (UK NAP p. 48 and Flemish NAP p. 19).

36 At least at first glance, Slovakia's plan to introduce a separate scheme for small emitters is surprising, but cannot be assessed in more depth because there is no detailed information available as yet.

Special reserves

Some of the new Member States (e.g. Estonia, Latvia, Lithuania and Poland) have included "set-asides" in their NAPs to avoid double counting for JI projects. These reserves are a requirement under the Linking Directive to avoid possible double counting if JI projects in these countries reduce CO_2 emissions from installations covered by the ETS Directive. These projects would generate ERUs and free up EUAs. The data from several MS (Estonia, Latvia, Lithuania and Poland) suggest that the JI reserves have simply been added to the overall allocation. Since an equivalent number of EUAs has not been subtracted from the ET-budget, double-counting has not been avoided and thus leads to inflated ET-budgets in these countries.

Several former EU-15 MS also created special reserves to cover additional allocations resulting from legal claims (e.g. NL: 0.5 million EUA p.a. and UK: 0.47 million EUA p.a.). It is questionable whether these reserves can be approved since legal claims – if not finalized before the actual allocation – may require ex-post allocations which are opposed by the European Commission.

4 Conclusions

In this section we summarize the main results of the macro and micro level analyses and offer recommendations for the future design of the EU ETS and possibly other emission trading schemes.

I) Macro level

At the macro level, the distance-to-target analyses for the NAPs included in this study suggest that the new MS will easily manage to achieve their **Kyoto-targets** without further efforts. Among the EU-15 MS, only France, Greece, Sweden, and the UK have already reached their Burden-Sharing target, while most of the others will have to make substantial additional efforts to do so. To a large extent, the missing gap will be bridged by government purchases of significant quantities of credits from **Kyoto Mechanisms**, but some countries (e.g. Spain) also require additional domestic efforts. In total, the governments of Belgium, Ireland, Italy, Luxembourg, the Netherlands, Spain and Sweden intend to purchase credits corresponding to about 114 MtCO_2e/a, which represents a share of 3.1 % of the Assigned Amount or 45.5 % of the eleven old EU Member States' aggregate gap to reach the Kyoto target (as of 2004). Assuming a price of 15 €/t CO_2e, these figures correspond to about 1.7 billion € p.a. which would have to be financed by the federal budgets. In addition, almost all MS also allow companies a generous use of **credits from Kyoto Mechanisms** (up to 50 % in Spain (draft NAP) and Ireland); the use of the Kyoto Mechanisms by some old MS appears to be at odds with the EU's own former interpretation of the supplementarity rule.

Our assessments of the **stringency of the ET-budgets** suggest that the purchase of these credits help to ease the reduction burden for installations covered by the ETS Directive. Adjusting for differences in the coverage of installations, we find that on average the ET-budgets in phase 2 are only about 3 % lower than the budgets in phase 1, than historical emissions in 2005 or than projected emissions in 2010. The comparison of the ET-budgets, for example, implies an annual emission reduction of less than 1 % between phase 1 and phase 2. These figures suggest that the intended allocation for the ET-sector in 2008-12 will not require significant reductions – given the error of margin on the data – actual emissions may – similar to phase 1 of the ETS – even be well below the intended allocation. Since the installations covered in our survey account for about 87 % of the allocation of these 18 MS in phase 1 of EU ETS, it is unlikely that this picture will change once the remaining NAPs become known. This would suggest that, unless the ET-budgets are adjusted downwards, the price for EUAs, innovation incentives for low-carbon technologies, or demand for ERUs and

CERs by companies are all likely to be low as well.[37] Our analyses of the stringency of the ET-budgets also show the dichotomy between old and new MS. While on average, old MS intend to reduce emissions by about 10 % for all three criteria, the implied average excess allocation in the new MS is substantial, ranging from 20 % to 30 %. Thus, the implied excess allocation in the new MS all but eradicates some old MS' efforts to tighten their ET-budgets.

Finally, exploring the **cost-efficiency** of the split in the required reduction efforts between trading and non-trading sectors in the MS, we find that, with the possible exception of the UK, the non-trading sectors have to bear a disproportionately high share of the reduction efforts in all EU 15 MS. Thus, while the ETS enables the trading sector to cost-efficiently achieve its ET-budget, the economy as a whole pays a premium for giving a more generous share of the Kyoto budget to the ET-sector rather than to those sectors where it is more costly to achieve emissions reductions. In other words, the costs of achieving the Burden-Sharing targets would be lower if a cost-efficient split of the reduction target were determined and implemented.

