COMMISSION STAFF WORKING DOCUMENT

Impact Assessment Report

Accompanying the document

Guidelines on certain State aid measures in the context of Greenhouse Gas Emission Allowance Trading Scheme

{C(2012) 3230 final}
{SWD(2012) 131 final}
### TABLE OF CONTENTS

1. THE CONSULTATION WITH INTERESTED PARTIES ........................................ 8
   1.1. Background ................................................................................................................ .. 8
   1.2. The outcome of the consultation and its organisation .................................................. 8
   1.3. Response to the Opinion of the Impact Assessment Board ......................................... 9
2. THE PROBLEM ............................................. 9
   2.1. The problem: carbon leakage due to indirect CO2 costs and related uncertainties .... 9
       2.1.1. The root of the problem: indirect CO2 costs resulting from ETS 3 ............................. 9
       2.1.2. The nature of the problem: production leakage, investment leakage and relocation. 13
       2.1.3. The scope of the problem ........................................................................................... 13
       2.1.4. Challenges in quantifying the problem ................................................................. 14
       2.1.5. The means to address the problem: the ETS Guidelines ............................................ 15
   2.2. Pass on of CO2 costs .................................................................................................. 16
       2.2.1. Pass on of CO2 costs in electricity prices by the electricity producers to the sectors concerned ................................................... 16
       2.2.2. Pass on of CO2 costs in electricity prices by the sectors concerned to their customers ............................................................. 17
   2.3. The future CO2 content of electricity ........................................................................ 18
   2.4. CO2 constraints on non-EU competitors ................................................................... 18
   2.5. The wider EU policy context ..................................................................................... 20
3. THE OBJECTIVES ............................................. 21
   3.1. General objective ....................................................................................................... 21
   3.2. Specific objectives ..................................................................................................... 21
   3.3. Operational objective ................................................................................................. 22
   3.4. Baseline Scenario ....................................................................................................... 23
4. OPTIONS ................................................................................................................... 23
   4.1. Eligibility and the maximum aid amount ..................................................................... 23
   4.2. Option Packages ......................................................................................................... 24
   4.3. Sector and subsector eligibility .................................................................................. 24
4.4. The CO2 price assumption used to determine eligibility

4.5. Option A1: The same sector and subsector eligibility as in the 2010 Carbon Leakage Decision

4.6. Option A2: Eligibility of sectors with indirect CO2 costs of at least 5% of the sector's GVA and a trade intensity of the sector of at least 10%

4.7. Option A3: Eligibility of sectors and subsectors based on a qualitative assessment

4.7.1. The first test under Option A3: criteria to be fulfilled in order to undergo a qualitative assessment

4.7.2. The second test under Option A3: substantive eligibility criteria

4.7.2.1. Cost-related proxies: the size of the indirect CO2 costs

4.7.2.2. Market related proxies: evidence that the sector is a price-taker and cannot pass on its indirect CO2 costs without losing significant market share to third country competitors

4.7.2.3. Fuel and electricity substitutability according to the 2011 Benchmarking Decision

4.7.2.4. A first set of sectors deemed eligible under Option A3

4.8. Option A4: Eligibility based on indirect and direct CO2 costs of at least 5% of the sector's GVA

4.9. Five variables determine the maximum aid amount per installation

4.10. Option B1: 100% and stable aid intensity

4.11. Option B2: 100% and degressive aid intensity

4.12. Option B3: Less than 100% and stable aid intensity

4.13. Option B4: Less than 100% and degressive aid intensity

4.14. The CO2 factor

4.14.1. Non-availability of EU-wide modelling to determine the impact of the ETS on electricity prices

4.14.2. Alternative methods to assess the impact of the ETS on electricity prices

4.15. Option C1: Regional CO2 factors

4.16. Option C2: The average CO2 factor in the EU (0.465 CO2t/MWh)

4.17. Option C3: The average marginal CO2 factor in the EU (0.75 CO2t/MWh)

4.18. The installation's production level (whether based on actual or historical output)

4.19. Option D1: the installation's actual output

4.20. Option D2: the installation's historical output

4.22. Subsidiarity and proportionality ................................................................. 42

5. IMPACTS UNDER THE BASELINE SCENARIO AND OPTION PACKAGES .. 42

5.1. Identification of impacts ............................................................................. 42

5.1.1. Sector eligibility (including under different price scenarios) .................... 42

5.1.2. Economic, social and environmental impacts (carbon leakage) ................. 43

5.1.3. Impacts in terms of maintaining ETS incentives ....................................... 43

5.1.4. Internal market distortions ........................................................................ 43

5.1.5. Significant uncertainty as to how many Member States will grant State aid as well as the aid amounts and sectoral and sub-sectoral coverage ......................................................... 43

5.2. Baseline Scenario: no State aid .................................................................. 43

5.2.1. Economic, social and environmental impacts (carbon leakage) under the Baseline Scenario ..................................................................................................................... 44

5.2.1.1. Economic impacts under the Baseline Scenario ................................................ 44

5.2.1.2. Employment impacts under the Baseline Scenario ........................................... 45

5.2.1.3. Environmental impacts under the Baseline Scenario ..................................... 46

5.2.2. Maintaining ETS efficiency under the Baseline Scenario ......................... 47

5.2.3. Distortions of the internal market under the Baseline Scenario .................. 48

5.3. Maximalist Package: A1 (151 sectors/13 subsectors), B1 (100% and stable aid intensity), C1 (regional CO2 factors) and D1 (actual output) ........................................ 49

5.3.1. Eligibility of sectors and subsectors under the Maximalist Package (including under different CO2 price assumptions) .......................................................... 49

5.3.2. Economic, social and environmental impacts (carbon leakage) under the Maximalist Package ............................................................................................................. 49

5.3.3. Maintaining ETS incentives under the Maximalist Package ..................... 50

5.3.4. Internal market distortions under the Maximalist Package ....................... 51

5.4. Minimalist Package: Option A2 (5 sectors), Option B4 (Less than 100% and degressive aid intensity), Option C2 (EU average CO2 factor (0.465 CO2t/MWh)) and Option D2 (historical output) .............................................................. 52

5.4.1. Eligibility of sectors and subsectors (including under different CO2 price assumptions) .................................................................................................................. 52
5.4.2. Economic, social and environmental impacts (carbon leakage) under the Minimalist Package .......................................................... 53
5.4.3. Maintaining ETS incentives under the Minimalist Package .......................................................... 53
5.4.4. Internal market distortions under the Minimalist Package ...................................................... 55
5.5. First Intermediate Package: A3 (14 sectors and two sets of subsectors), B3 (less than 100% and stable aid intensity), C1 (regional CO2 factors) and D2 (historical output) .......................................................................................................................... 55
5.5.1. Impact in terms of eligibility of sectors and subsectors under the First Intermediate Package ............................................................................ 55
5.5.2. Economic, social and environmental impacts (carbon leakage) under the First Intermediate Package ............................................................................ 56
5.5.3. Maintaining ETS incentives under the First Intermediate Package .......................................................... 56
5.5.4. Internal market distortions under the First Intermediate Package ...................................................... 57
5.6. Second Intermediate Package: A4 (35 sectors), B2 (less than 100% and stable aid intensity), C3 (EU average marginal CO2 factor (0.75 CO2t/MWh)) and D1 (actual output) .......................................................................................................................... 57
5.6.1. Eligibility of sectors and subsectors under the Second Intermediate Package ............... 57
5.6.2. Economic, social and environmental impacts (carbon leakage) under the Second Intermediate Package ............................................................................ 58
5.6.3. Maintaining ETS incentives under the Second Intermediate Package .......................................................... 58
5.6.4. Internal market distortions under the Second Intermediate Package ...................................................... 59
6. COMPARISON OF THE OPTION PACKAGES ........................................................................ 65
6.1. Effectiveness .......................................................................................................................... 65
6.2. Efficiency .......................................................................................................................... 66
6.3. Coherence .......................................................................................................................... 67
6.4. Overall comparison of the Option Packages ........................................................................ 68
6.5. Conclusions ......................................................................................................................... 68
7. MONITORING AND EVALUATION .................................................................................. 69
COMMISSION STAFF WORKING DOCUMENT

Impact Assessment Report

Accompanying the document

Guidelines on certain State aid measures in the context of Greenhouse Gas Emission Allowance Trading Scheme

5.7 Additional factor in assessing impacts

6. COMPARISON OF THE OPTION PACKAGES ............................................................. 65

6.1. Effectiveness ............................................................................................................. 65

6.2. Efficiency .................................................................................................................. 66

6.3. Coherence .................................................................................................................. 67

6.4. Overall comparison of the Option Packages ......................................................... 68

6.5. Conclusions .............................................................................................................. 68

7. MONITORING AND EVALUATION ........................................................................... 69
COMMISSION STAFF WORKING DOCUMENT

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Disclaimer

This report commits only the Commission's services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission
1. **THE CONSULTATION WITH INTERESTED PARTIES**

1.1. **Background**

The European Emissions Trading (ETS) Directive ("ETS Directive")\(^1\) envisages the possibility for Member States to provide State aid to compensate for higher electricity costs due to the ETS ("indirect CO2 costs")\(^2\).

On 11 March 2011 the Commission launched the public consultation on a new set of State aid rules in the context of the EU ETS ("ETS Guidelines" or "ETS State aid Guidelines"). The first consultation ended on 11 May 2011. The Report also takes account of the consultation on a draft version of the ETS Guidelines (opened on 21 December 2011 and closed on 31 January 2012), as well as a meeting with the Member States on 20 January 2012.

This Report is confined to State aid for "carbon leakage" due to indirect CO2 costs\(^3\). Carbon leakage occurs where costs imposed on EU firms by the ETS cause shifts of production, investments not to be undertaken or even relocation from the EU to third countries without comparable CO2 constraints in a way that results in a global increase in CO2 emissions\(^4\).

1.2. **The outcome of the consultation and its organisation**

Some 140 stakeholders responded to the Questionnaire which focused on the issues of sector eligibility, the aid intensity and the CO2 emission factor of electricity production. Most responses emanated from the industry (individual companies, European industry federations as well as wider industry bodies representing EU industry and energy-intensive undertakings). Most Member States responded. Several electricity producers and their European federation also provided submissions. A number of submissions were also received from employee federations, academic bodies and non-governmental organisations. Around 160 stakeholders replied to the consultation on the draft ETS Guidelines. The submissions made in that context largely confirmed those made during the consultation in the spring (see Annex 2 and 3).

A number of replies (including most of industry) argue in favour of wide sector eligibility and a high maximum aid ceiling with the primary aim of preventing carbon leakage. Second, many replies (including most Member States) also emphasise that carbon leakage must be

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\(^3\) The ETS Guidelines will also define the compatibility criteria for other measures in the ETS Directive that involve as follows: (i) investment aid to new high efficient power plants, including those that are CCS-ready; (ii) transitional free allowances to power generators for the modernisation of electricity generation in EU-10 and (iii) exclusion of small emitters from the EU ETS subject to equivalent measures.

\(^4\) The ETS Directive has been extended to the EEA, through the mechanisms of the EEA Agreement. Thus references to EU also encompass the EEA.
prevented in a way that minimises the distortions of the ETS and competition in the internal market. The wide range of stakeholder views is reflected in the options and option packages (see section 4).

Several meetings were held with stakeholders (mainly the European federations representing specific sectors and Member States). There was close cooperation with other Commission services in the context of an impact assessment steering group, in particular with DG CLIMA, DG ENTR and DG ENER.

The consultants Ecofys and Fraunhofer were enlisted by the DG CLIMA to provide technical support in respect of a specific issue (electricity efficiency benchmarks)\(^5\).

1.3. Response to the Opinion of the Impact Assessment Board

The impact assessment was presented to the Impact Assessment Board on 9 November 2011. The Board issued its Opinion on 11 November. On 20 April 2012 the Board issued its second Opinion on the resubmitted Report.

The revised Report presents a robust and fully fledged Baseline Scenario. The problem definition has been substantially strengthened. The incidence of carbon leakage is addressed. Sensitivity tests involving different CO2 price assumptions have been added, including the application of a price assumption based on CO2 price significantly above the current levels (€40).

To facilitate the comparison of options, four Option Packages (which reflect a wide range of stakeholder views) have been developed. The assessment also places greater emphasis on possible distortions in the internal market not only within but also between sectors.

The specific sections of the Report which implement the recommendationss of the two Opinions are set out in Annex 4.

2. THE PROBLEM

2.1. The problem: carbon leakage due to indirect CO2 costs and related uncertainties

2.1.1. The root of the problem: indirect CO2 costs resulting from ETS 3

The ETS Directive set up the ETS with effect from 1 January 2005. ETS 1 was in force 2005-2007 and ETS 2 will last four years (2008-2012). ETS 3 will last for eight years (2013-2020).

The rationale of the ETS is to generate a price signal – the CO2 price – strong enough to drive production and investment decisions towards a low-carbon economy\(^6\). The carbon price should feed through to the economy so that CO2 reductions are at least cost to society\(^7\).

\(^5\) In particular regarding the issue of product benchmark values which is one of the factors that will determine the maximum aid amount per eligible installation (see Annex 12). At the time of drafting, the work on the benchmark values is ongoing.
The ETS Directive\(^8\) provides for protection EU sectors and subsectors "at significant risk of carbon leakage" due to CO2 costs resulting from the ETS.

The first mechanism cushions the impact of ETS-induced costs linked to the firms' own production ("direct CO2 costs") in the form of free EU allowances to emit CO2 ("EUAs")\(^9\).

Direct CO2 costs are caused by the combustion of fuels (e.g. coal, gas and oil). Each tonne of CO2 emitted by an industrial installations covered by the ETS must be paid for by submitting one free allowance (EUA). The EUAs are submitted annually in April (in respect of the installation's CO2 emission in the previous year).

That mechanism was put into effect, first, through the Commission Decision 2010/2/EU ("2010 Carbon Leakage Decision"), listing the eligible sectors and subsectors. The second Decision (2011/278/EU) ("2011 Benchmarking Decision") explains how to calculate the number of free EUAs each installation within eligible sectors and subsectors shall receive.

Concretely, if an installation is active within one of the 151 eligible sectors or 13 subsectors under the 2010 Carbon Leakage Decision, it will receive free EUAs for the entire terms of ETS 3 (i.e. 2013-2020). The 2011 Benchmarking Decisions defines the method to calculate the number of free EUAs per installation. The method is designed to preserve the incentives created by the ETS CO2 price signal as far as possible (see 5.3.3).

This Report concerns the second mechanism in the ETS Directive aimed at protecting certain sectors against carbon leakage. That mechanism provides for compensation for extra electricity costs caused by the ETS (indirect CO2 costs). Those costs are 'indirect' in the sense that the costs are first incurred upstream by electricity producers (through the combustion of fossil fuels notably coal and gas) and passed on by those producers.

The second mechanism introduced into the ETS Directive is at the core of the problem addressed in this Report. The Directive explicitly envisages that Member States may decide to grant State aid to firms within sectors and subsectors at significant risk of carbon leakage due to the higher CO2 costs (it being assumed that these costs are passed on by electricity producers in their prices) ("indirect CO2 costs"). The specific provisions (recital 27 of Directive 2009/29/EC and Article 10a(6) of the ETS Directive and the Commission's Statement in that connection) are explained in more detail in Annex 6. EU industry as a whole consumes electricity for roughly €100bn a year\(^10\). For an illustration of the impact of indirect CO2 costs on electricity prices set the following graph:

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6 Stern (2009).
9 While the free permits to emit CO2 involves a transfer of resources from the Member States to the sectors concerned, it does not constitute State aid as the free allocation is fully harmonized by the ETS Directive (leaving no discretion to the Member States).
10 Based on Eurostat data fro 2007 when total electricity consumption in the EU mining and manufacturing industry amounted to 1218 TWh. An electricity price of 10 cents/KWh has been assumed (which may overstate the price paid by large industrial customers).
Figure 6. Estimated contribution of CO₂ price to rise in German industrial power costs

To illustrate the distinction between direct and indirect CO₂ costs and to highlight some of the industrial sectors which are particularly concerned by the problem, two figures relating to two Member States are set out below. A third figure illustrates the impact on indirect costs resulting from the ETS over time in one Member State.
Figure: Direct and indirect CO2 costs as a share of sector value added and GDP in Germany

Figure 1  Value at stake relative to GDP – area in light blue represent indirect costs, areas in red reflect direct costs

Source: Graichen, Mattes et al (2009)

Figure: Direct and indirect CO2 costs as a share of sector gross value added and GDP in the UK

Figure 1 CO2 cost screen: Subsectors potentially exposed under unilateral CO2 pricing

The compensation mechanisms are distinct. For direct CO2 costs EUAs are handed out for the free for the whole period (2013-2020). The EUAs can then be freely traded. The rationale of the ETS (and cap and trade systems in general) is that such a decentralised system will enable the market to continually search for the cheapest possibilities to abate CO2. The cheapest abatement possibilities can be expected to be exploited first by the sectors covered by the ETS (i.e. electricity producers as well as the manufacturing and mining industries). The abating firms will then be able to sell their EUAs.

Compensation for indirect CO2 costs in the form of State aid can be expected to be paid more frequently by the Member State (e.g. annually).

2.1.2. The nature of the problem: production leakage, investment leakage and relocation

The consultation yielded valuable information on the nature of the problem of carbon leakage. Stakeholders agreed with the literature that carbon leakage occurs in stages.

Typically, the effects would first be felt in the form 'production leakage'. This means that the 'asymmetric' cost impacting EU firms would entail losses of market share to non-EU competitors. That effect could first be felt in EU firms' export markets and later in the domestic markets (within the EU)11. 'Investment leakage' would ensue later as it would no longer be deemed profitable to invest in the EU, compared to non-CO2 constrained jurisdictions. Before that an EU firm may decide to utilise capacity in its non-EU jurisdictions or not carry out maintenance work within the EU12. The most extreme forms of investment leakage could involve plant closures or even relocation of activities to countries without comparable CO2 constraints. Stakeholders largely agree that this scenario (in particular relocation) is the most unlikely impact of carbon leakage, a position consistent with the findings of the literature on carbon leakage13.