II) Micro-Level

With regard to the allocation method, the majority of NAPs considered in this analysis allocate the entire ET-budget for free. To determine the **allocation at the installation level,** most EU-15 countries continue to apply a two step approach. In the first step, sector budgets are determined and, in a second step, EUAs are allocated to individual installations. To address windfall profits in the power sector and since emission reduction costs are believed to be lower, EU-15 MS (notably Sweden and the UK) continue to allocate relatively fewer allowances to the power sector than to industry sectors. Germany has changed its allocation philosophy and now also applies a two-step approach. While all EU-15 MS have to apply compliance factors either at the level of sector budgets or at the level of installations in order to meet emission targets, allocation at installation level in the new MS in this survey remains unconstrained, because these MS will easily manage to comply with their Kyoto-targets.

Allocating allowances at the level of installations based on historical emissions in a base period (**conventional grandfathering**) continues to be the dominant approach for existing installations in phase 2 as well. But compared to phase 1, more MS decided to use **benchmarks for existing installations** (e.g. Belgium, Latvia, Sweden, the UK). As in phase 1, benchmarking is mainly applied in the power sector. Typically,

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37 Since EUAs may be transferred from phase 2 into phase 3 of the EU ETS, prices of EUAs in phase 2 also depend on the expected stringency of future budgets.

average benchmarks are chosen, which are further differentiated by fuels to soften distributional effects. Although benchmarking may provide higher incentives for modernization and accounts for early action, it proved infeasible in several MS because of its distributional implications. Also, in some cases (e.g. Germany), there is still a lack of objective data on the production levels of installations needed to calculate benchmarks which created uncertainty on the part of the government and the companies.

Since verified emissions data at the level of installations were readily available from the first year of the EU ETS, Estonia, France, Germany, Latvia, Luxembourg, the Netherlands, Poland and Slovakia use data from the year 2005 to determine the quantities of EUAs to be allocated to individual installations (through base periods extending to 2005). To avoid strategic behaviour leading to inefficient decisions on production and emission levels, MS should commit to abstain from **updating** in the future.[38] Likewise, to ban updating, the Directive may be changed. To reduce uncertainty on the part of companies, the regulations for phase 3 should be enforced as soon as possible.

Compared to phase 1, where only four MS auctioned off part of their ET-budget, more countries will use **auctioning** and the share of allowances to be auctioned will increase to 1.3 % but this still falls short of the maximum level of 10 % allowed by the ETS Directive. In terms of quantity, at least five times as many allowances will be auctioned in phase 2 as was the case in phase 1. In the long run, this share should rise to 100 % because auctioning is able to avoid most, if not all problems and distributional aspects, such as early action, windfall profits or rules for new projects and closures of installations. Further, the outcome of an auction would be perceived as “fair”, because the 'polluter-pays' principle holds and auction revenues could be used for other purposes, including compensation to households or companies for increased electricity prices, funding research and development in energy-efficient technologies or reducing public debt. In the light of the small increase in auctioning from phase 1 to phase 2, it may be more effective to set a minimum level rather than a maximum level for the share of allowances MS are required to auction off.[39]

In the political discussion of the NAPs in several MS, the question of how to best address **windfall profits** got mixed up with the issue of **competitiveness**. While windfall profits are the consequence of the free allocation of allowances, higher output prices (e.g. electricity prices) are the consequence of putting a price tag on carbon dioxide

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38 Updating was avoided by some MS who did not use 2005 emissions data, but stuck to earlier years or projected data or, as in Italy, use the 2007 allocation rather than emissions.

39 For example, the emission trading scheme under the US Regional Greenhouse Gas Initiative (RGGI) includes a minimum auction share of 25 %.

due to the EU ETS. The former is an issue that should be dealt with in the NAPs, e.g. through tighter allocation for those companies benefiting from free allocation, or through auctioning. The latter is an intended effect of the EU ETS and should not be affected by the allocation method. The EU ETS changes the relative prices of factors of production, and thus necessarily affects competitiveness: carbon-intensive production should become relatively more expensive. This effect on output prices, however, should be the same whether allowances are allocated for free or auctioned off. In any case, competition may be distorted if electricity-intensive industries like the aluminium industry compete internationally with companies from countries where there is no climate policy in place. Production may then shift to those countries and total emissions may actually increase if production processes abroad are more carbon-intensive (leakage effects). Since the source of windfall profits rests in the method of allocation, the issue of windfall profits should be addressed in the NAPs. In contrast, the issue of competitiveness is not affected by the method used to allocate allowances, and would have to be dealt with outside the NAPs.[40]

From a long-term perspective, the allocation rules for new installations and modernizations are crucial since they (together with several other factors) determine investment decisions and thus affect the technology structure and CO_2-intensity of the capital stock for many years. The logic of emission trading requires that all allowances for new projects be purchased at market prices, ensuring that investment decisions are based on the full social costs (i.e. private costs plus environmental cost). Allocating free allowances to **new projects** – as foreseen in the NAPS of all MS via new entrant reserves - amounts to subsidizing investments (and output), increasing — ceteris paribus — the costs of achieving climate targets. New MS, in particular, allocate free allowances to new projects primarily based on BAT-values for individual installations from all sectors. The use of BAT-benchmarks has also increased in old MS in phase 2, where they have become the dominating allocation method for installations in the power sector. Based on the limited information provided so far, it seems that only Flanders and Wallonia in Belgium, Luxembourg, Sweden and the UK are applying uniform benchmarks. Installations in the power sector tend to be differentiated by fuel and fuel inputs and by technologies or sub-product groups in the industry sectors. Applying differentiated benchmarks or differences in standardized activity rates distorts the dynamic innovation incentives and also results in higher reduction costs for society in the long run. Differentiated benchmarks are, in essence, technology- or fuel-specific subsidies to preserve

40 One possibility is to introduce border tax adjustments such as imposing import tariffs on products from countries without climate policies, and export subsidies for exports from the EU into countries without climate policies (see, e.g. Grubb, Neuhoff 2006).

existing production structures. They run counter to the logic of emission trading systems, where market prices and flexibility should guide investment decisions rather than subsidies for particular types of installations. Nevertheless, from an economic, environmental and distributive perspective, basing allocation to new projects on differentiated benchmarks and standardized activity rates is still preferable to using installation-specific emission values together with projected activity rates for which operators have an incentive to project "optimistic" data. The example of high standardized utilization rates for new power installations, however, illustrates that standardization by itself is not the panacea for saving the NER. To reduce uncertainty about the total supply of EUAs, several MS need to specify how they would manage a possible NER surplus (cancelling or selling/auctioning). Several MS have followed and may follow the example of Germany from phase 1 and implement reserve replenishment mechanisms, which essentially allow borrowing EUAs from future trading periods. If future reduction costs are lower than current costs, such mechanisms would actually reduce total emissions over time, but the opposite may also be true. Moreover, these mechanisms shift a potentially increasing burden of reducing emissions into the future, which may also be at odds with concerns of intergenerational equity.

Since MS also appear to use the allocation rules for new entrants to attract new investments and thus compete against each other, it is necessary to change the ETS Directive to solve this prisoner's dilemma situation and achieve the socially optimal outcome: no free allocation to new projects. Such a rule, of course, would become obsolete once all allowances were auctioned. Until then, MS would not only have to use harmonized benchmarks to level the playing field for investments in new projects across MS, but also identical activity rates and compliance factors. Differences in other, potentially more relevant investment criteria across MS would remain.

From an economic perspective, operators of closed installations should continue to receive the intended quantity of allowances, as is typically the case in cap-and-trade systems (e.g. Ellerman et al. 2003). Since most, if not all MS linked the permit to emit greenhouse gases with the permit to operate, **closure** of a plant automatically terminates allocation. Typically, the issuing of allowances ends with the year of closure. To provide additional incentives for investments, more MS intend to allow the transfer of allocated allowances from closed installations to new ones, but this transfer is usually restricted to the same operator and/or the same product activity, thus tackling inefficiency only partially.

As in phase 1, MS included a set of various **special provisions** in their NAPs for phase 2 to account for early action, process-related emissions, or to shield or compensate small emitters.

Unlike in phase 1, EU-15 MS no longer provide direct compensation for **early action** at the level of installations. Instead, more MS (including Germany) account for early action indirectly by allowing long base periods. In contrast, several new MS either continue (Estonia and Poland) or even introduce (Lithuania) new rules for direct support in phase 2. With regard to **process-related emissions**, the MS which had special provisions in phase 1 either at the level of sectors or installations apply the same rules in phase 2 as well. Some MS (the Netherlands and Lithuania) have decided to introduce special rules for process-related emissions in phase 2. As was the case in phase 1, only a few MS have decided to shield **small emitters** in phase 2, but opting-out of installations is no longer feasible under the Directive. For example, Germany now applies a higher compliance factor to installations with average base period emissions below 25,000 t CO_2e/a. The Netherlands and the Flemish region in Belgium interpret the rules given in Annex I (ETS Directive) for the aggregation of capacities in a way that is perhaps not consistent with the view held by the Commission. So far, the Commission's attempt to harmonise the inclusion and interpretation of Annex I (CEC 2005b) has led to the inclusion of 45.13 Mt CO_2e/a estimated[41] in phase 2 compared to phase 1. In the future, the Directive may be amended by changing the criteria for the installations to be covered by the Directive. These decisions should be seen in the light of the intended inclusion of other greenhouse gases and sectors into the EU ETS. If there are only numerous small emitters for some gases, an upstream regulation may be more appropriate, where a few producers rather than many emitters would participate in the scheme (AEA Technology Environment, Ecofys UK 2006).