2.1.3. The scope of the problem

In recent years a growing body of literature on carbon leakage has emerged14. The sometimes highly divergent results as to carbon leakage risks in specific sectors have nevertheless led some commentators to urge caution about placing too much reliance on simulations15. The carbon leakage literature does not find empirical proof of carbon leakage16 (although some industry stakeholders take a different view: see e.g. the survey-based figures 18-19 in Annex 8). The literature finds that it is often difficult to distinguish the real drivers behind business decisions on production, investment and location and that it is therefore fraught with difficulty.

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11 See replies to questionnaire by e.g. the European Aluminium Association.
12 See replies to questionnaire by e.g. the Confederation of European Paper Industries (CEPI), EuroChlor and the European Aluminium Association.
13 See replies to questionnaire by e.g. Eurofer, the Confederation of European Paper Industries (CEPI), EuroChlor and the European Aluminium Association.
14 A non-exhaustive list includes among others Ecofys, Cambridge Econometrics, Ökoinstitut, Delft, Entec, Fraunhofer, Carbon Trust, Climate Strategies. Most studies and reports deal with risks of carbon leakage (and possible remedies) resulting from direct CO2 costs or direct CO2 costs together with indirect CO2 costs. For some summaries of parts of the literature see e.g. Cambridge Econometrics (2010) at pp. 5-17. For another summary of carbon leakage literature see Dröge (2009), p. 19.
15 See Peretz (2009) at p. 10 who refers to other authorities (including Reinaud) who share this view.
16 See e.g. Cambridge Econometrics (2010).
to attempt to disentangle decisions which could specifically be attributed to direct and/or indirect CO2 costs\(^{17}\). The absence of concrete evidence of carbon leakage adds to the difficulty of defining criteria to identify risks\(^{18}\).

Given the relatively short time span of EU ETS policies the results from analyses undertaken so far should however be treated with care\(^{19}\). The lack of empirical evidence of carbon leakage does not mean that there may not be any effects over the longer term, especially given the greater stringency of the ETS during 2013-2020.

Even with empirical evidence covering many years it may be very difficult to isolate the effect of carbon prices on investment, production and location decisions in Europe\(^{20}\). Identifying the triggering event would for example require disentangling the effects from carbon leakage from the effects of a slow-down in a commodity boom in the form of plant closures\(^{21}\).

Several studies looking at the competitiveness impact of ETS conclude that for most manufacturing sectors, the evolution of cost differentials due to exchange rate variations, costs of labour, costs of capital and costs of other inputs far outweigh the importance of cost differentials induced by the effects of carbon pricing, and in particular its effects on electricity prices\(^{22}\).

The findings on the incidence of carbon leakage in the literature should be distinguished from the 2010 Carbon Leakage Decision which – in the context of compensation for direct CO2 costs - finds that a number of sectors are at risk of carbon leakage within the meaning of the criteria in the ETS Directive.

2.1.4. Challenges in quantifying the problem

The carbon leakage literature also draws attention to a severe lack of data sources at both EU and national level that would be needed to better assess risks of carbon leakage\(^{23}\). One key area characterised by such paucity of data sources concerns information on electricity consumption by sectors and subsectors at a level of disaggregation relevant to the core problem addressed in this Report (see section 2.1.1). Eurostat only produces figures on electricity by sectors at a high level of aggregation, making it considerably more difficult to assess EU-wide cost impacts of electricity price increases at a more disaggregated level\(^{24}\).

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17 Cambridge Econometrics (2010); Reinaud (2008).
21 See Reinaud (2008), p. 69 (who recommends that countries concerned themselves step up ex-ante and ex-post studies).
22 Grubb et al (2009), p. 20. For example, iron ore constitutes 40% of the costs of steelmaking in the EU. Access to wood is said to be the competitiveness issue for the EU paper sector (See the 2011 Competitiveness report; see also Reinaud (2008).
23 Recent carbon leakage literature (Cambridge Econometrics (2010)) has strongly recommended "that both Member States and EU statistical agencies improve the quality and richness of the data required to make assessments of carbon leakage. In some cases key economic data are found to be severely lacking".
24 The 2011 Benchmarking Decision also drew attention to the lack of data on electricity consumption (see recital 11).
Second, even at more aggregated level, there is no sector-specific comparable EU-wide data of electricity generated by the industrial installations themselves (auto-generation) as opposed to electricity purchased from the electricity grid.

For the definition of sectors eligible for compensation of their direct CO2 costs under Commission's 2010 Carbon Leakage Decision and the related impact assessment, the Commission services collected and refined a large amount of key data on the direct and indirect CO2 cost impact expected to result from ETS 3 (2013-2020) on the relevant sectors as well as on their trade intensity. This data is a fundamental data source underlying this Report\(^{25}\).

Another factor adding to the precariousness of assessing risks of carbon leakage for particular sectors and subsectors is the lack of estimates of the price elasticity of demand in the context of trade between the EU and non-EU countries covering the sectors and subsectors potentially concerned by carbon leakage (see section 4.7.2.2 and Annex 16, table 20 and 25 on such so-called ‘Armington elasticities’). Where available and relevant, this Report will refer to existing studies.

2.1.5. The means to address the problem: the ETS Guidelines

To address the problem of carbon leakage due to indirect CO2 costs the ETS Guidelines will need to: a) define and apply criteria to determine eligible sectors and subsectors and b) define criteria to fix the maximum amount of aid a Member State may grant in respect of any particular installation.

The requirement in Article 10a(6) that aid by Member States must comply with the “state aid rules applicable" means that they must respect the specific legal basis of the envisaged Guidelines, namely Article 107(3) of the Treaty on the Functioning of the European Union (TFEU)\(^{26}\).

State aid for indirect CO2 costs is not linked to a new investment but constitutes operating aid. Operating aid relieves undertakings of day-to-day costs that they would normally have to bear. Unlike investment aid operating aid does not require a counterpart such as an investment that would not have been undertaken without the aid. When the Commission – exceptionally - authorises operating aid it normally requires that the aid be degressive over time and does not

\(^{25}\) As a general rule, trade data for 2005-2007 and CO2 cost data for 2005-2006. See impact assessment relating to the 2010 Carbon Leakage Decision (European Commission (SEC(2009) 1710). p. 9). The responsible Commission services at the time had to engage in an extensive data collection exercise to determine the share of a particular sector's electricity consumption of that sector's gross value added at EU level. The data was collected from the Member States and further processed by Eurostat. The results are annexed to that impact assessment. Specifically, the Member States reported industrial electricity consumption data at sector (NACE 4) level in volume terms (MWh/year). The indirect CO2 costs were then calculated by multiplying the reported electricity consumption with the average CO2 emission factor (0.465tCO2/MWh) and the €30 CO2 price assumption (taken from the impact assessment accompanying the energy and climate change package). Electricity data was requested and reported by the Member States as net electricity purchase. The electricity consumption did therefore not include auto-generation. All Member States did not report their industrial electricity consumption.

\(^{26}\) This is consistent with recital 49 of Directive 2009/29/EC which provides that measures adopted under that Directive shall be without prejudice to State aid rules.
cover all the costs\textsuperscript{27}. A special State aid framework governing the payment of aid for part of the beneficiaries' operating expenses is thus needed. The free allocation of EUA as compensation for direct CO2 costs does not constitute State aid as the modalities of that allocation are harmonised across the EU.

2.2. **Pass on of CO2 costs**

2.2.1. **Pass on of CO2 costs in electricity prices by the electricity producers to the sectors concerned**

Electricity producers will incur costs due to ETS 3. A driver of carbon leakage risks is the likelihood that electricity producers will pass on these costs in full or in part\textsuperscript{28}. Indeed, electricity producers were able to pass on most of those costs during ETS 1 (2005-2007) and so far during ETS 2 (2008-2012). They are widely expected to do so again during ETS 3 (2013-2020)\textsuperscript{29}.

Empirical evidence of pass on rates suggests that, while significant\textsuperscript{30} it is often below 100%. The 2010 Carbon Leakage Decision on leakage risks due to direct CO2 costs assumed a pass-on rate of 100%. This Report makes the same assumption\textsuperscript{31}. Under this assumption the size of the pass on equals the **CO2 price**. The CO2 price is the market price for one allowance (“EUA”) to emit one tonne of CO2. The CO2 price arises from the scarcity of EUAs created by a “cap” on CO2 emissions laid down by the ETS Directive for each ETS period. EUAs are issued each year up to the exact amount of the cap. The around 12 000 “installations” covered by the ETS cannot emit more than the cap. These installations mostly belong to the electricity, manufacturing or mining sectors.

The ETS 1 and ETS 2 caps were stable over time. **ETS 3 is more stringent**, since its cap falls by 1.74% each year (see figure below).

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\textsuperscript{28} See e.g. de Bruyn et al (2010a); de Bruyn et al (2010b).

\textsuperscript{29} The pass-on assumption is built into the 2011 Benchmarking Decision (see recitals 31-32).

\textsuperscript{30} Sijm et al (2006) at p. 21 estimate that the CO2 cost pass through for Germany and the Netherlands vary between 60% and 100%. See replies to questionnaire by e.g. the VCI referring to a pass-on rate of 75% and the Swedish Confederation of Enterprise (pass-on rate claimed to be 80%).

\textsuperscript{31} See e.g. Hobbs et al (2010).
This means that the price for one EUA - the CO2 price – is expected to increase (all other things being equal). The CO2 price has been volatile since the launch of ETS in 2005. This continues to be the case. In July 2011 market expectations placed the expected average CO2 price during ETS 3 in the region 25-30€/EUA. At the time of writing the price expectations for the 2013-2020 period is roughly in the €8-15/EUA range.

The considerable uncertainties as to the future CO2 price justify recourse to sensitivity tests using price assumptions covering a wide span. Assumptions of €10, €20 and €40 are applied when assessing the impacts of options and Option Packages. That outer range ((€10 to €40) incidentally corresponds to one of the scenarios in a recent impact assessment by the UK Department of Energy and Climate Change.

2.2.2. Pass on of CO2 costs in electricity prices by the sectors concerned to their customers

Even assuming that all indirect CO2 costs (i.e. the CO2 price) are passed on by electricity producers a significant carbon leakage risk – as defined by the ETS Directive – is only deemed to exist to the extent that the EU sector cannot pass on those indirect CO2 costs to downstream clients or customers without losing significant market share to third country competitors. In reality, the ability or inability of sectors to pass on costs is likely to be a question of degree. Studies have found that several sectors were able to pass on some of their CO2 costs.

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32 See e.g. forecast by Barclays Capital that the price will average €30 over 2013-2020 (Point Carbon of 1 July 2011).
33 The CO2 spot and future price can be monitored at the website of ECX (where by far the largest share of trading in EUAs takes place).
2.3. The future CO2 content of electricity

A projection of particular relevance to the problem is that the CO2 content of electricity production is expected to decrease in the coming years and decades (see figure below). The extent of the expected decarbonisation is subject to uncertainty: see e.g. Annex 16, figure 7. Decarbonisation is contingent on considerable investments being undertaken, principally by the private sector.

Further decarbonisation is also intimately linked to the speed and nature of technological development. Some commentators suggest that the degree of technological development in this area was underestimated when preparing for ETS 1 and ETS 2.

For one illustration of a possible technological scenario see the figure below which outlines three 'waves' of development relevant to decarbonisation.

Source: European Commission (SEC(2009) 1297)

The continued integration of EU electricity markets is likely to put further downward pressure on electricity prices (but not necessarily on the CO2 cost component which is embedded in electricity prices).

2.4. CO2 constraints on non-EU competitors

A key determinant in assessing significant risks of carbon leakage is the extent to which comparable CO2 constraints are imposed on non-EU firms. An international agreement binding on the EU's main trading partners imposing CO2 constraints similar to those of the

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36 IFIEC (2008) contains a scenario (based on the EU meeting its 20% CO2 reduction target by 2020) whereby the CO2 factor would be 0.44 by 2020 (see Annex 16, table 21).
ETS\textsuperscript{39} would make the envisaged ETS Guidelines, the 2010 Carbon Leakage Decision and the 2011 Benchmarking Decision superfluous. Compensation for direct and indirect CO2 costs is thus a second-best option. At the Durban conference developed and developing countries agreed to negotiate a new regime (“a protocol, another legal instrument or an agreed outcome with legal force”) by 2015 and to bring it into effect by 2020.

The ETS Directive and the 2010 Carbon Leakage Decision however also recognise that the risk of carbon leakage would diminish to the extent that major trading partners \textit{unilaterally} reduced the CO2 intensity of their production\textsuperscript{40}. The full extent to which such unilateral measures are taken by third countries is not known given the lack of reliable and comparable data\textsuperscript{41}. While the 2010 Carbon Leakage Decision only recognised Norway, Switzerland and Iceland as countries which at the time were deemed to be subject to comparable CO2 constraints to those of the ETS, the reality of the constantly evolving CO2 constraint landscape is more complex. The examples below are not intended to be exhaustive.

Some cap and trade systems (similar although not as ambitious as the ETS) already exist in New Zealand and in parts of the United States (20 States)\textsuperscript{42}.

In 2011 Australia adopted a CO2 tax to be imposed by mid-2012, being replaced by a CO2 emissions trading and carbon scheme in 2015\textsuperscript{43}. A cap and trade scheme in California will be launched in 2013\textsuperscript{44}.

Through its recently adopted 12th Five-Year Plan China (the world's largest CO2 emitter) committed itself for the first time to reduce the CO2 intensity of its economy\textsuperscript{45}. China has gradually introduced pilot cap and trade systems in several provinces with a view to a possible later introduction of a more comprehensive federal trading system\textsuperscript{46}. South Korea is

\textsuperscript{39} See recital 24 of the ETS Directive and the 2010 Carbon Leakage Decision at recitals 2 and 24 ("This list applies for the years 2013-2014, subject to the outcome of the international negotiations.").
\textsuperscript{40} Article 10a(18) of the ETS Directive.
\textsuperscript{41} Recital 22 of the 2010 Carbon Leakage Decision confirms the lack of data as regards CO2 efficiency of installations in third countries representing a decisive share of global production of products in sectors and subsectors deemed to be at risk of carbon leakage. According to the ETS Directive (point b of Article 10a(18) this factor should be taken into account for the purpose of determining the exposed EU sectors and subsectors.
\textsuperscript{42} The Regional Greenhouse Gas Initiative encompassing a number of western US states. The market price for emission permits under the RGGI is considerably below the EU price due to actual emissions falling well below the cap (Financial Times 22 August 2011). See also Carbon Market Daily of 14 November 2011.
\textsuperscript{43} The scheme involves enforcement of compliance of CO2 targets for 500 companies (with together emit some 400 million tonnes of CO2 per year). Carbon Market Daily, 14 November 2011 (USD/euro exchange rate as at 22 November 2011).
\textsuperscript{44} The Global Warming Solutions Act of 2006. The California law that sets up the first enforceable state-wide program in the US to cap all greenhouse gas emissions from major industries. The law requires that by 2020 the state's greenhouse gas emissions be reduced to 1990 levels. Carbon Market Daily, 14 November 2011.
\textsuperscript{46} The pilot schemes concerned seven provinces as reported by Carbon Market Daily, 14 November 2011.
reportedly following a similar path. Thailand, Turkey, Ukraine and Vietnam have stated their intention to launch CO2 trading schemes.\footnote{Carbon Market Daily, 14 November 2011.}

There is uncertainty as to the extent that comparable constraints may be put in place until 2020, for example the extent to which in particular developing countries will deliver on their pledges under the Copenhagen Accord (see figure below for the result of one survey)\footnote{So called 'non-Annex I countries' (i.e. countries without binding targets under the Kyoto Protocol. The IEA World Energy Outlook 2010 estimates the total uncertainty to amount to the equivalent 3.9Gt CO2 emissions. De Bruyn et al (2010) at pp. 5, 29-30 argue that trade intensities should be corrected to the extent that the EU’s trading partners become subject to CO2 constraints.}. Some projections foresee a convergence of global CO2 prices over the longer term (Annex 16, figure 23). According to another estimate one third of global emissions could be capped and traded by the end of the decade compared to the current level of 6\%\footnote{Carbon Market Daily of 14 November 2011.}.

Carbon leakage only arises if CO2 is emitted in such trading partners. Some third countries are characterised by CO2-free industrial production.\footnote{See for example reply to questionnaire by Elkem referring to relocation of activity (within sector NACE 2710) to Iceland where industrial production (such as aluminium) is largely CO2-free.}

In sum, the risk of carbon leakage is particularly present in relation to those third countries with which the EU engages in trade to a significant extent in the sectors concerned. The risk of carbon leakage is reduced to the extent that such countries impose or can be expected to impose carbon constraints.\footnote{De Bruyn et al (2010).}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure54}
\caption{ETS around the world}
\end{figure}

\textbf{Source: Carbon 2011}

\subsection*{2.5. The wider EU policy context}

The core EU policy context consists of the EU’s Climate and Energy Package adopted by the European Council in March 2007. The ETS Directive (as amended in 2009) is a central
component of that policy which lays down two binding targets to be achieved by 2020\textsuperscript{52}: first, a reduction of CO2 emissions by 20\% from the emissions level in 1990 and, second, increasing the share of renewable energy sources in the EU to 20\% of overall energy consumption (over the same time span). At the same time the European Council established a (non-binding) target to increase energy efficiency by 20\% by 2020\textsuperscript{53}.

The 20\% reduction target remains valid, although the EU is committed to moving to a legally binding 30\% reduction commitment depending on international action. The EU's objective is to reduce CO2 emissions by 80-95\% by 2050. For more detail on the EU’s Climate and Energy Package and its follow up as well as other dimensions of the wider policy context (notably the Europe 2020 Strategy, see Annex 5).

In 2011, to ensure coherence between the ETS sectors and non-ETS sectors, the Commission made a proposal for a Council Directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. That proposal will also be considered part of the core policy framework.

3. THE OBJECTIVES

3.1. General objective

The general objective is for the Commission to adopt, under the State aid provisions of the TFEU (Article 107(3)(c)), Guidelines for the assessment of State aid for indirect CO2 costs arising in the context of ETS 3.