Based on the NAPs of the MS included in this survey, a comparison of the allocation rules between phase 1 and phase 2 yields mixed results. First, as a general observation, MS tend to stick to the allocation concepts and methodologies (e.g. high degree of free allocation, rules for new installations and closures) applied in phase 1. This **path dependency of policies** helps to explain the observed small progress in the implementation of **more efficient allocation rules** and **more harmonized rules** across MS. Of course, as a result of the NAP guidance for phase 2 the types of installations covered in each country have been harmonised. In the same way, the efficiency of the system has been improved because the NAP guidance ban ex-post adjustments. Distributing free allowances to new projects and stopping allocation after closure in all MS are examples for where implicit harmonisation has prevailed, but the outcome is not economically efficient.

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41 Data for Italy are not yet available.

Areas of harmonisation which were not triggered by EC rules/guidelines include the use of benchmarks for existing and new energy installations, although the benchmarks and standard utilization rates used differ substantially across the MS. Differences in the benchmarks for new industry installations are even larger because production technologies are more heterogeneous across MS. Likewise, an increased use of transfer rules in the case of closures can be observed, but the transfer terms vary across MS. In almost all the EU-15 MS in our sample, allocation to the power sector is more stringent than the allocation to industry sectors (Luxembourg does not differentiate between sectors). Also, most EU-15 MS (including Germany) now use a two step approach, but as was shown in section 3, the logic applied to arrive at sector budgets varies considerably.

Examples for improved efficiency which were not the result of further specifications of the European Commission, e.g. through the NAP guidance, are the increase in the share of allowances to be auctioned off (especially in the UK, Luxembourg and the Netherlands), or the use of less differentiated BAT-benchmarks for gratis allocation to new entrants in some MS (e.g. power installations Germany, Luxemburg and the UK).

Also, some countries have managed to reduce the **complexity** of the allocation rules compared to phase 1. This is especially true for Germany, where allocation in phase 1 was based on almost 60 different rules or combinations of rules. Some MS have also facilitated or abandoned special provisions for early action, process-related emissions or CHP installations. Likewise, the use of benchmarks together with standardised utilisation rates to determine the quantity of allowances for new installations (e.g. Germany, Italy, France, Luxembourg, Spain, Sweden, and the UK) also improves the **transparency** of allocation rules. However, these improvements can be observed almost exclusively in the EU-15 MS. In contrast, several new MS have introduced special allocation rules in phase 2. For example, Lithuania has introduced special provisions for CHP and early action, and Poland has created a special reserve for forestry in the event that a change in the Directive includes this sector in the EU ETS. When reviewing the NAPs, the European Commission will also have to assess whether the opt-in provisions for small entities which appear, among others, in the NAPs of Lithuania and Latvia, are attempts to further increase ET-budgets and unduly favour domestic companies. In general, the allocation for JI set-asides in Estonia, Latvia, Lithuania and Poland appears to suffer from double counting which would lead to inflated ET-budgets. Since the EU ETS Directive requires that companies not be unduly favoured (Annex III, criteria 5), the European Commission needs to ensure that MS do not unjustifiably over-allocate to their companies.

In particular, the decisions by the European Commission need to address the lack of environmental effectiveness and economic efficiency identified in this study. The outcome of the European Commission's review process will not only act as a signal to those MS who have not yet submitted their NAPs. Perhaps even more important, it will have repercussions for other carbon markets and investments and technology transfer through JI and CDM. Likewise, the Commission's assessment may boost or hamper other emission trading schemes being set up around the world and will impact on Post 2012 international climate policy negotiations.

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ANNEX I: Summary Table of National Allocation Plans for Phase 2

	BE-B	BE-F	BE-W	DE	EE	ES#	FR	GR	IE	IT#	LT	LU	LV	NL	PL	SE	SK	UK
Number of installations - Phase 2 (Phase 1) - of which opt-in in Phase 1 (Phase 2) - Inclusion of additional gases or sectors (number of installations)	8 (13) 0 (0)	178 (178) 0 (0)	172 (114) tbd (0) yes, N_2O (n.a.)	n.a. (1,849) 0 (0)	45(43) 0 (0)	n.a. (957)	1193 (1,172) 0 (18) yes, N_2O (18)	150 (139) 0 (0)	155 (143)	995 (1,240) 0(0) No	135 (134) 34 (yes, but figure n.a.)	15 (15) 0 (0) No (0)	95 (91) 20 (26)	304 (207) 0 (3) yes, N2O (3)	n.a. (945) 0 (0)	735 (700) 261 (13)	183 (209) 0 (0) Plans separate ETS for small entities	1070 (1057)
New Entrant Reserve (NER) - Mt p.a. (and in % of ET budget) - First come first served? - replenished if empty? - split in Energy/Industry? - surplus (auctioned, sold, cancelled from ETS-budget)? - other reserves	0.0143 (27.46%) N/A No no cancelled Special CHP	3.612 (10.18%) N/A yes no auctioned or banked no	1.375 (6.08%) yes no no cancelled or sold no	10 (2.4%) no yes no sold Special reserves: admin. costs JI/CDM (2 Mt) and replenish-ment NER phase 1 (5 Mt) (excl. above)	1.7 Mt (3%) yes no no sold 2 reserve for JI projects Total: 1.7 Mt	7.96 (5.2%) yes no no sold no	9 (5.8%) N/A May be no tbd no	6.2 (8.2%) Yes no no auctioned Special CHP Reserve	1.14 (5%) yes no yes, even further split e.g. CHP and Cement Cancelled no	8 (4.12%) yes no no Cancelled No	2 (11.9%) N/A yes no cancelled Reserve for JI projects and Closure of Ignalia Nuclear Power Plant[4]	0.59 (14.9%) no yes no Sold no	3.5 Mt (45%) n.a. no no *May* be auctioned Reserve for JI projects	6.2 (6%) yes tbd no tbd Reserve for legal claims (0.5 MT/a)	9 (3.2%) n.a. n.a. no Auctioned Reserve for JI projects Forestry reserve	3 (12%) yes no no tbd	1.8 (4%) yes no no tbd no	17.3 (7%) yes no no special CHP Reserve auctioned Contingency fund included in NER (0.47 Mt/a)
Auction for primary allocation - share (Phase 2 (1)) - use of auction revenue (fill in) - restricted participation (existing/new/energy/domestic?) - form: static, dynamic - frequency	0 (0)	0.5% (0) Climate Policy, e.g. flexible mech. tbd	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.5% (0.0075) admin. costs unrestricted tbd tbd	0(0)	2.7% (0.015) reduction in non-ETS sector unrestricted yearly	5% (0) purchase of Kyoto mechanisms domestic tbd	0 (0)	4% (0) compensate low-volume electricity users tbd tbd	1% (0) Nat. Fund for Environ. Protection Polish installations that were not allocated enough tbd	0 (0)	0 (0)	7%(0) tbd unrestricted tbd
Sectoral differentiation - b/w energy(power) and non-energy; power budget as residual	yes, no	yes, no	yes, yes	yes; yes	no	yes, no	no	no	yes; no	Yes, yes	no	no	no	no	no	yes; yes	yes; no	yes; yes
Allocation to existing installations Two steps / One step 1. step = Sector budget (SB) 2. step = Individual allocation (IA) *a) Power* (Energy)/combustion installations - budget share of historic emissions - historic emissions (base period, BP) * growth factor * efficiency factor - Benchmarks (avg./BAT) - Uniform/fuel-specific or/and technology-spec. - Activity figure (historic or projected output/capacity) - Compliance factor (CF) b) *non-power* - SB share of historic emissions - historic emissions (base period, BP) * growth factor[1] * compliance factor - Benchmarks (avg./BAT) - Uniform/fuel-specific/technology-spec.? - Activity figure (historic or projected output/capacity) - Compliance factor (CF) c) Special provisions *CHP*	*a)* IA = average emissions in 2002-2005 - CF=1 *b)* IA = emissions 2005 * growth factor * individual reduction potential – CHP potential *c)* no	*a)* IA = Installed capacity * technology-specific load factor * uniform BAT benchmark (0.359 t CO_2/ MWh) *b)* Installation part of covenant: *IA* = covenant agreement (world top by 2012) - Installation not part: CF = 0.85 (diminished by 0.008 each year) *c)* CF = 1	*a)* IA = Installed capacity * technology-specific load factor * uniform BAT benchmark (0.4 t CO2/ MWh) * CF - CF = 0.839 (= benchmark of 0.336 t CO2/ MWh) *b)* IA = emissions (1 yr. out of 1999 – 2002), * projected growth * efficiency factor (indiv. agreed or assessed) - CF = 0.97, VET2005< projected