3.2. Specific objectives

The first specific objective is to \textit{prevent carbon leakage}\textsuperscript{54} Carbon leakage means that even if the 20\% reduction target (through the binding cap) of the EU ETS is met, that effect may be impaired, neutralised or even outweighed by an increase in CO2 emissions outside the ETS due to lower production, lower investment and relocation by EU firms in ETS sectors due to the higher costs imposed by the EU ETS. The ETS Directive acknowledges that State aid may be required to minimise the risk of carbon leakage due to higher indirect CO2 costs as of 2013.

The second specific objective is to \textit{maintain the efficiency of the ETS}; in other words, carbon leakage should be prevented at least cost to the economy and society\textsuperscript{55}. The literature on carbon frequently distinguishes between the "efficiency" or "cost-effectiveness" of the ETS on the one hand and the "effectiveness" of the ETS on the other hand\textsuperscript{56}.

\textsuperscript{52} Council document 7224/1/07 Rev 1.
\textsuperscript{53} Compared to a business as usual scenario baseline.
\textsuperscript{55} See e.g. Recitals 1 and 15 of the ETS Directive. The need for necessary and proportionate aid and the need to maintain the efficiency of the ETS is explicitly enshrined in recital 27 of Directive 2009/29/EC, criteria which are also reflected in the Commission Statement at paragraphs 4, 10 (see Annex 6 ).
\textsuperscript{56} Graichen, Matthes et al (2009); Neuhoff (2008).
The ETS State aid Guidelines can affect the efficiency of the ETS, both at the level of buyers of electricity and the power producers (within the ETS). They can have impacts outside the ETS (e.g. services and households).

The third specific objective is to **minimise distortions on the internal market**\(^{57}\). All State aid distorts competition on the internal market to a lesser or greater extent. Such distortions cannot be eliminated, only minimised.

**Intra-sector distortions** would arise if only one or some Member States decide to support installations within eligible sectors. Distortions within a sector could also arise if a sector receives compensation for direct CO2 costs in the form of free EUAs but no aid is paid for indirect CO2 costs within that sector (i.e. non-alignment in the treatment of direct and indirect costs).

**Inter-sector distortions** could arise in situations where there is prima facie substitutability between materials and products manufactured by different sectors, one or some of which are eligible under the Guidelines. Inter-sector distortions in a wider sense could also arise in the sense that the sectors excluded from aid under the ETS State aid Guidelines would have to “work harder” for the EU to achieve its 20% ETS reduction target\(^ {58}\). The legally binding CO2 reduction cap under ETS 3 must be met even if some sectors are insulated through State aid or by other means.

Stakeholder input is divided on whether minimising internal market distortions should be an objective. Several stakeholders consider that prevention of carbon leakage is the sole objective. Conversely, several stakeholders (not least several Member States) emphasise the importance of reducing internal market distortions and the need to avoid subsidy races\(^ {59}\).

This Report uses the term 'distortion' in relation to competition within the internal market (i.e. the term used by the Treaty provisions on State aid) and 'competitiveness' in relation to competition between EU firms and non-EU firms in view of the specific definition of carbon leakage in Directive 2009/29/EC\(^ {60}\). The Guidelines thus need to factor in both distortions of competition in the internal market caused operating aid (which is normally prohibited by EU State aid rules) and the competitive situation of EU sectors vis-à-vis third country firms operating in the same sectors.

3.3. **Operational objective**

The immediate operational objective is to adopt before 2013 a set of ETS State aid Guidelines allowing Member States to notify – should they choose to do so – aid in favour of

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\(^{57}\) The legal basis of the Guidelines is Article 107(3)(c) TFEU. See also Recitals 8, 19, 23 of Directive 2009/29/EC amending the ETS Directive. See also European Commission (SEC(2008) 85 VOL. II) as regards carbon leakage risks due to direct CO2 costs which refers to distortions of competition between the Member States' trading sectors as well as distortions within sectors.

\(^{58}\) Grubb (2010).

\(^{59}\) See replies to questionnaire by e.g. University of Groningen, UK and Sweden.

\(^{60}\) See in particular Recital 24 and the reference to EU sectors subject to international competition that may be put "at an economic disadvantage".
installations covered by the list of sectors at significant risk of carbon leakage due to indirect CO2 emission costs incurred after 1 January 2013.

The ETS Guidelines are not self-executing. The Member States are enabled but not obliged to address carbon leakage in their respective jurisdictions.

The monitoring arrangements that will accompany the ETS Guidelines make it possible to assess achievement of one of the three specific objectives set out in section 3.2. The reporting and review mechanisms as well as their scope are outlined in see section 7 on monitoring and evaluation.

3.4. Baseline Scenario

The ETS Directive accepts that the Member States may grant operating aid. Operating aid relieves beneficiaries of costs that form part of their day-to-day operations (wages, energy, taxes etc.) without any counterpart such as an investment. As operating aid does not involve incentive effects it is normally prohibited under State aid rules. Absent the envisaged ETS Guidelines, Member States would be barred from granting the aid foreseen by the ETS Directive (save for compensation up to the de minimis threshold - i.e. €200,000 per undertaking per three-year period - laid down by EU State aid rules for that type of aid).

The Baseline Scenario is a "zero aid" scenario considering that so far no Member State is or has so far been granting aid to reduce carbon leakage in view of the State aid rules currently in force. In November 2010 the European Commission opened an in-depth investigation into a scheme intending to relieve German producers of non-ferrous metals of part of their electricity costs. Germany intended to grant operating aid totalling €40 million for the second half of 2009. In that context, the Commission also stated that it does not encourage electricity price-subsidisation schemes for targeted industrial sectors as such support tends to go against the climate change and electricity market liberalisation policies and may trigger subsidy races between Member States.

Potential impacts linked to the "zero aid" Baseline Scenario are assessed in section 5.

4. OPTIONS

4.1. Eligibility and the maximum aid amount

A first set of options (Options A1, A2, A3 and A4) contains criteria to define eligible sectors or subsectors. The criteria are proxies to assess significant risks of carbon leakage due to indirect CO2 costs: i.e. whether the sectors or subsectors are able to pass on the CO2 cost

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61 See e.g. Case C-86/89, Italy v Commission [1990] ECR I-3891, para 18; Case C-288/96, Germany v Commission, paras 77-78; Case C-459/10 P, Freistaat Sachsen und Sachsen-Anhalt v Commission, para 34; case C-113/00, Spain v Commission, para. 70; C-156/98, Germany v Commission, para. 30.


component in electricity prices without significant loss of market share to third country competitors.

Three further sets of options (Options B1-B4, C1-C3, D1 and D2) concern the determination of the maximum amount of State aid that a Member State may grant in favour of an installation which is active in one of the eligible sectors or subsectors.

The 13 options (four A, four B, three C and two D Options) are presented below.

4.2. Option Packages

Any combination of the four A, four B, three C and two D options is possible. To enhance the transparency of the Report and facilitate the comparison of the options only a limited number of combinations (“Option Packages”) will be examined.

In designing the Option Packages the key specific objectives – minimising carbon leakage risk, maintaining the efficiency of the ETS and minimising distortions across the internal market – served as a point of departure. The rationales underlying the Packages are set out in more detail in 4.21. The Packages are illustrative and intended to cover a range of options. They are without prejudice to other combinations of Options.

4.3. Sector and subsector eligibility

In its Statement in 2008 relating to the ETS Directive (Annex 6) the Commission took the position that when defining sectors and subsectors deemed to be exposed to a significant risk of carbon leakage it “would use the method that is being developed in the context of direct emissions, but adapt this to take into account cost increases related to indirect emissions” (emphasis added) (see Annex 6).

The “method” used to determine the sectors and subsectors entitled to receive free EUAs for their direct CO2 costs is enshrined in Articles 10a(15-17) the ETS Directive.

That method was further refined when implemented through the 2010 Carbon Leakage Decision (see Annex 7 for details). It mainly involved using two sets of quantitative data. First, each sector's combined direct and indirect CO2 costs were related to the sector's gross value added (GVA). The method to determine the indirect CO2s was based on net purchases from the electricity grid (but not auto-generated electricity: see 2.1.4). The GVA is made up of the sector's sales minus its intermediate consumption. Second, each sector's trade intensity was used to determine eligibility. By trade intensity is meant the sector's non-EU imports and non-EU exports as a share of the sector's total EU turnover plus non-EU exports and imports.

If a sector's direct and indirect CO2 costs exceeded 5% of its GVA and its trade intensity exceeded 10% the sector qualified. A sector also qualified if its CO2 costs exceeded 30% of its GVA. A sector with trade intensity above 30% was also deemed eligible. In addition, a sector could qualify based on a purely qualitative assessment.

The ETS Directive does not define the eligibility criteria to be applied in the ETS Guidelines. The Commission only committed itself to use the “method” developed in the context of compensation for direct CO2 costs and to “adapt” that method “to take into account cost
increases related to indirect emissions”. There is no “magic” eligibility criterion that must be used in the context of State aid for indirect CO2 costs. The potential range of eligibility options is wide.

Options A1 to A4 are consequently based on the key elements in the “method” used for direct CO2 cost compensation. Three of the four options (A1, A2 and A4) rely on the two key forms of quantitative data referred to above, relating them to CO2 cost and trade intensity thresholds. The threshold values used are mainly those laid down in the ETS Directive, adapted to the context of this Report and the ETS Guidelines (aid for indirect CO2 costs). One of the four options (Option A3) is – again in line with the method applied to compensation for direct costs – qualitative in nature. As prescribed by the Impact Assessment Guidelines account has been taken of the stakeholder consultation and the requirement that the options retained should encompass a sufficiently wide “range”.

4.4. The CO2 price assumption used to determine eligibility

The CO2 price is a function of supply and demand for allowances to emit CO2 (one allowance – EUA – corresponds to one tonne of CO2). The number of EUAs in circulation equals the ETS 3 cap. The CO2 price is crucial in determining sector eligibility. This is so as the CO2 price is one of the three variables required to calculate a sector's direct and indirect CO2 costs. The other variables are the sector's electricity consumption and the CO2 content of that consumption.

A CO2 price assumption of €30 was used to determine sector eligibility in the context of compensation for direct CO2 costs. At the time of the adoption of the ETS Directive 2009 €30 per EUA was the CO2 price expected apply on average during ETS 3. That price assumption was built into the ETS Directive in 2009. It was also applied as the basic premise for eligibility in the 2010 Carbon Leakage Decision as well as in the updating of that Decision in 2011. **A CO2 price of 30€ is taken as the basic starting point in Report. To that extent, equal treatment between direct CO2 costs and indirect CO2 costs is ensured**. Similar to energy commodity markets, CO2 prices are inherently uncertain and have also in general tended towards volatility (see figure below illustrating e.g. how the CO2 price has halved since June 2011).

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64 In respect of direct CO2 costs the €30 price assumption was used in Commission Decision (2011/754/EU) of 11 November 2011, adding to the 2010 Carbon Leakage Decision eligibility list under the annual updating procedure set out in Article 10a(13) of the ETS Directive.
The historically volatile and inherently uncertain nature of the CO2 price calls for a precautionary approach when assessing the impact of the different eligibility options. To that end, sensitivity tests are carried out. Those tests use CO2 prices which are both lower (€10 and €20) and higher (€40) than the primary price assumption of €30. A precautionary approach is further justified given that, given its greater stringency, ETS 3 can – all things being equal – be expected to increase the carbon leakage risks.

In the course of the second public consultation several Member States and some other stakeholders advocated a "floor price". They supported a floor price in the region of €15-20\textsuperscript{65}. By floor price is meant a CO2 price below which no installation would be eligible for any aid. They would receive compensation only for the price above that floor. One Member State proposed a floor price of €50\textsuperscript{66}. Another stakeholder supported a floor price of €30\textsuperscript{67}. A third Member State argued that the price at the time of its submission (€17) was in any case sufficient to justify eligibility for State aid\textsuperscript{68}. Some stakeholders argued that such a mechanism did not appear consistent with the method used in the context of direct CO2 costs.

While the Report does not consider an outright "floor price" option, the Baseline Scenario set out in section 5.2 effectively addresses the consequences of the requests for a "floor price" of €15 and above. It does so as the CO2 price projections at the time of writing for the ETS 3 period are below €15 and because the Baseline Scenario is a "zero aid" scenario (i.e. no State aid to any firm in any sector in the EU).

\textsuperscript{65} One Member State advocated a floor price of €50.
\textsuperscript{66} See reply to questionnaire by Denmark.
\textsuperscript{67} See reply to questionnaire by Eurelectric.
\textsuperscript{68} See reply to questionnaire by Germany.
4.5. Option A1: The same sector and subsector eligibility as in the 2010 Carbon Leakage Decision

Option A1 is fully based on the “method” used in the context of compensation for direct CO2 costs (the 2010 Carbon Leakage Decision) resulting in **151 eligible sectors and 13 eligible subsectors** (see Annex 7 for details on how these sectors and subsectors qualified). That list would be expanded as part of the annual updating. Many stakeholders (notably industry) advocated eligibility in line with Option A1.

4.6. Option A2: Eligibility of sectors with indirect CO2 costs of at least 5% of the sector's GVA and a trade intensity of the sector of at least 10%

Sector eligibility under Option A2 requires indirect CO2 costs of at least 5% of the sector's gross value added and a trade intensity of the sector of at least 10%.

Option A2 is an adaptation of one of three sets of purely quantitative criteria used in the 2010 Carbon Leakage Decision. The adaptation consists in replacing the 5% threshold comprising both direct and indirect CO2 costs with a 5% threshold comprising indirect CO2 costs only. Such an adaptation is explicitly envisaged in the Commission Statement (see Annex 6) and was supported by some Member States in the consultation, although one Member States proposed that the indirect CO2 threshold be set at 3%.

Option A2 results in the following **five sectors** being eligible: **Mining of chemicals and fertiliser minerals** (NACE 1430); **Manufacture of leather clothes** (NACE 1810); **Manufacture of other inorganic chemicals** (NACE 2413); **Aluminium production** (NACE 2742) and **Lead, zinc and tin production** (NACE 2743) (for more detail see 5.4.1).

4.7. Option A3: Eligibility of sectors and subsectors based on a qualitative assessment

Options A1 and A2 rely on purely quantitative criteria to determine eligibility. The 2010 Carbon Leakage Decision also used – to a limited extent – a qualitative approach. Five sectors were added to the 146 sectors which had qualified under purely quantitative thresholds (see Annex 7 for details). Option A3 thus makes it possible to add sectors and subsectors.

Under Option A3, a sector or subsector must overcome two hurdles (as in the 2010 Carbon Leakage Decision). The first obstacle is to qualify for a qualitative assessment in the first place. Second, the sector or subsector must pass the substantive eligibility test. Based on those tests, Option A3 results in **14 eligible sectors and two sets of eligible subsectors** The 14 eligible sectors automatically include the five sectors eligible under the Minimalist Package: **Mining of chemicals and fertiliser minerals** (NACE 1430); **Manufacture of leather clothes** (NACE 1810); **Manufacture of other inorganic chemicals** (NACE 2413); **Aluminium production** (NACE 2742) and **Lead, zinc and tin production** (NACE 2743) (for more detail see 5.4.1).

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69 Two sectors – salt (1440) and bricks, tiles and construction products in baked clay (2640) and three subsectors cocoa past, butter and power – were added to the original list by Commission Decision 2011/754/EU of 11 November 2011, adding to the 2010 Carbon Leakage Decision eligibility list under the annual updating procedure set out in Article 10a(13) of the ETS Directive.

70 See Article 15 of the ETS Directive.

71 Belgium and the Netherlands are broadly in favour of this Option. France is in favour of the 10% trade intensity but argues for a more generous indirect CO2 costs criterion (3%).
clothes (NACE 1810); Manufacture of other inorganic basic chemicals (NACE 2413); Aluminium production (NACE 2742) and Lead, zinc and tin production (NACE 2743). The additional nine sectors include: Mining of iron ores (NACE 1310); Preparation and spinning of cotton-type fibres (NACE 1711); Manufacture of fertilizers and nitrogen compounds (NACE 2415); Manufacture of paper and paperboard (NACE 2112); Manufacture of basic iron and steel (NACE 2710); Copper production (NACE 2744) and Manufacture of other organic basic chemicals (NACE 2414); Manufacture of industrial gases (NACE 2411); Manufacture of man-made fibres (NACE 2470). The two sets of subsectors are seamless steel pipes within Manufacture of stainless steel pipes (NACE 2722) as well as a limited number of commodity polymers within Plastics in primary forms (NACE 2416) (see 5.5.1 and Annex 10 for more detail).

4.7.1. The first test under Option A3: criteria to be fulfilled in order to undergo a qualitative assessment

By analogy with the 2010 Carbon Leakage Decision, the qualitative assessment is confined to sectors or subsectors where industry representatives or Member States made a sufficiently plausible and substantiated case in favour of eligibility. No such sufficiently plausible and substantiated claims were made for some sectors despite high trade intensity and indirect CO2 costs including coke oven (NACE 2310), malt (NACE 1597) and mining of clays and kaolin (NACE 1422).

By analogy with the 2010 Carbon Leakage Decision a sector or subsector would have to fall within one or more of the following scenarios to be qualitatively assessed.

First, borderline sectors can be assessed. Borderline sectors – for the purposes of this Report – are defined as NACE 4 sectors with indirect CO2 costs in the 3-5% range and a trade intensity of at least 10%. Five sectors were deemed to be border: Preparation and spinning of cotton-type fibres (NACE 1711), paper and paperboard (NACE 2112), Mineral fertilisers and nitrogen compounds (NACE 2415), Manufacture of basic iron, steel and ferroalloys (NACE 2710) and copper (NACE 2744). Six sectors could have qualified as 'borderline' sectors but sufficiently plausible and substantiated claims were not made on their behalf by Member States or industry associations.72

Second, sectors and subsectors can also qualify for an assessment in case official data are missing or are of poor quality (always assuming sufficiently plausible and substantiated requests were made in support of eligibility). The sectors deemed to pass into a qualitative assessment via the second entry point (i.e. missing data) include Mining of iron ore (NACE 1310); pulp (NACE 2111) and Manufacture of synthetic rubber in primary forms (NACE 2417).

Third, sectors and subsectors can also qualify for an assessment in case they can be considered to have been insufficiently represented by the quantitative assessment (even if they do not constitute borderline cases and even if there are no data deficiencies) Most other

72 Cold Drawing (NACE 2731); Manufacture of other non-distilled fermented beverages (NACE 1595); Manufacture of malt (NACE 1597); Manufacture of coke oven products (NACE 2310).
sectors in Annex 10 qualified under this third generally worded criterion (which was broadly construed for the purposes of this Report).

Sectors with less than 1% indirect CO2 costs have not been considered (with the exceptional of the special situation of a subsector within NACE 2722: see 4.7.3.5). The qualitative assessment must in principle take place at the EU level. Some submissions listed large numbers of sectors without specifically linking the arguments to a specific sector. Sometimes the submissions referred not to indirect CO2 costs (i.e. electricity costs) but to "energy" costs or "energy intensity". The 2010 Carbon Leakage Decision limited its qualitative assessment to a relatively small number of sectors due to data and resource constraints73 an approach which finds support in the ETS Directive74. As appears above and from Annex 10 a more generous approach in terms of number of sectors assessed is pursued for the purposes of this Report.

4.7.2. The second test under Option A3: substantive eligibility criteria

The ETS Directive considers that sectors which are unable to pass on the CO2 cost element in electricity prices to their customers without losing significant market share to third country competitors are at significant risk of carbon leakage and therefore eligible for compensation for direct and indirect CO2 costs. While a very large number of factors could have a bearing on the pass-on ability, the carbon leakage literature75 finds that most factors can be subsumed under one of two broad headings. First, 'cost-related proxies' (e.g. the indirect CO2 cost/GVA criterion used in Options A1-A2 above). Second, 'market-related proxies' (such as the trade intensity criterion used in Options A1-A2 above).

4.7.2.1. Cost-related proxies: the size of the indirect CO2 costs

The starting point for the substantive eligibility assessment is the size of the asymmetric indirect CO2 cost impact as a share of the sector's gross value added. This criterion has the advantage of transparency and comparability.

The asymmetric cost impact must be sufficiently large to entail a significant risk of carbon leakage due to indirect CO2 costs. Thus, indirect CO2 costs of more than 2.5% will be taken into account for this criterion. Given that the ETS Directive uses 5% as a CO2 cost threshold, lowering the bar by more than half is not considered justified.

4.7.2.2. Market related proxies: evidence that the sector is a price-taker and cannot pass on its indirect CO2 costs without losing significant market share to third country competitors

An asymmetric indirect CO2 cost impact only gives rise of carbon leakage risk to the extent that the sector is unable to pass on the costs in its product prices to its clients without losing

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73 See Recital 16 on "time constraints" in the 2010 Carbon Leakage Decision and the related impact assessment (European Commission (SEC(2009) 1710) on "time constraints and limited resources" at p. 18.
74 See Article 10a(17).
75 See e.g. the trawl of carbon literature by Cambridge Econometrics (2010) yielding close to one hundred factors that have been used to assess carbon leakage risks.
significant market share to its third country competitors, i.e. because downstream clients can switch to competing products or suppliers.

Whether such switching or substitution is possible ultimately depends on factual circumstances specific to each sector and may vary over time. These factors include the degree of competition in the sector concerned and the degree to which the products are differentiated or homogeneous. The greater the extent to which the EU sector is sheltered from competitive pressure and the greater the degree of product differentiation the greater the ability to pass on asymmetric costs is likely to be. This ability to pass on costs may also be affected by high transport costs in relation to the product value that would have to be borne by non-EU competitors.

To this end, a robust proxy for the cost pass on ability would ideally take the form of elasticities of demand, i.e. precise quantified estimates of the degree to which a price increase by an EU sector would induce clients to switch suppliers or switch to substitute products. International demand elasticities measuring the degree of substitution between domestic and imported goods (so-called “Armington elasticities”) would be required. The higher the Armington elasticity the higher the impact of a domestic price increase on domestic production and international trade for varying estimates of Armington elasticities in respect of specific industry sectors). The carbon leakage literature draws attention to the lack of reliable and relevant Armington elasticities.

In the absence of such elasticities an objective proxy should be introduced into the qualitative assessment to act as a preliminary filter. As an objective proxy exists in terms of sector-specific trade intensity data, it is proposed to use a trade intensity of 25% as a screening device. Raising the trade intensity is considered justified as the indirect CO2 threshold is lowered to 2.5% (from the 5% quantitative threshold used by the ETS Directive).

Second, given that the assessment is qualitative in nature, sufficient evidence is required to support the conclusion that the sector or subsector in unable to pass on its indirect CO2 costs without significant loss of market share. Notably, substantiated information that indicate the EU sectors concerned are on the whole likely to be price-takers is required; for example, in the form of price correlation across regions for the products concerned or because the prices are de facto set at international commodity exchanges (see Annex 10). Typically, commodity-type products would tend to be price-takers and, typically, the more expensive the product per tonne the less likely transport products are likely to be constitute a hindrance to trade. The assessment is focused on the sector (as defined by NACE) and not on input goods used by the sector. Thus while sector providing inputs into the NACE sector assessed may be at the risk of carbon leakage that cannot be decisive.

A sector which is a price-taker is subject to competitive constraints emanating from third countries. The Commission's previous assessments in merger cases concerning the sectors concerned have thus been drawn on were available. The geographic market definition in such cases is of particular importance as it demonstrates the geographic extent of possible significant competitive constraints faced by the products in question. Thus if such decisions

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find that the geographic market is at least EEA or EU wide it indicates that it cannot be excluded that the EU sector in question is unable to pass on costs without a significant loss of market share to non-EU competitors. The Commission's merger decisions have a rather short time horizon, assessing the scope of the markets one or two years ahead.

The international demand and supply situation may affect to the pass-on ability. EU sectors may be more exposed to loss of market share in the case of overcapacity or new capacity coming on stream in neighbouring regions. EU decisions on the use of trade defence instruments (such as antidumping proceedings) may inform the assessment of the trade dynamics characterising specific sectors. Information on profit margins, estimations as to the ability of a sector to further abate CO2 emissions and other factors relevant to indirect CO2 cost pass on ability may also inform the sector assessment to the extent such information is available.

The issue as to whether a particular production process is electricity-intensive does not by itself make it possible to compare sectors according the principal method prescribed by the ETS Directive, namely relating the indirect CO2 costs to the GVA of the sector as a whole. The issue of the electricity-intensive nature of specific production processes is central to the issue of defining the electricity benchmarks (an issue related not to sector eligibility but to the maximum aid amount). The key basis for comparing sectors according to the logic of the ETS Directive is indirect CO2 costs as a percentage of the GVA. Thus all comparable electricity costs are taken into account, whether attributable to specific electro-intensive processes or not. The data on indirect CO2 costs which constitutes the fundamental basis of this Report did not include auto-generated electricity. Auto-generated electricity has accordingly not been taken into account for the purposes of the eligibility assessment.

Many factors are relevant to the assessment of impacts (section 5) without constituting elements of the eligibility assessment. The fact that a sector is listed in the 2010 Carbon Leakage Decision is not deemed to have a sufficient bearing on pass on ability relating to indirect CO2 costs. Likewise, the fact that two categories of products may be in competition with each is not treated as an eligibility criterion. Nor can the size of a sector in principle be considered relevant to eligibility. The fact that a sector is part of a value chain may – depending on the circumstances – both make a sector more exposed and resilient against carbon leakage.

Submissions that merely refer to the situation in one or a few Member States are much weaker as an element to assess eligibility.

4.7.2.3. Fuel and electricity substitutability according to the 2011 Benchmarking Decision

The “method” developed in the context of direct CO2 emissions also comprises the 2011 Benchmarking Decision which defines the size and modalities of the free allocations of EUAs to the sectors eligible under the 2010 Carbon Leakage Decision.

The Benchmarking Decision establishes that in respect of some production processes (among those eligible under the 2010 Carbon Leakage Decision) there is – at least to a certain extent – substitutability between fuel and electricity. Installations however only receive free EUAs for their fuel consumption and not for their electricity consumption. Installations using fuels
would be favoured over installations using electricity. This may contribute to a greater risk of carbon leakage on the part of the electricity-intensive undertaking. The 2011 Benchmarking Decision therefore refers to the possibility to grant State aid in respect of electricity consumption set out in the ETS Directive. Annex I.2 of the 2011 Commission Benchmarking Decision which lists a number of products where such fuel substitutability has been deemed to exist at least to a certain extent (see Annex 9).

4.7.2.4. A first set of sectors deemed eligible under Option A3

By analogy with the 2010 Carbon Leakage Decision eligibility under Option A3 for the purposes of this Report and in order to make the assessment as objective as possible the following test is set out.

First, sectors with less than 2% are not eligible at this stage as the asymmetric cost impact is not considered sufficiently large to entail significant carbon leakage risks (see 4.7.2.1 above).

In addition, two of the following three criteria must be fulfilled:

First criterion: indirect CO2 costs of at least 2.5%/GVA.

Second criterion: Assuming a sector or subsector has a trade intensity of at least 25%, sufficient evidence that the sector or subsector is unlikely to be able to pass on the indirect CO2 costs (see Annex 10).

Third criterion: Fuel and electricity substitutability established by the 2010 Benchmarking Decision at least in respect of part of the NACE 4 sector concerned.

Mineral fertilisers and nitrogen compounds (NACE 2415) and Manufacture of basic iron, steel and ferroalloys (NACE 2710) fulfil all three criteria.

Preparation and spinning of cotton-type fibres (NACE 1711); Mining of iron ores (NACE 1310); Paper and paperboard (NACE 2112); Man-made fibres (NACE 2470) and copper (NACE 2744) fulfil the 2.5% and inability to pass on costs criteria.

Basic organic chemicals (NACE 2414) and Manufacture of industrial gases (NACE 2411) fulfil the inability to pass on costs and the fuel and electricity substitutability criteria.

In addition, a set of subsectors within Plastics in primary forms (NACE 2416) is deemed eligible given indirect CO2 costs data in relation to GVA provided at the subsector level.

A special situation also applies in respect of Manufacture of stainless steel pipes (NACE 2722). For historical reasons, steel pipes were not included in the basic steel code (NACE

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78 Referring to Article 10a(6) of the ETS Directive (see Recital 31 of the 2011 Benchmarking Decision).
79 Recital 7 of the 2011 Benchmarking Decision.
80 Recital 31 of the 2011 Benchmarking Decision.
81 Data provided by the sector is undergoing verification.
82 See Annex 10 on the relevance to this sector of the special provision in the ETS Directive (recital 23).
83 Data provided by the sector is undergoing verification.
2710) (see Annex 10 for details), unlike comparable sectors such as aluminium and copper where pipes made out those materials are included in the basic NACE codes (2742 and 2744). At the time only products covered by the (now expired) European Coal and Steel Community were included into the basic steel code. In view of the special situation it could be considered to subsume the NACE 2722 code under the basic steel code (NACE 2710). Limiting the eligibility to a part of NACE 2722 could be considered, as seamless steel pipes appear to be the segment most concerned.

The sector-specific findings above were based on the evidence and data that it was possible to gather during this exercise\textsuperscript{84}. That body of information is summarised in Annex 10.

Under Option A3, five additional sectors are automatically eligible: Manufacture of leather clothes (NACE 1810); Aluminium production (NACE 2742); Mining of chemical and fertilizer minerals (NACE 1430); Manufacture of other inorganic chemicals (NACE 2413) and Lead, zinc and tin (NACE 2743). As these sectors qualify automatically under Option A3 they are not qualitatively assessed in Annex 10.

4.8. **Option A4: Eligibility based on indirect and direct CO2 costs of at least 5% of the sector's GVA**

Under Option A4, sectors are eligible based on a purely quantitative criterion directly based on one of the elements in the "method" applied in the 2010 Carbon Leakage Decision, namely that the sector must bear combined direct and indirect CO2 costs as a share of the sector's gross value added of at least 5%. That approach places more emphasis on aligning the treatment of sectors with high direct CO2 costs with those bearing high indirect CO2 costs. To that extent, the approach follows the logic of the 2010 Carbon Leakage Decision on compensation for direct CO2 costs.

Option A4 thus "adapts" (as envisaged in the Commission Statement: see Annex 6) one of the sets of quantitative criteria in the ETS Directive by fully retaining the first leg (combined indirect and direct CO2 costs of at least 5%) but discarding the other leg (trade intensity of at least 10%). That approach is favourable to sectors with very high CO2 costs but with low trade intensity. Many industry stakeholders emphasised that indirect CO2 costs should be viewed in conjunction with the indirect CO2 cost impact.

Option A4 results in the following **35 sectors** being eligible: Manufacture of lime (NACE 2652); Manufacture of cement (NACE 2651); Manufacture of coke oven products (NACE 2310); Manufacture of fertilizers and nitrogen compounds (NACE 2415); Aluminium production (NACE 2742); Manufacture of other inorganic basic chemicals (NACE 2413); Manufacture of refined petroleum products (NACE 2320); Manufacture of paper and paperboard (NACE 2112); Manufacture of basic iron and steel (NACE 2710); Manufacture of flat glass (NACE 2611); Lead, zinc and tin production (NACE 2743); Manufacture of hollow glass (NACE 2613); Manufacture of starches and starch products (NACE 1562); Manufacture of malt (NACE 1597); Production of ethyl alcohol from fermented materials (NACE 1592); Copper production (NACE 2744); Manufacture of other organic basic chemicals (NACE 2414); Manufacture of sugar (NACE 1583); Preparation and spinning of cotton-type fibres (NACE 1711); Mining and agglomeration

\textsuperscript{84} See recital 16 of Decision 2010/2/EU.
of hard coal (NACE 1010); Mining of chemicals and fertilizer minerals (NACE 1430); Manufacture of leather clothes (NACE 1810); Manufacture of synthetic rubber in primary forms (NACE 2417); Cold drawing (NACE 2731); Other non-ferrous metal production (NACE 2745); Manufacture of agricultural tractors (NACE 2931); Manufacture of other non-distilled fermented beverages (NACE 1595); Manufacture of ceramic tiles and flags (NACE 2630); Manufacture of cast iron tubes (NACE 2721); Manufacture of bricks, tiles and construction products, in baked clay (NACE 2640); Manufacture of industrial gases (NACE 2411); Mining and agglomeration of lignite (NACE 1020); Quarrying of limestone, gypsum and chalk (NACE 1412); Manufacture of plasters (NACE 2653) and Casting of iron (NACE 2751) (see section 5.6.1 for more details).

4.9. Five variables determine the maximum aid amount per installation

The second dimension of the problem addressed in this Report concerns options to define certain of the (five) variables which make up the formula to determine the maximum amount of aid that an installation may receive (provided it belongs to an eligible sector or subsector).

The maximum aid amount would thus be determined by multiplying the following five variables: the CO2 price; the product-specific electricity efficiency benchmarks; the installation's production level; the aid intensity and the CO2 factor. This formula is set out in detail in the Commission Statement (see Annex 6).

The CO2 price variable related to the maximum aid amount should be distinguished from the CO2 price used to calculate sector gross value added and thereby sector eligibility (for the latter eligibility-related CO2 price see section 4.6 above).

In fixing the CO2 price relevant to the aid amount (but not to sector eligibility), it could be considered to calculate the average of all (future) CO2 prices observed during a reference period relating to period over which the aid is to be granted. One advantage of that approach would be that the future prices would be known ex ante. Second, the CO2 price used would be based on the type of price information business normally take into account in this context (e.g. decisions on investment); in other words, the future CO2 price can be assumed to reflect companies' planning horizon better than the spot price. Future prices are also on the whole less volatile than spot markets (making them less susceptible to actions by any individual market participant).

The value of the CO2 price and electricity benchmark variables is to a lesser or greater degree predetermined as they depend on the future CO2 price level and the most efficient production techniques. No options are outlined for these two variables. Instead options are set out for the three variables where the degree of discretion is greater: the aid intensity, the CO2 factor and the installation's production level.

4.10. Option B1: 100% and stable aid intensity

Under Option B1, the aid intensity would be set at 100% over the whole period 2013-2020.

One rationale for Option B1 is found in the ETS Directive which refers to compensation for the “costs” passed on in the electricity (Article 10a(6) of the ETS Directive), which could be interpreted as covering all indirect CO2 costs.
A variant of 1 could be to accept 100% aid intensity on the condition that a certain percentage (e.g. 10%, 15%, 20% or 25%) is re-invested in electricity efficient technologies. That would make the option similar to Option B3 (for which reason it is not considered necessary to assess a fifth B Option).

4.11. Option B2: 100% and degressive aid intensity

Under Option B2, the aid intensity would be set at 100% at the start of period 2013-2020 and would fall either each year or after each two or three year period.

Degressivity would be in line with the Treaty rules on State aid as interpreted by the Court (see 2.1.5). It would be consistent with the temporary nature of the rules.

4.12. Option B3: Less than 100% and stable aid intensity

Under Option B3, the aid intensity would initially be set at less than 100% (e.g. 80% or 85%) after which it would remain stable.

Stakeholders advocating such an option argue that partial compensation would provide a continued incentive to energy users to increase their energy efficiency going beyond the product benchmarks.

4.13. Option B4: Less than 100% and degressive aid intensity

Under Option B4, the aid intensity would be set at less than 100% at the start of the 2013-2020 period after which it would fall either each year or after each two or three year period.

4.14. The CO2 factor

The CO2 emission factor ("CO2 factor") refers to the amount of CO2 (in tonnes) used to produce one MWh of electricity. The CO2 factor varies from zero in the case of CO2-free electricity production (including hydropower, nuclear power and renewable electricity production such as solar and wind power), to more than one tonne of CO2 (per MWh) in the case of brown coal (also called "lignite"). The average CO2 factor for all electricity production in the EU, based on installed capacity (figure for 2007) was 0.465 tonnes of CO2 per MWh of electricity. The CO2 factor differs considerably between Member States.