emissions *c)* IA = emissions 2000-2004 - CF = 1	***Two steps*** *a) SB:* - calculated as residual - CF =0.85 *IA:* Average emissions (2000-2005) * 0.85 *b)IA= Average* emissions 2000-2005 *CF - CF = 0.9875 *c)* CF = 0.9875 (as industry)	*a)b)*- IA = emissions 1995-2005 (district heating) or 2000-2005 (electricity and industry) *growth factor - growth factor vary: Electricity (6.5%) district heating (3%), industry (3%) - no CF *c)* increase of CHP rewarded as early action	a) IA = installation capacity* load factor* BAT benchmark (technology specific) * CF -CF=0.746 ***Two steps*** b) SB = projected output 2010 * average benchmarks (2005) * efficiency factor IA = avg. specific emissions * output (2 yrs 2000-2005) * install. specific CF c) projected emissions (based on VET 2005)	***Two steps*** *a)b) SB:* production (2004/2005) * growth rate * average benchmark (2004/2005) * reduction potential - CF = 0.9729 - *IA:* installation's share of emissions in BP (varying: 1996 -2005, sometimes one single year) *c)* no	***Two steps*** *a)b) SB =* projected emissions (combustion, process, CHP) * CF $CF_{combustion}$ = 0.89 $CF_{process}$ = 1 CF_{CHP}=1 $CF_{industry}$ = varies 0.91 – 0.99 *IA* = average emissions 2000-2004 (-lowest year)* sector-specific CF - Fuel coefficient used for other combustion, paper and cardboards, lime and ceramics Steel and Cement: special rules *c)* CF = 1	***Two steps*** *a)b) SB* = share sector-specific emissions 2003 * CF * total available amount of allowances - 0.5% (for auction) – allocation for New Entrants - *CF Energy* based on renewable projections - CF all others = 1 *a)b) IA* = share of emissions (2003-2004) * total SB *c)* electricity part: allowances from energy budget based on CCGT-benchmark	***Two steps*** *a)b)* SB= allocation 2007 * efficiency factor * growth factor *a)* IA= output 2005 * fuel and technology BM * trend factor * CF -CF =0.9897 *b) IA*= CF * benchmark or early action index * average production 2000-2005 *CF = vary* *c)* CHP similar to a) but double benchmark and energy saving index of 20% and * trend factor	***Two steps*** *a)b) –SB* = Average emissions (2002-2005)* projected growth * CF– 5% (auction part) *CF_{energy} = 0.9* $CF_{other\ industry}$ = varies: 0.9 - 1 *IA* = Fuel consumption (in toe) in BP (2002-2005) * (1 toe = 0,5 t CO2) + process-related emissions BP + early action bonus + CHP bonus *c)* CHP bonus	a/b) IA= average emissions (3 yrs. out of 2002-2005) * growth factor * CF - CF = 0.991 c) no special provisions for existing CHP	*a)b)* IA= average output in BP (varying for sectors, between 2001 and 2006) * fuel-and product-specific benchmarks * growth factor - CF = 0.98 *c)* double benchmark	*a)* IA = average emissions (3 yr. out of 2000-2005) * growth factor * efficiency factor * CF - *efficiency factor* = over covenant - *CF* = 0.73 (incl. -0.15 cut for windfall profits) *b)* IA= emissions (3 yrs. 2000-2005) * growth factor (1.7) * efficiency factor * CF - *CF* = 0.87 Process emissions = 0.92 *c)* efficiency benchmark - no CF for small CHP	***Two steps*** *a)b)* *SB* = output 2005 * growth rate *sector average benchmarks (2005) * efficiency factor a) IA = projected output related to SO_2 emissions and fuel specific benchmarks b) *IA* = similar to SB and projected output agreed with associations *c)*- double benchmark - first served	*a)* IA = average emissions 1998 - 2001 CF = 0.3 to 0.4 *b) All, except BOF-steel[2]:* IA = emissions 1998-2001 + growth in process-related emissions CF = 1 *BOF-steel:* projected output*EU average benchmark (2005) *C)* CF = 1	*a) IA Thermal:* average emissions 1998 -2003 (or 2005, if higher) * growth of apartments (1.004) - *Electric and thermal:* projected energy output * emissions / output (1998 – 2003) *b)Large emitters:* Negotiations of BP or projected production *Small emitters:* emissions (1998 – 2005)*sector-specific growth rates *c)* no	***Two steps*** *a) SB* = total ET budget – industry allocation CF = 0.7 - *IA* = capacity * standardized load factor (2000-2003) * technology- and fuel-based benchmark[3] *b) SB* = projected emissions incl. growth and reduction potential CF = 1 IA = installation's share emissions in 2000-2003, (- with year) *c)* separate Good Quality CHP Sector