Ideally, the options relating to the CO2 factor (of electricity production) which affect the maximum aid amount should try to approximate the impact of ETS on electricity prices compared to a counterfactual scenario without the ETS. Again, ideally, to avoid

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85 Article 10a of the ETS Directive, which includes the legal base for the aid for the indirect costs of emissions is entitled "Transitional Community-wide rules for harmonised free allocation".

86 See Annex 16., figure 6 on the use of different proportions of hard and brown coal in the electricity mixes of selected Member States.
overcompensation, State aid should thus at most equal the additional cost resulting from the ETS compared to a situation without the ETS.

An additional challenge is that the difference an ETS scenario and a non-ETS scenario would have to be set at EU level; it would not suffice to estimate the difference at national level only. Article 10a(6) requires that the CO2 factor correspond to "the CO2 emissions of the relevant European electricity mix". Estimating the extra costs resulting from the ETS would require recourse to simulation models at EU level covering the entirety of the EU. Such EU-wide modelling is not available.

4.14.2. Alternative methods to assess the impact of the ETS on electricity prices

Even so, meaningful options regarding the CO2 factor can be set out. A higher rather a lower CO2 factor will mean a higher maximum aid amount. Thus a factor based on the marginal production will tend to be higher than the average CO2 emissions of electricity in the EU. It would reflect to a greater extent the price formation mechanism in EU electricity markets.

Several alternatives to define – as required by the ETS Directive – the "relevant" CO2 factor were addressed and proposed in the context of the public consultation. They fall into three broad categories: a) defining the CO2 factor installation by installation; b) using regional CO2 factors as proxies of the marginal production in those areas and c) applying a uniform CO2 factor across the whole of the EU.

The first category concerns the question whether it is possible to determine the CO2 factor for individual installations, notably through explicit references to the CO2 component of the price in bilateral supply contracts or through the determination of regulated tariffs. A large number of stakeholders argue strongly against such an option, principally on the ground that it would not be possible to verify if an explicit CO2 component has been artificially inflated to maximise the aid amount. No installation-specific options will therefore be considered.

Nor will any options involving any regulated tariffs for industrial customers that may remain in existence as of 1 January 2013 be considered. The logic of the compensation mechanisms of the ETS Directive for direct and indirect CO2 costs builds on the market price for electricity (see Article 10a(6) of that Directive). On this basis, as regards indirect CO2 costs, under the ETS Guidelines Member States may grant aid up to the maximum aid amounts. Member States may also decide to grant less aid than the maximum amount on the condition that the aid is granted on an objective and non-discriminatory basis.

Instead three non-installation specific options are set out. Option C1 is based on the CO2 factor related to the marginal production in each relevant geographic zone whereas Options C2 and C3 involve uniform CO2 factors applicable across the whole of the EU.

All three options comply with the legal requirement that the factor correspond to the “relevant European electricity mix”.

87 While the Finnish and French versions uses the term "average", the clear majority of the language versions use the term "relevant".
88 Advocated inter alia by the European Aluminium Association and EuroAlliages.
4.15. Option C1: Regional CO2 factors

Option C1 is based on regional differentiation so as to correspond to the current reality in terms of electricity market integration in the EU. It involves estimating the CO2 content of the marginal production for each region. The rationale is that that the marginal production in each region can normally be expected to consist of varying proportions of fossil fuels, i.e. coal, gas or oil (“the marginal production will always be grey”)\(^{89}\).

Fossil fuel (and notably gas and coal) based electricity generation plays is key to the formation of electricity prices. In the EU's increasingly liberalised electricity market(s) it is the "marginal production" which sets the wholesale price for all consumers (such as manufacturing industry) which buy electricity at that level (i.e. directly from the electricity grid) in the relevant geographic area.

The table below illustrates the large variations in fossil versus non-fossil sources of electricity production between the Member States (see figure below and Annex 16, figure 8).

| Table 1 Shares of fossil and non-fossil powered electricity production in the EU (source EC, 2007a). |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EU-27 | BE | BG | CZ | DK | DE | EE | EL | ES | FR | IT | CY | LV |
| Fossil | 55% | 41% | 47% | 65% | 71% | 62% | 99% | 91% | 88% | 64% | 11% | 81% | 106% | 33% |
| non-fossil | 45% | 59% | 53% | 35% | 29% | 38% | 1% | 9% | 12% | 36% | 99% | 19% | 0% | 76% |
| LT | LU | HU | MT | NL | AT | PL | PT | RO | SI | SK | FI | SE | UK |
| Fossil | 24% | 79% | 56% | 100% | 87% | 90% | 96% | 81% | 57% | 37% | 29% | 34% | 2% | 74% |
| non-fossil | 76% | 25% | 44% | 0% | 13% | 9% | 4% | 92% | 43% | 63% | 71% | 68% | 98% | 26% |

Source: IFIEC (2008)

In many cases the 'region' is likely coincide with the borders of a Member State. In other cases the wholesale price – through trading on exchanges – is de facto set for a wider region encompassing several Member States. See figure below which indicates that the four countries concerned belong to such a wider region.

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\(^{89}\) See Pöyry (2011). See in support of approach underlying Option C1, also a study by the Boston Consulting Group ("Assessment of the Impact of the 2013-2020 ETS Proposal on the European Cement Industry" November 2008) ("coal and natural gas are assumed to be the price fixing technologies in proportion to installed capacity").
Stakeholder input indicated that there may be at least three supranational regions: a) The Nordic area (Denmark, Finland, Norway and Sweden); b) Central Western Europe (Austria, Belgium, France, Germany, the Netherlands and Luxembourg); c) the Iberian Peninsula (Portugal and Spain). The remainder would be made up of individual Member States.

The CO2 factors under Option C1 relate to the mix of fossil fuels used to generate electricity in the Member State or wider region in question. It does not relate to the average CO2 factor generated by both fossil and non-fossil sources of electricity. One proxy for such a fossil fuel based CO2 factor would be to estimate the share of fossil fuels (each of which has a different CO2 factor) used in electricity production in a Member State and divide it with the relevant region's or Member State's gross electricity production.

4.16. **Option C2: The average CO2 factor in the EU (0.465 CO2t/MWh)**

A key feature of Option C2 is that is that the CO2 factor is uniform EU-wide. Second, it uses the EU average. It will therefore tend to be lower that the CO2 factor under Option C1. Third, the exact figure used in Option C2 – 0.465 CO2t/MWh – corresponds to the CO2 factor used in the impact assessment relating to the 2010 Carbon Leakage Decision. Option C2 would thus entail equal treatment between direct and indirect CO2 costs. On current projections the marginal CO2 factor is set to fall over the coming years and decade, making the 0.465 CO2t/MWh factor more relevant over time. The Report also needs to consider a range of factor covering different Option Packages from 'Minimalist' to 'Maximalist' (see 4.23). Option C2 is thus justified even if it is unrealistic – given the Member States' current electricity mix and the current stage technological penetration of renewables and nuclear power that such installations would act as marginal plants.
4.17. **Option C3: The average marginal CO2 factor in the EU (0.75 CO2t/MWh)**

Option C3 corresponds to the average CO2 factor of marginal production within the EU. Such an "average marginal" factor is higher than the average EU CO2 factor although it is expected to fall over time with the uptake of less carbon intensive or CO2-free technologies.

Industry representatives – with reference to PRIMES – have estimated the EU-wide "average marginal" CO2 factor to be around 0.75 CO2t/MWh (Annex 16, table 21). This factor was also explicitly considered in the impact assessment relating to the 2010 Carbon Leakage Decision.

4.18. **The installation's production level (whether based on actual or historical output)**

Member States who want to grant aid based on the ETS Guidelines will need to submit data on the production level of each installation belonging to an eligible sector or subsector regardless of whether it is determined according to Option D1 (actual output) or Option D2 (historical output) (see below).

4.19. **Option D1: the installation's actual output**

Under Option D1, the production level would be the installation's actual production determined ex post. Option D1 undoes to a significant extent the CO2 price signal embodied in electricity prices. Option D1 is thus designed to remove carbon leakage risks resulting from the CO2 price component (passed on by electricity producers). Increasing production is not financially sanctioned in that the aid will increase with increasing indirect CO2 costs passed on in electricity prices.

New entrants are not disadvantaged vis-à-vis incumbents as they would also receive State aid in proportion to their actual output.

As it follows actual production, Option D1 by definition excludes windfall profits.

In addition, Option D1 (unlike Option D2) obviates the need to fix a historical reference period.

4.20. **Option D2: the installation's historical output**

Under Option D2, the production level would be determined beforehand in the form of a "lump sum" based on the average historical output over a sufficiently long and representative reference period.

Such a fixed aid amount per time period is designed to maintain the full incentive to reduce emissions at installation level. Option D2 thus exposes companies to the full ETS price signal (embodied in electricity prices). A historical baseline would be in line with the method used to determine the amount of free EAU granted to each installation for direct CO2 costs.\(^\text{90}\)

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\(^{90}\) The 2011 Benchmarking Decision used 2005-2008 or, if they were higher, 2009-2010, as reference years.

To somewhat mitigate the risk of windfall profits associated with Option D1, the historical baseline could be adjusted in case of significant capacity increases or substantial reductions in actual production. To this end, the method applied in the context of free EUA allocation could serve as a model.

Accordingly, if the production capacity at an installation has increased by more than a specified threshold (e.g. 10%) over the aid granting period, the baseline output would be increased by an equivalent amount. Conversely, if average production capacity during the aid granting period were to significantly decrease, the aid would be cut. If not, a company could collect State aid and still shift its production abroad.

For a new entrant, it could be envisaged to base the aid on the entrant's during e.g. its first three or four years of operations, thereafter increasing or decreasing the amount on the same terms as applied to incumbent firms.

The reference period used to fix the historical production in the context of compensation through free EUAs for direct CO2 costs was 2005-2008 or 2009-2010, whichever was the higher. The dramatic impact of the crisis on industrial production, especially during 2009 is relevant in determining a representative historical average. For example, that exceptional year could be excluded.

Alternatively, the year with the lowest production could be excluded from the calculation of the average historical production of an installation.

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91 According to the explanatory memorandum “There is a need to limit the impact of CO2-related taxation on the sectors and subsectors deemed to be exposed to a significant risk of carbon leakage in the sense of Article 10(13 of the 2010 Carbon Leakage Decision) Accordingly, transitional measures to avoid an undue cost impact while maintaining environmental effectiveness of CO2-related taxation are needed, in a similar way as achieved with free allocation of greenhouse gas allowances under the ETS Directive. In order to maintain the full incentive to reduce emissions, this tax credit should be based on the historic energy consumption of an installation concerned in a specific reference period …”.

92 See Article 23 of the 2011 Benchmarking Decision.

93 See e.g. reply to questionnaire by the Hungarian Chemical Industry.

Any combination of the (13) A, B, C and D options is theoretically possible. To facilitate the comparison of the options this Report sets out four Option Packages (all of which can be considered illustrative and relevant in view of the wide range of stakeholder input) (see Annexes 2 and 3).

First, a Maximalist Package is set out which is aimed at preventing carbon leakage risks to the maximum extent. Accordingly, it comprises Options A1 (151 sectors and 13 subsectors); B1 (100% and stable aid intensity); C1 (regional CO2 factors) and D1 (actual output). The Package tends on the whole to address inter rather than intra-sector distortions.

The Minimalist Package aims at maximising the ETS efficiency objective. It comprises Options A2 (five sectors); B4 (less than 100% and degressive aid intensity); C2 (CO2 factor: 0.465 CO2 t/MWh) and D2 (historical output). The Package tends on the whole to address intra rather than inter-sector distortions.

Third, a First Intermediate Package comprises Options A3 (14 sectors and two sets of subsectors); B2 (100% and degressive aid intensity); C1 (regional CO2 factors) and D2 (historical output). The Package's qualitative approach specifically attempts to target the sectors and subsectors at greatest risk of carbon leakage, while maintaining as far as possible the efficiency of the ETS. The Package is broadly neutral as far as intra and inter-sector distortions are concerned.

Fourth, a Second Intermediate Package comprises Option A4 (35 sectors); B3 (less than 100% and stable aid intensity); C3 (CO2 factor: 0.75 CO2 t/MWh) and D1 (actual output).
The Package principally focused on reducing carbon leakage risks while preserving to some extent the incentives of the ETS. It tends to address inter rather than intra-sector distortions.

4.22. Subsidiarity and proportionality

Article 5(3) of the Treaty on European Union (TEU) provides that the principle of subsidiarity applies in areas which do not fall within its exclusive competence of the European Union. Article 3(1)(b) of the TFEU provides that the EU shall have exclusive competence in the area of "the establishing of the competition rules necessary for the functioning of the internal market". The legal basis for the Guidelines (Article 107(3)(c) TFEU) falls into this category of exclusive competence. Legally speaking, the issue of subsidiarity does not arise. In any event, the need for action at EU level is established by the ETS Directive which requires an assessment at Union level in order to determine sector eligibility.\(^94\)

The principle of proportionality also applies to acts adopted within the EU's exclusive competences. Article 5(4) TEU states that "the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties". The ETS Directive and the Commission's Statement (see Annex 6) define both the content (compensation for indirect CO2 costs in the context of ETS 3) and form (State aid rules to be adopted by the Commission) of the Guidelines.

5. IMPACTS UNDER THE BASELINE SCENARIO AND OPTION PACKAGES

5.1. Identification of impacts

5.1.1. Sector eligibility (including under different price scenarios)

The bulk of the carbon leakage literature regularly uses NACE 4 as the principal analytical level.\(^95\) The same is true of most stakeholder input on the eligibility issue. This Report also uses Eurostat's NACE 4 level as the main analytical level. At that level mining, quarrying and manufacturing activities are divided into 258 sectors. Those NACE 4 sectors frequently comprise a large number of subsectors (at the eight-digit Prodcom level) (Annex 11), while other NACE 4 codes comprise one single subsector (i.e. product) at the disaggregated Prodcom level (e.g. malt). Unless otherwise stated, "sector" refers to NACE 4 and "subsector" refers to the Prodcom classification.

Relying on the NACE 4 level to determine eligible sectors inevitably means that – within a given NACE 4 code – there may be production processes which are relatively less electricity-intensive and which may 'free ride' based on other much more electricity-intensive subsectors and products within the same NACE 4 code. Conversely, some electricity-intensive subsectors and processes may be excluded from eligibility because of a lower relative level of electricity consumption in the NACE 4 code as a whole.

The CO2 price assumption for 2013-2020 is another fundamental determinant of sector eligibility. The Report uses €30 as the principal price assumption. The uncertainties related to

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94 Article 10a(14): “… the Commission shall assess, at Community level”). Some stakeholders have argued in favour of a Member State-specific level of assessment.
95 See e.g. Cambridge Econometrics (2010).
the CO2 price (see section 4.6 above) nevertheless call for the use of sensitivity tests using both lower (€10, €20) and higher price assumptions (€40).

5.1.2. Economic, social and environmental impacts (carbon leakage)

By definition carbon leakage involves increased global CO2 emissions, lowering economic activity and employment in the EU. The environmental, economic and social impacts of carbon leakage are inextricably tied together. Those impacts will nevertheless be distinguished as far as possible.

5.1.3. Impacts in terms of maintaining ETS incentives

The ETS Directive requires that the ETS Guidelines maintain the incentives for electricity savings and the shift from grey to green electricity\(^96\).

5.1.4. Internal market distortions

The ETS Guidelines may give rise to distortions in the internal market. Potential distortions within sectors and between sectors will be assessed.

5.1.5. Significant uncertainty as to how many Member States will grant State aid as well as the aid amounts and sectoral and sub-sectoral coverage

It is not known how many Member States and which Member States will in the end avail themselves of the possibility to grant aid during the period 2013-2020. If aid is granted the beneficiary sectors and subsectors are also unknown. In assessing the impacts the Report proceeds on the basic assumption that Member States will by and large avail themselves of the ETS Guidelines, while also considering some situations were that assumption would not hold.

Some stakeholders have expressed concerns that only some Member States may grant aid\(^97\). Some have even argued that all Member States should be obliged to grant aid on the same terms, i.e. a scenario which is legally ruled out.

The complete discretion on the part of the Member States to grant aid is a fundamental difference compared to free allocation of EUAs aimed at preventing carbon leakage due to direct CO2 costs. That free allocation is harmonised at EU level, implying equal treatment of all eligible sectors and subsectors across the Member States.

5.2. Baseline Scenario: no State aid

Under the Baseline Scenario no ETS Guidelines would be adopted. No sector or subsector would be eligible for or could receive State aid. If Member States were to grant the type of aid envisaged in the ETS Directive in respect of carbon leakage, such aid would not be in line with State aid rules. Member States would only be allowed to grant up to €200,000 per undertaking per three-year period, in accordance with the State aid rules on \(de minimis\) aid.

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\(^{96}\) Article 10a(6) of the ETS Directive.

\(^{97}\) See e.g. replies to questionnaire by the Association of Swedish Miners and the Flemish Region.
5.2.1. Economic, social and environmental impacts (carbon leakage) under the Baseline Scenario

5.2.1.1. Economic impacts under the Baseline Scenario

One simple proxy to identify the sectors most at risk of carbon leakage under the Baseline Scenario would be to list the in order of their indirect CO2 costs as a share of sector gross value added.

The following five sectors have the highest indirect CO2 costs as a % of their GVA (above 5%): Manufacture of leather clothes (5%<x<30% indirect CO2 costs/GVA); Aluminium production (10.3%); Manufacture of industrial gases (7.5%); Mining of chemicals and fertilizer minerals (6.6%); Manufacture of other inorganic chemicals (6%) and Lead, zinc and tin production (6%).

After that comes a second group with indirect CO2 costs in the range of 3-5%: Manufacture of paper and paperboard (4.8%); Manufacture of fertilizers and nitrogen compounds (4.8%); Manufacture of coke oven products (4.6%); Manufacture of cement (4.4%); Preparation and spinning of cotton-type fibres (4.0%); Manufacture of basic iron and steel (3.6%); Manufacture of malt (3.5%) and Copper production (3.4%).

Next, twelve sectors have indirect CO2 costs in the range 2-3% and 14 sectors with indirect CO2 costs in the 1-2% range (see Annex 8).

Under the Baseline Scenario EU industry is fully exposed to CO2 price signal arising from ETS 3. Some studies have been carried out to estimate the macroeconomic impact of direct and indirect CO2 costs. The 2008 impact assessment accompanying the proposal to amend the ETS Directive98 estimated the aggregate cost impact (direct and indirect CO2 costs) at 0.58% of EU GDP99. Those estimates assumed that the CO2 during ETS 3 would be €30. For all 258 sectors (at NACE 4 level)) potentially concerned, the data on which the 2010 Carbon Leakage Decision (and this Report) relies, indirect CO2 costs made up 48% of the total. On that basis, the total GDP impact resulting from indirect CO2 costs imposed on EU industry amounts to close to one quarter of a percentage point of EU GDP (based on a CO2 price of €30).

The Commission subsequently estimated the macroeconomic impact of moving from the present ETS target of a 20% to a 30% reduction of CO2 emissions by 2020100. Based on CO2 prices of respectively €30 and €55 by 2020 the total additional GDP was estimated to be in the 0.22-0.31% range.

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99 Eurostat data for 2007 based on a weighting of the sectors' GVA, excluding sectors for which GVA was confidential, and using the upper bounds of cost intervals for those sectors where direct or indirect costs were only provided in intervals.
100 See European Commission (SEC(2010)650/2), pp. 52-54. The findings build on a number of different models including PRIMES. This Impact Assessment was preceded by consultation of the social partners (Recital 25 of the ETS Directive).
Those modelling results are consistent with the findings in the carbon leakage literature that the potential macroeconomic effects of carbon leakage are limited\textsuperscript{101}.

The gross value added of the EU manufacturing sector which would ineligible for State aid (258 NACE 4 sectors) amounts to around €1,218bn.

It is fraught with particular difficulty to quantify the benefits of the Baseline Scenario. The starting point of that assessment would be that no industry sector is sheltered from the indirect CO2 cost component in the CO2 price. To that extent the Baseline Scenario would fully support the EU's decarbonisation (binding and non-binding) targets compared to scenarios involving State aid. No sector would be sheltered and the CO2 price signal would apply across all ETS sectors. Neither the impact assessment in relation to the ETS done in 2008 nor the impact assessment relating to a possible increase of the EU's CO2 reduction target to 30% quantifies those benefits. The Commission's Energy Roadmap 2050 refers to major positive economic and employment impacts of decarbonisation\textsuperscript{102}.

An indication of the scale of benefits associated with non-exemption for energy intensive industries is found in the OECD working paper "A Framework for Assessing Green Growth Policies". It refers to analysis said to show that exempting energy-intensive industries from the application of a carbon tax or a cap and trade scheme could raise the global cost of achieving a given emission-reduction target by as much as 50%. It is argued that such exemptions would entail forgoing a range of low-cost abatement opportunities in a sector which represent a significant share of total CO2 emissions\textsuperscript{103}.

Given the interconnected nature of EU industry any positive developments could in any case have large multiplier effects. Of all the sectors in the economy, the manufacturing sector has the greatest multiplier effects.

5.2.1.2. Employment impacts under the Baseline Scenario

A severe lack of data availability has been found to exist as regards employment effects due to carbon leakage\textsuperscript{104}. The capital intensive nature of the sectors likely to be most exposed to carbon leakage under the Baseline Scenario means that relatively speaking the direct impact on employment would be more limited than their direct economic impact (Annex 16, table 15), a finding confirmed by the literature on carbon leakage\textsuperscript{105}.

\textsuperscript{101} See de Bruyn et al (2008) estimating the impact of direct CO2 costs on Dutch GDP to amount to 0.2% (half of which could be passed on to consumers by the sectors concerned); see also Neuhoff (2008), p. 121, Grubb (2010), p. 11 and Reinaud (2010), p. 7. The same conclusions are drawn in by the European Parliament (2010): "Carbon leakage is expected to be rather small in most studies and can be offset by technology spill-over. Employment losses due to carbon leakage will be concentrated in a few processes and facilities", p. 6.


\textsuperscript{103} OECD (2010), p. 56.


\textsuperscript{105} Reinaud (2010), p. 7 referring to studies on US suggesting that the economic effect of carbon leakage would be greater than the employment effect.
There is a wide range of uncertainty as regards the overall employment impact of the EU's energy and climate policy (including the 20% CO2 reduction target). Some assessments by the Commission refer to a range of employment impacts between a negative net impact of 1% as well as positive net impact of the same magnitude. The uncertainties as to the net employment effect (loss of employment and new "green" jobs) are due e.g. to the degree of labour market flexibility.

Keeping the uncertainties in mind, negative side effects of climate policy are more likely to materialise in the short term, while positive impacts are rather to be expected in the medium and long term. Nevertheless, Eco-industries in the EU have already expanded rapidly in the EU, growing to become a sector equivalent to chemicals. Annual employment growth between 1999 and 2008 has averaged around 179 000 jobs per year in this sector, over 7% growth. In 2008 it was estimated to employ 3.4 million people across the EU.

The Member States may also decide to use their auctioning revenue (around half of all EUAs will be auctioned during ETS 3) to mitigate any social impacts that may occur due to carbon leakage. Auctioning revenues at a carbon price of €20 per EUA would roughly yield €20bn in revenues. The Member States may also use the proceeds for other ends, e.g. investing in low-carbon technology and infrastructure.

Carbon leakage may also have an impact on the EU's skills base. A recent study describes the manufacture of coke, refined petroleum products, the manufacture of chemicals, chemicals product and man-made fibres as 'high skill', the manufacture of pulp and paper as 'low intermediate skill' and mining and quarrying, manufacture of food products and beverages, textiles and textile products, leather and leather products, rubber and plastic products and other non-metallic products as 'low skill'.

5.2.1.3. Environmental impacts under the Baseline Scenario

The 2008 impact assessment underlying ETS 3 above modelled the potential impact on CO2 emissions from energy intensive industries (i.e. covering both direct and indirect CO2 costs). The model simulations indicated that the achievement of the 20% independent CO2 reduction without addressing the impacts on the energy intensive sectors could lead to a rise...

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106 See European Commission (SEC(2011) 288 final), Impact assessment relating to Energy Strategy 2050; see also Bruegel Working Paper 2011/08 ("Assessing the Impact of the EU ETS Using Firm Level Data") which also finds that the impact of the ETS on employment has been limited.
108 The replies to the questionnaire submitted by the chemical industry emphasise the contribution that the chemicals industry can make towards the transition to a low-carbon economy.
109 European Commission (SEC(2011) 1188)
110 See p. 3 of MEMO/11/258 Brussels, 27 April 2011 relating to the Commission's Benchmarking Decision.
112 The PACE model was used. PACE is a global general equilibrium model similar to the GEM-E3 model but with more detail on electricity generation technologies. PACE was used to examine the sector specific impacts on energy-intensive industries of meeting a 30% renewable electricity target and the greenhouse gas objectives.
in emissions beyond business as usual in other world regions (i.e. carbon leakage) equal to 2.5% of EU27 emissions and hence reduce the overall effect of EU policies accordingly. This would roughly translate into an outer bound carbon leakage impact of 1.25% of all EU emissions.

Even under the Baseline Scenario it is however likely that even if there were carbon leakage the beneficial environmental effect of the ETS cap would never be fully wiped out. The carbon leakage literature suggests that the environmental impact (i.e. carbon leakage which means that CO2 emissions rise in non-EU countries), in terms of increased CO2 emissions outside the EU would be lower than the loss of economic activity within the EU (e.g. in the form of shifts of production). A study estimates that in the US around one quarter of the reduction of domestic industrial activity would be reflected in carbon leakage (i.e. increased CO2 emissions abroad)\(^\text{113}\). This suggests that if the EU ETS leads to reduced activity within a sector that will not necessarily lead to an equivalent increase in global emissions.

To the extent that carbon leakage occurs, the reduced level of economic activity would also entail somewhat lower pressure for resources in the domestic markets. Carbon leakage could thus also indirectly weaken the ETS price signal given that the need for EUAs would be lower.

5.2.2. *Maintaining ETS efficiency under the Baseline Scenario*

*Impact on ETS sectors*

Under the Baseline Scenario all ETS sectors would be faced with the full costs of the ETS price signal, i.e. the CO2 price. All ETS sectors would therefore have higher incentives to increase their electricity efficiency. The CO2 abatement possibilities would be at a maximum as decentralised decision-making would enable the market and all sectors exposed fully to the CO2 price to continuously search for the cheapest abatement options\(^\text{114}\). The amount of industrial electricity consumption that would not be insulated from the CO2 at all amounts to around 1219 TWh\(^\text{115}\). That consumption roughly amounts to a value of €100bn at a price of 10 cents/KWh\(^\text{116}\).

By not insulating some industrial sectors within the ETS from the CO2 price signal, no extra burdens in terms of meeting the reduction targets under ETS 3 would be imposed on other ETS sectors not eligible for State aid.

*Impact on non-ETS sectors*

In addition, as no ETS sectors are sheltered from the CO2 cost in electricity prices the rest of the economy (transport, agriculture, construction, services, households etc.) would not have to bear the increase in electricity cost which would likely result in insulation of some ETS


\(^{114}\) OECD (2010), pp. 20, 23; Stern (2009).

\(^{115}\) The aggregate electricity consumption estimates in Section 5 is based in the first place on Eurostat data for 2007. If unavailable, figures from the most recent of the three previous years were used. Figures were based on the 'high end' figure (involving extrapolation from available consumption data across the EU).

\(^{116}\) Price assumption taken from Eurostat. The figure may be inflated as large purchasers may be charged a lower KWh.
sectors from the CO2 price signal. The insulated sectors – i.e. the sectors receiving aid – can be expected to maintain their demand for electricity independently of the ETS CO2 price signal in so far as that they receive State aid.

5.2.3. Distortions of the internal market under the Baseline Scenario

Intra-sector distortions

Under the Baseline Scenario no Member State could provide the operating aid envisaged by the ETS Directive. No intra-sector internal market distortions would arise in the form aid being given to sectors by some Member States only.

Another intra-sector second distortion could however result from a scenario where a) installations in a sector use widely varying proportions of fuels (direct CO2 costs) and electricity (indirect CO2 costs) to produce the same product and b) only those incurring direct CO2 costs receive the compensation envisaged by the ETS Directive. Under the Baseline Scenario unequal treatment would mean that installations mainly using direct fuels would receive EUAs for free whereas installations mainly using electricity would not receive compensation for indirect CO2 costs (e.g. blast oxygen furnace steel versus electric arc steel and chemical pulp and paper compared to mechanical paper and pulp) (see Annex 10 for more detail on these and other sectors).

Strictly speaking such unequal treatment could not – in the short term – affect the competitive balance between fuel-reliant and electricity-reliance sectors within the same sector. This is so because a sector receiving free EUAs for direct CO2 costs still incurs opportunity costs that would leave that sector's cost structure and output decisions unaffected. Indeed, there is a large degree of consensus in the carbon leakage literature that installations that receive EUAs for free treat these costs (in order to determine their production decisions) in the same way as installations which have had to pay for their EUAs. Thus both paying and non-paying installations face the same CO2 costs. The difference being that the non-paying installations face opportunity costs and the paying installations face actual (or "accounting") costs. As one leading commentator formulates this central insight:

"… whether allowances are provided for free or auctioned, the value of carbon emissions allowances should be reflected in the prices of products whose producers' emissions are capped since every unused carbon allowances has a market value (the so-called opportunity cost")

But even taking into account the opportunity costs incurred by installations receiving free EUAs as compensation for their direct CO2 costs and even if the least distortive mechanisms were used to provide the aid – i.e. basing the aid on historical production as opposed to actual output – the non-insulated sectors would – in the case of non-alignment of the treatment of indirect and direct CO2 costs - be disadvantaged in terms of profitability. Even, though,

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117 Given the standard assumption in microeconomics that a firm aims to maximise its profits rather than its market share.
strictly speaking, the competitive position of an installations relying primarily on electricity – incurring indirect CO2 costs – within the same sector would however not change vis-à-vis installations having received EUAs for free, hat distributional impact is considered to be an internal market distortion for the purposes of this Report. To that extent, the Baseline Scenario results in inter-sector distortions.

**Inter-sector distortions**

An inter-sector distortion in the internal market could arise where there is a degree of substitutability between different sectors and where only one of those sectors was eligible for aid. As mentioned above, the (ETS and non-ETS) sectors and parts of society not receiving aid (the non-insulated sectors) would be disadvantaged as they “would have to work harder” to meet the overall CO2 reduction targets under ETS 3.

5.3. **Maximalist Package: A1 (151 sectors/13 subsectors), B1 (100% and stable aid intensity), C1 (regional CO2 factors) and D1 (actual output)**

5.3.1. **Eligibility of sectors and subsectors under the Maximalist Package (including under different CO2 price assumptions)**

Under the Maximalist Package all 151 sectors and 13 subsectors eligible under the 2010 Carbon Leakage Decision\(^{120}\) would also be eligible for State aid for indirect CO2 costs\(^{121}\) (see Annex 7 for an exhaustive list of these sectors and subsectors). Broadly, more than two thirds of all EU mining and manufacturing sectors would be eligible for aid. The eligible sectors would include more than 100 sectors with no indirect CO2 costs or indirect CO2 costs of less than 1%.

Given that level of aggregation – i.e. sectors at NACE 4 level – there is also a risk that subsectors may 'free ride' on other subsectors with much higher electricity costs as a percentage of gross value added; however, that effect is an inevitable by-product of having to rely (largely) on NACE 4 as the level of analysis. The electricity benchmarks used to calculate the maximum aid amount for eligible sectors mitigate the risk inasmuch the actual amount of electricity needed to produce a tonne of the relevant product is built into each benchmark (see Annex 12).

5.3.2. **Economic, social and environmental impacts (carbon leakage) under the Maximalist Package**

Compared to the Baseline Scenario, the Maximalist Package would likely eliminate to a large extent the risk of carbon leakage for the 151 eligible sectors and 13 subsectors (on the basic assumption that all or most Member States would fully grant aid to those sectors within their own territories and that they would all do so up to the maximum aid amount). The gross value added represented by those 151 sectors amounts to around €900bn (roughly half of the entire GVA of EU industry).

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\(^{120}\) Both the ETS Directive and the 2010 Carbon Leakage Decision lay down an annual update procedure whereby additional sectors and subsectors can be placed on the eligibility list. At the time of writing no such additions had been made.

\(^{121}\) A number of stakeholders support this Option (e.g. Italy and Vattenfall).
The risk of carbon leakage (and the attendant social and economic impacts) in a Member State may however increase in so far as that Member State decides to allocate aid to all sectors and subsectors, staying well below the maximum aid amount allowed. In such a scenario involving dilution of the aid, the sectors that are in reality at the greatest risk of carbon leakage may not receive sufficient aid to stave off that risk.

Other elements of the Maximalist Package would further minimise the risk of carbon leakage: the 100% aid intensity; the use of regional CO2 factors (which aim capture to the greatest practical extent the actual CO2 costs paid by the sectors and subsectors) and making the aid depend on actual instead of historical production.

5.3.3. Maintaining ETS incentives under the Maximalist Package

Impact on ETS sectors

The eligible 151 sectors represent 676 TWh of electricity consumption (somewhat more than half of all industrial electricity consumption in the EU). If the basic assumption holds (i.e. maximum use of State aid by the Member States) a considerable part of EU industry would thus be sheltered. The number of installations subject to the full CO2 price signal would be significantly reduced. First of all, the electricity consuming industrial sector thus sheltered – the 151 sectors – would be subject to reduced incentives to reduce electricity consumption. On the other hand, the non-sheltered ETS sector electricity producers and the non-insulated part of EU industry) would face a higher CO2 price signal and a proportionately greater adjustment burden (in terms of having to abate CO2 emissions or buy EUAs) (see table below as well as Annex 16, figure 25, tables 9-10). This is so given that the same CO2 emissions reduction must take place overall given that – the legally binding – ETS cap remains the same. In the words of one of the leading commentators in the carbon leakage field:

"Protecting energy intensive sectors inevitably requires the rest of the economy to 'work harder' to reach a given emissions target"122.

While the non-insulated ETS sectors would be subject to higher abatement incentives. it is nevertheless acknowledged that the broader the scope of a cap and trade scheme (such as the ETS) in terms of entities and jurisdictions covered, the greater the efficiency of the scheme123. By insulating more than half of all industrial electricity use in the EU, the range of abatement possibilities would be much reduced as the scope for decentralised decision-making would shrink. Cheaper CO2 abatement potential within the sheltered sectors would be more likely to remain unexploited (such as abatement not requiring new investment). There is no evidence that the electricity sector is inherently more innovative than the industrial sector. The incentives for the sheltered part of EU industry would be blunted over time.

The impact on ETS efficiency of such insulation is likely to be much accentuated by the use of aid being provided for actual production (Option D1). While he use of regional CO2 factors (Option C1) would make the Maximalist Package likely to somewhat weaken the incentives under the ETS for industrial sectors (compared to the EU average factors in

122 Grubb (2010).

Options C2 and C3)\textsuperscript{124}, the use of Option D1 – increases in aid for increased production – is more significant in terms of weakening the ETS incentives\textsuperscript{125}. The choice between aid for actual production (an ongoing annual subsidy for electricity consumption) or historical production (an annual fixed amount irrespective of production) is fundamental from the point of view of maintaining the ETS incentives.

**Impact on non-ETS sectors**

Large-scale insulation against the CO2 price signal would however not only place extra burdens on the non-sheltered ETS sectors.

As insulation of 151 industrial sectors (and 13 subsectors) causes the CO2 price to rise for the remaining ETS sectors, the electricity sector's costs for EUAs will rise. There is every likelihood that those extra costs will be – in significant part – passed on to all electricity consumers including those outside the ETS (including sectors such as transport, construction, agriculture, the public sector or households to the extent that the any of these do not enjoy fixed regulated electricity tariffs). Energy (including electricity costs) makes up a significant part of household income.