	BE-B	BE-F	BE-W	DE	EE	ES*	FR	GR	IE	IT*	LT	LU	LV	NL	PL	SK	SE	UK
Allocation to new installations *a) Power* - free allocation of allowances - Benchmarks (avg./BAT) - Uniform/fuel-specific/technology-spec.? - Activity figure (projected output/capacity/standardized load factors) -compliance factor (CF) b) *non-power* - No free allocation of allowances - Benchmarks (avg./BAT) - Uniform/fuel-specific/technology-spec. - Activity figure (historic or projected output/ capacity/ standardized load factors) - compliance factor (CF) c) Special provisions for *CHP* d) Definition of New entrant	*a)b)* – free allocation - based on projected emissions *c)* special CHP New Entrants Reserve	*a)* – free allocation – Allocation = Installed capacity * technology-specific load factor * uniform benchmark (0.359 t CO2/ MWh) *b)* – free allocation - - Installations taking part in covenant: world top by 2012 - Installations not taking part in covenant: CF = 0.85 (diminished by 0.008 each year) *c)* CF = 1	*a)* – free allocation – Allocation = Installed capacity * technology-specific load factor * uniform benchmark (0.4t CO2/ MWh)* CF - CF = 0.839 (equal to setting benchmark at 0.336 t CO2/ MWh) *b)* – free allocation - Allocation based on BAT and projected production *c)* CF = 1	*a)b)*- free allocation - based on capacity, standardized load factors (based on product) and BAT benchmarks - product-/technology-based benchmarks for homogenous products - no compliance factor for 14 years *c)* double benchmark *d)* 14 years To install. that started operating after 01/01/08 (01/01/03 – but permits out of sector cap)	*a)*- free allocation - no information on allocation method *b)*- free allocation - Estonian BAT benchmarks *c)* no	a) free, like existing installations b) BAT BM*projected output 2008-12 (capacity, avg. capacity use) c) according to projected emissions d) new installations and capacity extensions	*a)b)*- free allocation - BAT gas benchmarks * projected output; official list of benchmarks to be set up *c)* no *d)* To Phase II New Entrants	*a)b)* – free allocation - capacity * load factor * specific emission factor * sector specific CF (if BAT CF = 1) *c)* – CF = 1 - special CHP reserve *d)* to new installations after notification	*a)b)*- free allocation - BAT (both fuel- and technology-related) * installation specific projected emissions - max. 0.88 of projected emissions *c)*- specific Reserve - double benchmark *d)* Installations commissioned after 30/06/06 (01/01/02 – but permits out of sector cap)	*a)* IA = capacity * load factor * emission factor *b) Brand new:* projections * trend factor BAT *c)* IA= double benchmark and energy saving index *d)* Differs: brand new, reactivation from total suspension or closure, increased capacity, reactivation from partial suspension or closure, unknown 2005-2007 and/or substantial modifications after NAP II	*a)b)* – free allocation - product-specific BM, capacity and standard load factors *c)* double benchmark *d)* To installations that start operating after 30/06/06	*a)b)* - free allocation - uniform BAT BM - standard load factors - no CF *c)* double BM d) in subsequent period allocation based on output, not on emissions	*a)b)* – free allocation - projected output * fuel- and product-specific BM * efficiency factor (for Energy sector) *c)* double BM *d)* Installations that start operating after 30/04/06	*a)b)* – free allocation - BAT BM (covenant) * projected output (max 90%) - no growth factor - no CF *c)* BAT for New Entrants *d)* Installations put into operation after 31/12/06	*a)b)* – free allocation - BAT BM* production forecast *c)* double BM *d)*to installations not included in NAP II	*a)b)* - free allocation - projected emissions * BAT (fuel and technology specific but not specified any further in NAP) *c)* no *d)* Installations starting operating after 01/01/2008	*a)*- free allocation only high-efficiency CHP - uniform average benchmark (emissions of 464 Swedish installations 2000-2004) - projected output: specific for each installation *b)*- free allocation - BAT -installation-specific projected output *c)*see *a)*	*a)* –free allocation - uniform benchmark (CCGT) * standard load factor * CF (0.7) *b)* – free allocation - uniform benchmark (gas - unless not applicable) * standard load factor * CF $CF_{generally}$ = 0.95, $CF_{Boilers\ \&\ other\ generators}$ = 0.9 *c)* see *a)* CF = 1 *d)* install. start operating after 30/06/06 (01/01/04 – but permits out of sector cap)