The fact that such effects are widely diffused across society does not mean that they – taken as an aggregate – can be discarded. Based on figures from 2005 (see Annex 16, table 17) households and services in EU27 accounted for an electricity consumption of 1554 TWh compared to 1127 TWh consumed by industrial and mining sectors (i.e. the 258 NACE 4 sectors). Some non-ETS sectors are in fact electro-intensity (such as the railway sector). A study cited by the EU rail sector estimates that pass-on of electricity cost could lead to additional annual costs for the rail sector of €0.5bn (claimed to induce a shift towards transport modes with higher CO2 emissions)\textsuperscript{126}.

5.3.4. **Internal market distortions under the Maximalist Package**

**Intra-sector distortions**

The Maximalist Package would – among the four Packages - reduce scope for intra-sector distortions to the greatest extent (on the basic assumption that all Member States fully provide State aid to the 151 sectors. Likewise, on that assumption, the Maximalist Package would entail the most equal treatment of fuel reliant and electricity reliance sectors in terms of distribution (i.e. profitability). In so far as the basic assumption does not hold the scope for intra-sector distortions would significantly increase.

Regional CO2 factors mean that the same sector is treated equally across Member State in so far as those factors serve as best available proxies for marginal pricing across the whole EU.

\textsuperscript{124} The aid amount would be adjusted to even the areas which have the highest CO2 factor, i.e. in those Member States or regions where electricity production result in prices containing the highest relative CO2 component.

\textsuperscript{125} OECD (2010), p.

Inter-sector distortions

Compared to the Baseline Scenario the Maximalist Package would considerably reduce – in so far as the Member States would actually grant aid – the risk of distortions of competition between sectors in so far as products of such sectors are in competition with each other. But – as explained - the non-insulated sectors (whether ETS or non-ETS) would have to make greater efforts to meet the ETS 3 cap. This would be so in part because the insulated sectors would not face the CO2 price signal as the aid under the Maximalist Package would be based on actual – and not historical – output.

5.4. Minimalist Package: Option A2 (5 sectors), Option B4 (Less than 100% and degressive aid intensity), Option C2 (EU average CO2 factor (0.465 CO2t/MWh)) and Option D2 (historical output)

5.4.1. Eligibility of sectors and subsectors (including under different CO2 price assumptions)

The following five NACE 4 sectors would qualify under the Minimalist Package: Mining of chemicals and fertiliser minerals (NACE 1430); Manufacture of leather clothes (NACE 1810); Manufacture of other inorganic chemicals (NACE 2413); Aluminium production (NACE 2742) and Lead, zinc and tin production (NACE 2743).

As mentioned, the choice of NACE 4 as the main level of analysis inevitably means that 'free-riding' subsectors may be deemed eligible even though electricity intensity of their production processes is relatively low. This 'subsector free rider' problem arises in particular in relation to sectors such as 'other inorganic chemicals' (NACE 2413) which comprises 98 subsectors (Prodcom), only a few of which possess particularly electricity intensive production processes (notably the production of chlorine via electrolysis). Likewise, the electricity intensive process linked to zinc production (via electrolysis) explains the inclusion of other non-ferrous metals such as lead (which are produced via less electricity intensive processes)127.

The Minimalist Package entails the potential problem of exclusion of subsectors in situations where electricity intensive procedures at the subsector level are embedded in sectors which do not qualify under the two cumulative quantitative criteria under the Minimalist Package.

Sensitivity tests using €10 and €20 to calculate the indirect CO2 cost as a share of the sectors' GVA instead of the primary CO2 price assumption of €30 (see section 4.6 above) result in only one sector becoming eligible under the Minimalist Package, namely Aluminium production (NACE 2742).

At a CO2 price of €40 on the other hand the following four sectors qualify in addition to the five qualified based on €30: Manufacture of paper and paperboard (NACE 2112); Manufacture of fertilizers and nitrogen compounds (NACE 2415); Manufacture of coke oven products (NACE 2310) and Preparation and spinning of cotton-type fibres (NACE 1711).

127 In fact, it is generally only part of the production process which is electro-intensive. For example, primary smelting in the case of zinc (see reply to questionnaire by IZA Europe).
At 40€ the indirect CO2 costs of Manufacture of cement (NACE 2651) pass the 5% cost threshold; however, cement does not meet the 10% trade intensity threshold under the Minimalist Package. On the other hand, cement qualifies under the Maximalist and Second Intermediate Packages.

5.4.2. Economic, social and environmental impacts (carbon leakage) under the Minimalist Package

Compared to the Baseline Scenario, the Minimalist Package would only be likely eliminate to a large extent the risk of carbon leakage for the five eligible sectors (assuming that all or most Member States would fully grant aid to those sectors within their own territories and that they would all do so up to the maximum aid amount). The gross value added represented by those five sectors amounts to €18.5bn.

The design of the Minimalist Package implies that it would entail the greatest risks in terms of carbon leakage. It is thus the Package which most closely approaches the Baseline Scenario.

Except for the five sectors included (e.g. inorganic chemicals, aluminium, zinc, lead and tin) the likely economic, social and environmental impacts can be assimilated to those outlined for the Baseline Scenario above.

Compared to the Maximalist Package (under which 151 sectors qualify), the Minimalist Package involves the exclusion of 146 sectors. At the EU level, these 146 sectors account for around 52% of total manufacturing, mining and quarrying GVA (and 8% of EU27 GDP)\textsuperscript{128}. They account around 45% of total manufacturing, mining and quarrying employment.

5.4.3. Maintaining ETS incentives under the Minimalist Package

The insulation effect would be limited to five sectors which together represent 113 Twh (close to 10% of EU industrial electricity consumption). Two production processes within two of those five sectors (aluminium electrolysis and chlorine production) alone make up around 8% of all industrial electricity use in the EU (see table below).

<table>
<thead>
<tr>
<th>Process</th>
<th>TWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium electrolysis</td>
<td>54.4</td>
</tr>
<tr>
<td>Copper electrolysis</td>
<td>1.13</td>
</tr>
<tr>
<td>Zinc electrolysis</td>
<td>6.7</td>
</tr>
<tr>
<td>Chlorine production</td>
<td>36.1</td>
</tr>
</tbody>
</table>

Source: Ecofys and Fraunhofer

Of the four Packages examined the Minimalist Package would be most likely to maintain incentives under ETS 3.

\textsuperscript{128} Eurostat data for 2007. These figures are rough estimates. In respect some 20 sectors data is missing or exist for years other than 2007.
**Impact on ETS-sectors**

The Minimalist Package in particular is liable to maintain the ETS incentives in that it is based on an installation’s historical – as opposed to actual – production level (Option D2). Thus the aid does not increase with increases in production (and the attendant rise in CO2 emissions). Likewise, the fact that the historical costs are only covered in part and in that the aid falls each year means that the installation is incentivised to reduce indirect CO2 costs. That effect is buttressed by use of a uniform CO2 factor across the EU which means that an installation is only covered up to that CO2 factor (0.465 CO2t/MWh), even if the CO2 factor in the Member State or region where the installation is based is higher.

The Minimalist Package (compared to the three other Packages) would also be most likely to maintain the incentives of electricity generators to invest in low-carbon generation capacity for the longer term even if it is unlikely that this would affect the supply decisions of the electricity generators in the short term (as pointed out by many stakeholders). The principal incentives for electricity generators to invest in green technologies is that the EUAs they require will be subject to full auctioning under ETS 3 (2013-2020)\(^{129}\).

Industry stakeholders have on the other hand argued that aid at less than 100% aid intensity (incorporated in the Minimalist Package) would reduce the funds available for industry to undertake low-carbon investments\(^{130}\).

The Minimalist Package would be most consistent with the Commission's policy on a shift towards a low-carbon-intensive economy\(^ {131}\) towards which all sectors are expected to contribute\(^ {132}\). The relevant Communication emphasises that clear and irreversible signals are needed to incentivise a shift towards a low-carbon economy\(^ {133}\).

Of all Packages, the Minimalist Package would be most likely to enhance the cost-effectiveness of the ETS, as that Package narrows the list of eligible sectors the most. It thus comes closest to the Baseline Scenario is maximising ETS efficiency.

**Impact on non-ETS sectors**

Of all Packages, the Minimalist Package would likely entail the lowest relative burdens in terms of higher electricity prices for other (non-ETS) parts of the economy (given that lower extra costs borne by electricity producers – and largely passed on), as that Package contains the lowest number of eligible sectors.

\(^{129}\) An argument made by IFIEC in its reply to the questionnaire.

\(^{130}\) See reply to questionnaire by Eurofer.

\(^{131}\) The Opinion of the Commission's Impact Assessment Board on the impact assessment accompanying the said Communication (European Commission (SEC(2010) 650) states that this Communication and the related impact assessment should serve as a common analytical base for other work undertaken by the Commission related to the shift to towards a low-carbon economy.

\(^{132}\) See MEMO/11/258 Brussels, 27 April 2011 relating to the 2011 Benchmarking Decision ("... it shows that EU is pressing ahead with the implantation of its ambitious climate agenda and that it is serious in striving for a low carbon economy where all sectors will need to contribute to emission reduction" (emphasis added)).

5.4.4. Internal market distortions under the Minimalist Package

Intra-sector distortions

Intra-sector distortions resulting from aid being granted by some Member States would – even if the basic assumption were not hold - only be limited to the five eligible sectors (i.e. the lowest likely degree of distortions of the four Packages). Any subsidy races between the Member States would also by definition be confined to those situations.

There would be more scope for intra-sector distortions in the form of unequal treatment in terms of impact on profitability given that fuel-reliant sectors covered by the 2010 Carbon Leakage Decision (151 sectors and 13 subsectors) receive subsidies during ETS 3 in the form of free EUAs. A uniform CO2 factor would also be unfavourable to installations in Member State with higher CO2 intensities in their electricity generation.

Inter-sector distortions

Compared to the other three Packages there would be greater scope for inter-sector distortions between substitutable products and materials. On the other hand, unequal treatment in the form of greater burdens being imposed on non-aid receiving (“non-insulated”) sectors would likely be lower compared to the other three Packages. This would be so in part given that the aid-receiving sector would be exposed to the same CO2 price signal as the aid would be based on historical (and not actual) output.

5.5. First Intermediate Package: A3 (14 sectors and two sets of subsectors), B3 (less than 100% and stable aid intensity), C1 (regional CO2 factors) and D2 (historical output)

5.5.1. Impact in terms of eligibility of sectors and subsectors under the First Intermediate Package

Under the First Intermediate Package, 14 sectors and two sets of subsectors become eligible.

The eligible sectors automatically include the five sectors eligible under the Minimalist Package: Mining of chemicals and fertiliser minerals (NACE 1430); Manufacture of leather clothes (NACE 1810); Manufacture of other inorganic basic chemicals (NACE 2413); Aluminium production (NACE 2742) and Lead, zinc and tin production (NACE 2743).

Second, it includes the following sectors based on the qualitative assessment criteria: Mining of iron ores (NACE 1310); Preparation and spinning of cotton-type fibres (NACE 1711); Manufacture of fertilizers and nitrogen compounds (NACE 2415); Manufacture of paper and paperboard (NACE 2112); Manufacture of basic iron and steel (NACE 2710); Copper production (NACE 2744) and Manufacture of other organic basic chemicals (NACE 2414); Manufacture of industrial gases (NACE 2411); Manufacture of man-made fibres (NACE 2470).

The following two sets of subsectors are also deemed eligible under the qualitative assessment: seamless steel pipes within Manufacture of stainless steel pipes (NACE 2722)
as well as a limited number of commodity polymers within **Plastics in primary forms** (NACE 2416) (see Annex 10).

5.5.2. **Economic, social and environmental impacts (carbon leakage) under the First Intermediate Package**

In respect of sectors eligible under the First Intermediate Package, the risk of carbon leakage and the related economic and social impacts for such sectors would be reduced compared to the Minimalist Package.

The carbon leakage related impacts under the First Intermediate Package are more similar to those under Minimalist Package than under the Maximalist Package. Nevertheless, the GVA of the eligible sectors – €160bn – is significantly higher compared to the Minimalist Package (partly as it include high value added sectors within EU manufacturing industry such as steel, organic chemicals and part of the plastics sectors). The First Intermediate Package would also capture several of the most labour intensive NACE 4 sources (notably steel and paper) (see figure below).

![Sectors’ employment as a share of total EU27 employment](chart)

**Source:** Own calculations based on available Eurostat data.

5.5.3. **Maintaining ETS incentives under the First Intermediate Package**

The insulation effect would be limited to a number of sectors which together represents 408 TWh, around a third of EU industrial electricity consumption (to be compared to close to ten percent under the Minimalist Package and more than half under the Maximalist Package). At a price of 10 cents/KWh that consumption amounts somewhat over €30bn.

**Impact on ETS sectors**
The First Intermediate Package would be more likely to maintain incentives under ETS 3 than the Second Intermediate package and in particular the Maximalist Package.

In terms of rough orders of magnitude, based on the premise of full use of the possibility to grant State aid, it is recalled that the Minimalist Package would insulate roughly 10%, the First Intermediate Package around a third and the Maximalist Package about half of the electricity consumed by EU industry.

The ETS incentives would in particular be maintained through the use of historical output (i.e. an annual fixed aid amount compared on a subsidy linked to actual production). To some extent the use of regional CO2 factors would detract from the ETS incentives.

**Impact on non-ETS sectors**

The potential spill-over in terms of higher electricity prices passed on into the non-ETS part of the economy in terms of would be greater compared to the Minimalist Package but smaller compared to the Maximalist Package.

5.5.4. **Internal market distortions under the First Intermediate Package**

**Intra-sector distortions**

The longer list of sectors and subsectors under the First Intermediate Package (compared to the Minimalist Package) would only increase the risk of potential intra-sector distortions of competition compared to the Minimalist Package if there were deviations from the basic assumption that the Member States comprehensively exploit the possibilities to grant aid.

**Inter-sector distortions**

The First Intermediate Package would also reduce possible distortions in the internal market by including products which may potentially to some extent be in competition with each other (aluminium and steel).

Given that the aid under the First Intermediate Package is based on historical output, other inter-sector distortions would be reduced (see section 5.4.4 on the Minimalist Package).

5.6. **Second Intermediate Package**: A4 (35 sectors), B2 (less than 100% and stable aid intensity), C3 (EU average marginal CO2 factor (0.75 CO2t/MWh)) and D1 (actual output)

5.6.1. **Eligibility of sectors and subsectors under the Second Intermediate Package**

The following **35 sectors** would be eligible under the Second Intermediate Package:

- Manufacture of lime (NACE 2652);
- Manufacture of cement (NACE 2651);
- Manufacture of coke oven products (NACE 2310);
- Manufacture of fertilizers and nitrogen compounds (NACE 2415);
- Aluminium production (NACE 2742);
- Manufacture of other inorganic basic chemicals (NACE 2413);
- Manufacture of refined petroleum products (NACE 2320);
- Manufacture of paper and paperboard (NACE 2112);
- Manufacture of basic iron and steel (NACE 2710);
- Manufacture of flat glass (NACE 2611);
- Lead, zinc and tin production (NACE 2743);
- Manufacture of hollow glass (NACE 2613);
- Manufacture of starches and starch products (NACE 1562);
- Manufacture of malt (NACE 1597);
Production of ethyl alcohol from fermented materials (NACE 1592); Copper production (NACE 2744); Manufacture of other organic basic chemicals (NACE 2414); Manufacture of sugar (NACE 1583); Preparation and spinning of cotton-type fibres (NACE 1711); Mining and agglomeration of hard coal (NACE 1010); Mining of chemicals and fertilizer minerals (NACE 1430); Manufacture of leather clothes (NACE 1810); Manufacture of synthetic rubber in primary forms (NACE 2417); Cold drawing (NACE 2731); Other non-ferrous metal production (NACE 2745); Manufacture of agricultural tractors (NACE 2931); Manufacture of other non-distilled fermented beverages (NACE 1595); Manufacture of ceramic tiles and flags (NACE 2630); Manufacture of cast iron tubes (NACE 2721); Manufacture of bricks, tiles and construction products, in baked clay (NACE 2640); Manufacture of industrial gases (NACE 2411); Mining and agglomeration of lignite (NACE 1020); Quarrying of limestone, gypsum and chalk (NACE 1412); Manufacture of plasters (NACE 2653) and Casting of iron (NACE 2751).

A price assumption of €10 results in four eligible sectors: Manufacture of lime (NACE 2652); Manufacture of cement (NACE 2651); Manufacture of coke oven products (NACE 2310) and Manufacture of fertilizers and nitrogen compounds (NACE 2415).

At a price of €20 a further six sectors would be added: Aluminium production (NACE 2742); Manufacture of other inorganic chemicals (NACE 2413); Manufacture of refined petroleum products (NACE 2320); Manufacture of paper and paperboard (NACE 2112); Manufacture of basic iron and steel (NACE 2710) and Manufacture of flat glass (NACE 2611).

At a CO2 price of €40 only one more sector - Manufacture of man-made fibres (NACE 2470) – would be added to the list of 35 sectors (resulting from the basic price assumption of €30).

5.6.2. Economic, social and environmental impacts (carbon leakage) under the Second Intermediate Package

The First Intermediate Package would likely eliminate to a large extent the risk of carbon leakage for the 35 eligible assuming that all Member States would fully grant aid to those sectors within their own territories and that they would all do so up to the maximum aid amount. The gross value added represented by the 35 sectors eligible amounts to €211bn.

The Second Intermediate Package would – on the said assumptions – likely reduce the risk of carbon leakage in a number of agricultural sectors (including starch and sugar) as well as in parts of the cement sector likely to be more exposed to such risks the higher the CO2 price (in particular coastal regions: see Annex 16, figure 39).

Other components in the Second Intermediate Package that would likely somewhat minimise the risk of carbon leakage include the use of regional CO2 factors (which aim to capture to the greatest practical extent the actual CO2 costs paid by the sectors and subsectors) and – in particular - the fact the aid would depend on actual instead of historical production. The protection against carbon leakage would increase the closer to 100% the aid intensity were set, although that impact would be secondary compared to use of actual (aid rising with higher production) and not historical production (a fixed aid amount).
5.6.3. **Maintaining ETS incentives under the Second Intermediate Package**

**Impact on ETS sectors**

The Second Intermediate Package would be the less likely than the First Intermediate Package to preserve the ETS-related incentives. In particular this is so as the aid would be directly linked to the installations' actual production (including for large increases in production). This would be compounded by a sector coverage which is more than twice as large. The size of electricity consumption under the Second Intermediate Package amounts to 485 TWh compared to 408 TWh under the First Intermediate Package (of around 1219 TWh for EU industry as a whole).

To a lesser extent, the use of stable (as opposed to degressive) aid intensity would further make the Second Intermediate Package likely to weaken the incentives under the ETS (as in the case of the Maximalist Package: see section 5.3.3 above).

One the other hand the use of a uniform CO2 factor would go some way towards increasing the ETS incentives.

**Impact on non-ETS sectors**

The burdens on the non-ETS sectors would be greater compared to the First Intermediate Package, given the greater sector coverage in conjunction with State aid based on actual output.

5.6.4. **Internal market distortions under the Second Intermediate Package**

**Intra-sector distortions**

As the number of sectors compared to the First Intermediate Package would increase by around 20 sectors the potential scope for intra-sector distortions resulting from only some Member State aid granting aid would be enlarged.

**Inter-sector distortions**

Compared to the First Intermediate Package, the Second Intermediate Package would reduce – in so far as the Member States would actually grant aid – the risk of distortions of competition between sectors in so far as products of such sectors are in competition with each other.

5.7 **Additional factors in assessing the impacts**

Possible effects on employment of carbon leakage should also be considered given the upstream and downstream integration of many of the sectors concerned\(^{134}\) as well as the wider importance of industry to the EU economy\(^{135}\). Some of the sectors concerned may generate

\(^{134}\) Numerous the chemical (organic and inorganic), plastics, steel and cement industries.

considerable indirect employment\textsuperscript{136}; for example, according to the European Commission's 2011 Competitiveness Report direct and indirect employment in the chemicals sector amounts 1.16m and 3m respectively. The EU steel industry directly employs 420 000 people with indirect employment estimated to amount to "millions".

Indeed, the web of interdependencies in the EU's industrial fabric also needs to be factored into the assessment of possible downstream effects of the Baseline Scenario and the four Option Packages. Possible economic and employment effects could reverberate along the many value chains of which EU industry is made up. For example, refinery products are often used as inputs for basic organic chemicals which in turn often after used as inputs for the production of primary plastics. While such interdependencies may increase the scale of carbon leakage through knock-on effects, they may also make the sectors included in a value chain more resilient to carbon leakage. The graphs below are an attempt to illustrate the absolute and relative economic significance of some value chains made up of a number of sectors. It appears from the graphs that the added value of the chains is almost three times that of the sectors on a stand-alone bases:

\textsuperscript{136} For example, some sectors (such as steel production) generate more employment
Value-added of selected sectors on a stand-alone basis

Value-added of the value chains

The graphs above and the figure below illustrate that relatively few sectors (defined at the NACE 3 below) account for a considerable part of overall GVA of the EU's energy-intensive industry. In particular the chemicals sector (which in the figure below includes inorganic and basic chemicals, fertilisers, plastics and industrial gases) tower above the other sectors. At
NACE 4 level basic organic chemicals and steel have the highest value added as a percentage of EU GDP (see Annex 15).

**Figure 3: Value added of energy-intensive industries in EU 21, 2004**

Source: Eurostat: Structural business statistics

Source: Bergman et al (2007)

Any carbon leakage impacts are likely to affect Member States and regions differently. Member States with a higher proportion of mining and manufacturing would in general be potentially more affected. Industry constitutes a relatively higher share of GDP in the Member States to the right of the figure below (see also Annex 16, figures 1 and 16 and tables 1-4; and Annex 16, table 5 as regards regional specialisation).
To further highlight potential impacts in different parts of the EU the figure below identifies in respect of one Member State (Slovakia) certain sectors which represent different shares of that Member State's GDP. Graphs for other Member States and EEA countries for which data was available are set out in Annex 15. Those graphs are consistent with the finding above that the larger Member States (Germany, France, Italy, Spain and Poland) have a more diversified industrial structure (and that iron and steel constitutes a key pillar in that structure). The sectors concerned make up a relatively large share of GDP in a number of smaller Member States (Belgium, Bulgaria, Ireland, Lithuania, Hungary, Finland and Sweden). In those countries one or two sectors tend to represent a relatively large share: iron & steel and basic organic chemicals in Belgium; iron & steel and cement in Bulgaria; organic basic chemicals in Ireland; refined petroleum in Lithuania and Hungary and iron & steel and paper in Finland and Sweden. In some Member States the sectors concerned make up a small very small share of overall GDP (e.g. Denmark, Estonia and Latvia).

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137 Member State specific GVA data were available for 17 Member States and Norway. Such data were available for 27 sectors.
Finally, while carbon leakage as defined in this Report results from negative competitiveness impacts caused by indirect CO2 costs placing EU sectors at a disadvantage vis-à-vis their third country competitors, it is necessary to bear the impacts on the internal market in mind (as done throughout this report). As appears from the figure based on WTO data below intra-regional trade in Europe by far outweighs its trade with third countries. For that reason the issue of intra-sector and inter-sector distortions in the internal market has been systematically addressed in the Option Packages (see e.g. 4.7.2.3, 5.1.4, 5.2.3, 5.3.4, 5.4.4, 5.5.4 and 5.6.4).

**Figure 2.1: Europe has the world’s busiest goods trade**
(world merchandise trade, US$ billions, 2006)
6. COMPARISON OF THE OPTION PACKAGES

6.1. Effectiveness

To determine the effectiveness of the Option Packages it will be considered whether the four key elements in each Package (sector coverage, aid intensity, CO2 factor and whether the aid is output based or based on historical output) can be expected to contribute towards the objectives (positive impact), to produce a largely neutral impact vis-à-vis the objectives or undermine the objectives (negative impact).

Maximalist Package: Option A1 (151 sectors/13 subsectors), Option B1 (100% and stable aid intensity), Option C1 (regional CO2 factors) and Option D1 (actual output)

<table>
<thead>
<tr>
<th>Sector coverage</th>
<th>Minimising carbon leakage</th>
<th>Maintaining ETS incentives</th>
<th>Minimising internal market distortions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximalist</td>
<td>Positive</td>
<td>Negative</td>
<td>Neutral</td>
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Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

<table>
<thead>
<tr>
<th>Aid intensity</th>
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<th>Negative</th>
<th>Neutral</th>
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| Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

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<thead>
<tr>
<th>CO2 factor</th>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
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| Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

<table>
<thead>
<tr>
<th>Eligible output</th>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
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</table>
| Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

Minimalist Package: Option A2 (5 sectors), Option B4 (less than 100% and degressive aid intensity), Option C2 (EU average CO2 factor (0.465 CO2t/MWh)) and Option D2 (historical output)

<table>
<thead>
<tr>
<th>Sector coverage</th>
<th>Minimising carbon leakage</th>
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<th>Minimising internal market distortions</th>
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</thead>
<tbody>
<tr>
<td>Minimalist</td>
<td>Negative</td>
<td>Positive</td>
<td>Neutral</td>
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Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

<table>
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<tr>
<th>Aid intensity</th>
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| Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

<table>
<thead>
<tr>
<th>CO2 factor</th>
<th>Negative</th>
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<th>Neutral</th>
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| Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

<table>
<thead>
<tr>
<th>Eligible output</th>
<th>Negative</th>
<th>Positive</th>
<th>Neutral</th>
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</table>
| Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

First Intermediate Package: Option A3 (14 sectors and two sets of subsectors), Option B2 (100% and degressive aid intensity), Option C1 (regional CO2 factors) and Option D2 (historical output)

<table>
<thead>
<tr>
<th>Sector coverage</th>
<th>Minimising carbon leakage</th>
<th>Maintaining ETS incentives</th>
<th>Minimising internal market distortions</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Intermediate</td>
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Minimising carbon leakage Maintaining ETS incentives Minimising internal market distortions

<table>
<thead>
<tr>
<th>Aid intensity</th>
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<th>Neutral</th>
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<tbody>
<tr>
<td>CO2 factor</td>
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<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>Eligible output</td>
<td>Negative</td>
<td>Positive</td>
<td>Neutral</td>
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Second Intermediate Package: Option A4 (35 sectors), Option B3 (less than 100% and stable aid intensity), C3 (EU average marginal CO2 factor (0.75 CO2t/MWh)) and Option D1 (actual output)

<table>
<thead>
<tr>
<th>Sector coverage</th>
<th>Minimising carbon leakage</th>
<th>Maximising ETS efficiency</th>
<th>Minimising internal Market distortions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aid intensity</td>
<td>Positive</td>
<td>Negative</td>
<td>Neutral</td>
</tr>
<tr>
<td>CO2 factor</td>
<td>Neutral</td>
<td>Positive</td>
<td>Neutral</td>
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<tr>
<td>Eligible output</td>
<td>Positive</td>
<td>Negative</td>
<td>Neutral</td>
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In terms of effectiveness the Packages rank – after a first step of analysis - as follows. The First Intermediate Package obtains a net positive score of (3). The Second Intermediate Package obtains a net positive score of (1) with zero scores (0) for the other two Packages. The ranking rests on the following scoring system: a positive impact equals one net positive score and a negative impact equals one net negative score. A neutral impact equals a score of zero.

All internal market distortion scores are zero. This reflects the inevitable trade-off between minimising the risks of intra-sector distortions versus inter-sector distortions (as appears from sections 5.2.3, 5.3.4, 5.4.4, 5.5.4 and 5.6.4).

The fact that the impacts cancel each other should not be construed as a finding that no real world impact are expected to occur. The Maximalist and Minimalist Packages are thus not neutral in terms of expected carbon leakage and ETS efficiency impacts (even though the 'positives' and 'negatives' cancel each other out138.

6.2. Efficiency

The ideal Option Package achieves the objectives set out above (effectiveness) at lowest administrative and economic cost (efficiency). The Opinion Packages must thus be assessed in terms of their relative efficiency.

Efficiency is measured qualitatively in two steps in terms of the extent to which the Packages can be accepted to minimise administrative burdens and the trade-off between carbon leakage and maintaining the incentives under the ETS.

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138 Impact Assessment Guidelines, p. 47.
Administrative burdens on the Member States and the beneficiaries are considered under the efficiency heading as follows. The Packages may involve administrative burdens on Member States and aid beneficiaries in the following three (equally weighted) respects. The first burden affects Member States and aid beneficiary firms and concerns the calculation of the production level (per installation). A second burden (on Member States and aid beneficiaries) arises if the production level must potentially be determined in respect of more than 20 sectors. A third burden (on Member States and beneficiaries) arises if changes in investment capacity must be monitored. It follows that the Minimalist Package entails one of the three burdens. The other three Packages entail two burdens each.

A degree of trade-off between carbon leakage and ETS efficiency is inevitable. The most efficient Package minimises that trade-off. An ideal package would target as far as possible the sectors at real risk of carbon leakage due to indirect CO2 costs, limiting the insulation against the CO2 price signal and maximising the abatement possibilities (and the cost-effectiveness) within the ETS subject to the EU's overall 20% reduction target. To that end, an ideal package needs to preserve the CO2 price signal to the fullest extent feasible.

The First Intermediate Package comes closest to that ideal. It pinpoints the sectors based on a targeted and more comprehensive assessment (compared to the purely quantitative or mechanical approach used in the other three Packages).

Under the First Intermediate Package it was also possible to single out sectors at subsector level (which is not possible under the Minimalist and Second Intermediate Packages). The First Intermediate Package targets the core issue – the asymmetric indirect CO2 cost impact – best in relative terms: its coverage (14 sectors and two sets of subsectors) capture 408 TWh of electricity consumption (25.5 TWh per sector\textsuperscript{139}). The Second Intermediate Package (35 sectors) captures 485 Twh (13.8 Twh per sector).

The design of the First Intermediate and Minimalist Packages also preserves the CO2 price signal to the greatest extent feasible compared to the other two Packages. That comparative efficiency results from the aid taking the form of a fixed amount per time period based on a historical baseline (save for significant changes in capacity). The mode of allocation of compensation – whatever the form of the subsidy – is fundamental to the efficiency of a cap and trade system.

The efficiency comparison thus reinforces the top ranking of the First Intermediate Package resulting from the comparisons in terms of effectiveness.

6.3. Coherence

The First Intermediate Package was also found to be most coherent with the EU's core policy framework. The ETS Directive is the pillar of the core EU policy framework. That framework also includes – in particular – two key Commission Decisions pursuant to the ETS Directive, namely the 2010 Carbon Leakage Decision and the 2011 Benchmarking Decision.

The ETS Directive directly targets ETS sectors (although its effects extend beyond that circle). The greater the extent to which a Package minimises carbon leakage risks in a cost-effective way, the greater its coherence with the core EU policy framework. Indeed, the ETS Directive's very first recital defines its purpose as reduction of CO2 emissions in a cost-

\textsuperscript{139} Based on the full electricity consumption of the NACE 4 sectors to which the two sets of subsectors belong.
effective manner (which presupposes minimisation of significant carbon leakage risks due to indirect CO2 costs at lowest overall cost).

The First Intermediate Package meets that first coherence criterion to greater extent than the other three Packages. It does so – as explained above - by targeting the sectors that – based on an overall assessment – can be considered to be at greatest risk of carbon leakage.

The First Intermediate Package is also aligned to a greater extent with another cornerstone of the policy framework: the fundamental issue of the mode of allocation of the compensation. The First Intermediate Package mirrors the "sister framework" (i.e. the 2010 Carbon Leakage and 2011 Benchmarking Decisions on direct CO2 costs) in that the compensation/State aid is based not on actual production but on a historical reference amount (a fixed aid amount) subject to the ability to adjust that amount in line with significant changes in production capacity. In that respect it also mirrors the closely related Commission Proposal of 13 April 2011 for a Council Directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity.

The First Intermediate Package is therefore deemed to conform significantly to the EU policy framework. The others are deemed to conform to that framework to a limited extent.

6.4. Overall comparison of the Option Packages

With the highest net positive score based on an evaluation of effectiveness, reinforced by qualitative assessments of efficiency and coherence, the First Intermediate Package performs the best of all Packages, notably by minimising the trade-off between carbon leakage risks and the maintenance of ETS efficiency.

6.5. Conclusions

The comparisons of the four Packages reflect an inherent element of subjectivity in terms of the weighting of the three key objectives. The element of subjectivity in this type of exercise is reflected in carbon leakage literature: "... subjectivity is inherent with (sic) the selection of threshold and weighting of different criteria – a task that therefore relates to the political priorities given to addressing carbon leakage and the acceptability of negative competitiveness effects".

Second, the key objectives should not be seen as mutually exclusive. An excessive focus on ETS efficiency may result in carbon leakage which over time may undermine the CO2 price signal and – in turn – the efficiency of the ETS.

At the same time, carbon leakage is ultimately about EU sectors losing competitiveness vis-à-vis third country competitors due to the extra CO2 costs induced by the ETS. The degree of trade-offs between the three objectives – in particular trade-offs between minimising carbon leakage and maximising ETS efficiency – should not be exaggerated. Likewise, increases in ETS efficiency may lead to greater competitiveness, thereby reducing the risk of carbon leakage;

140 Dröge and Cooper (2010) p. 28.
Indeed, it has been observed that "More stringent environmental policies, if implemented correctly, may result in a higher level of productivity, or a new comparative advantage, which can lead to improved competitiveness."

7. MONITORING AND EVALUATION

The ETS Guidelines are adopted under the State aid rules of the Treaty. As a result, Article 21 in chapter VII (‘Monitoring’) of the Council Regulation No 659/1999 will apply. This means that all Member States that adopt aid schemes covered by the ETS Guidelines shall submit annual reports on such schemes to the Commission. This obligation could be defined in more precise terms in the ETS Guidelines. Member States could for example be required to keep records relating to the aid for a number of years. Some stakeholders advocate strict monitoring of the aid.

The ETS Guidelines form part of a wider regulatory framework under which monitoring and evaluation already takes place or will take place in the near future.

Article 10(5) of the ETS Directive obliges that Commission to monitor the European carbon market and to draw up yearly reports to this end.

Under the ETS Directive, Decision 2010/2/EU must be reviewed by end-2014. To this end, much data will be collected that will be relevant in connection with a possible review of the ETS Guidelines. Of particular relevance will be information on electricity consumption as a share of sector GVA as well as data of trade intensity. The revision of the 2010 Carbon Leakage Decision will be preceded by an impact assessment which can feed into a possible review of the ETS Guidelines.

In addition, Article 10(5) of the ETS Directive obliges that Commission to monitor the European carbon market and to draw up yearly reports to this end.

That information makes it possible for the Commission to assess progress towards the specific objectives set out in section 3 of this Report. The Commission will receive precise and comprehensive reports on any aid granted in different Member States including aid amounts and the sectors to which aid has been paid. That data will inform the assessment of the extent of possible distortions in the internal market. Likewise, it will be possible to assess the impact on ETS efficiency – the second specific objective - in the form of the extent of insulation against the CO2 price signal of part of the economy. This is so as the reports will enable the Commission to aggregate all aid paid under the ETS Guidelines.

By the mid-term review of the ETS Guidelines it will also be possible to assess the specific objective of reducing significant carbon leakage risks. This is so as the 2010 Carbon Leakage Decision must be reviewed by end-2014. For that review key data will be collected and will inform the assessment of possible significant carbon leakage risks. Crucially, data that will be collected on indirect CO2 costs as a share of gross value added as well as data on trade intensity for sectors potentially concerned. The ETS Guidelines could also consider asking the Member State to report on carbon leakage (including possible actual leakage and risks) in respect of aided sectors and subsectors.

142 See e.g. reply to questionnaire by CEFIC.
It could also be considered to approach Eurostat with a view to obtaining a better picture of electricity consumption per sector in relation to that sector's GVA (i.e. the principal method in the ETS Directive to determine sector eligibility). Currently such data is only collected by Eurostat on a regular basis in respect of sectors defined at the NACE 3 level. It could also be considered to review the situation as regards the confidentiality of data given that sectors for which indirect CO2 costs are cited in terms of a range (e.g. less than 5% of GVA) find themselves in an unfavourable position.