Closure rules -Issuance of allowances for x years following closure -Definition of closure -Transfer of allowances to new projects; Phase 2 (1)	0 n.a. no (no)	0 no longer covered by directive/ no permit yes (no)	0 n.a. no (no)	0 - average emissions in 2005-2006 < 20% of average emissions 2000-2004 - yes (yes)	n.a.	0 n.a.	n.a.	0 -permit removed - yes, same product, based on output	- closing installation retain 75% allocation/a, up to a maximum of 25,000 allowances/a, future allowances withheld - ceased operation/ deemed by EPA to have closed - n.a.	- No further issuance, retain issued allocation - Permanent suspension of production activity, total suspension for > 6 months, partial closure - n.a.	- 0 - permit terminated - no transfer	0 reporting requirement for closure de or if less than 10% of base year emissions transfer allowed	- N/A - N/A - yes, same product, based on output	- 0 - no longer covered by directive - yes, same product, based on output	- 0 - N/A - yes, same product, based on output	- 0 - as long as installation holds permit. - not mentioned	- 0 - as long as installation holds permit (if only operation has ceased and could continue under same permit) - no	- 0 - installation ceased operating/capacity below Annex I - yes but not for electricity (yes)
Combustion installations in Industry treated as - non-combustion in industry? - combustion in energy sector?	- as industrial installation	- n.a.	- n.a.	- as installations in energy sector	37 out of 45 are energy inst. but no allocation difference		- part of industrial installation	- CF for all combustion = 1 (also in industrial installations)	- part of industrial installation	- part of electricity: installations with $>20MW^{th}$ which sell > 51% electricity to grid	- part of industrial installation	no sectoral differentiation	- part of industrial installation	- part of industrial installation (no cut for windfall profits)	- part of industrial installation	- part of industrial installations (mentioned, but no special treatment specified)	- industry installation	- part of industrial installation
New special provisions for **early action** in phase 2 (1) - indirectly through base period / benchmark - directly through CF	No (yes)	No (no)	Indirectly (indirectly)	no (directly)	Yes (yes)	no	Indirectly (indirectly)	Indirectly (indirectly)	No (no)	Indirectly, through the "efficiency index"	Early action bonus → reduced emissions between 1996-2005	no (no)	No (yes)	Through efficiency factor (- " -)	Yes early action bonus starting 1988 (yes)	Indirectly through base period (")	Indirectly through base period (")	Indirectly through base period and rationalisation rule (")
Special provisions for **process-related emissions**? - at installation or sector level? Phase 1 (2)	No (no)	No (both)	No (no)	Sector-level over CF (installation level)	No (no)		Yes through benchmark (yes)	Yes, CF = 1 (")	No (no)	No (no)	Inst. level calculated separatly (no)	no (inst. level)	No (no)	Installation-level (no)	Indirect through benchmark (no)	Not specified (")	Through special growth rate (")	Sector-level (sector-level)
Special treatment of **small installations**? Definition of small installations i.t.o. CO2-emissions p.a.	De minimis threshold to exclude <3 MW	De minimis threshold to exclude <3 MW	De minimis threshold to exclude <3 MW	CF of 1.0 < 25.000 t	No (no)	no	No (no)	No (no)	No (no)	Not mentioned	Yes opt-in (no)	no	No (no)	Yes special interpretation of aggregation rule (no)	No (no)	Allocation methods applied according to inst. size (see above)	no	De minimis threshold for instal. < 3 MW → voluntary opt-out

Note: # = Draft NAP II, tbd = to be decided, n.a. = not available 1) BOF = basic oxygen steel furnace 2) Coal: 0.91 t C02 / MWh; Oil: 0.83 t CO2 / MWh; Gas: 0.4 t CO2 / MWh 3) Special reserve for nuclear power plant of 4.8Mt/ year was denied to be allocated ex-post → Lithuanian government will establish ex-ante procedure until 1st November 2006