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Part 1

**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**

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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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1 Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC; OJ L 275, 25.10.2003, p. 32, as subsequently amended.

2 Recital 27 of Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the community, OJ L 140, 05.06.2009, p. 63, and Article 10a(6) of the ETS Directive, as amended.

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].

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[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).

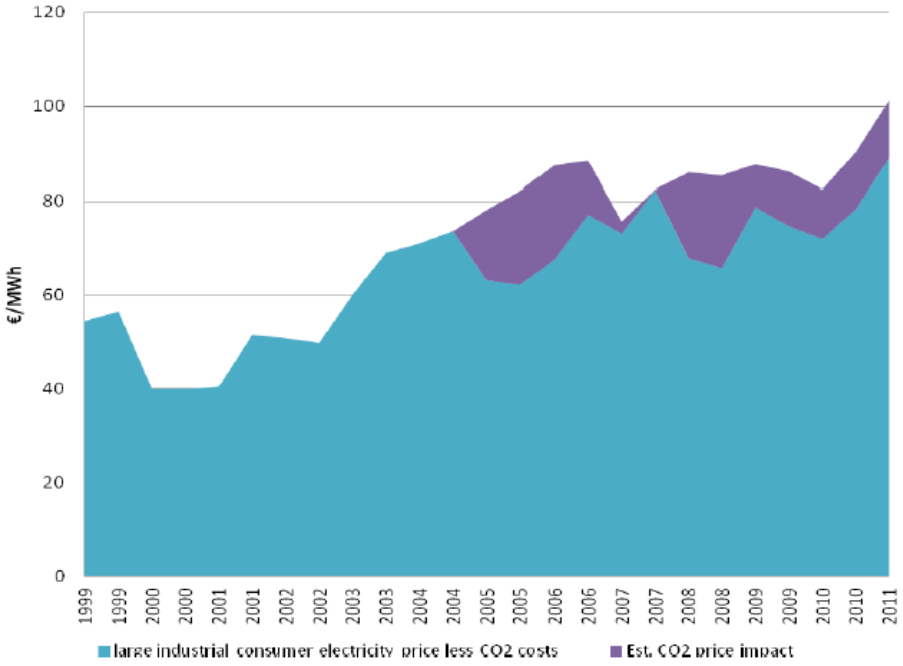
7 See e.g. Neuhoff (2008); Stern (2009); European Commission (SEC(2008) 85 VOL. II), pp. 13-14.

8 ETS Directive, p.63.

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 $CO_2$ price to rise in German industrial power costs**

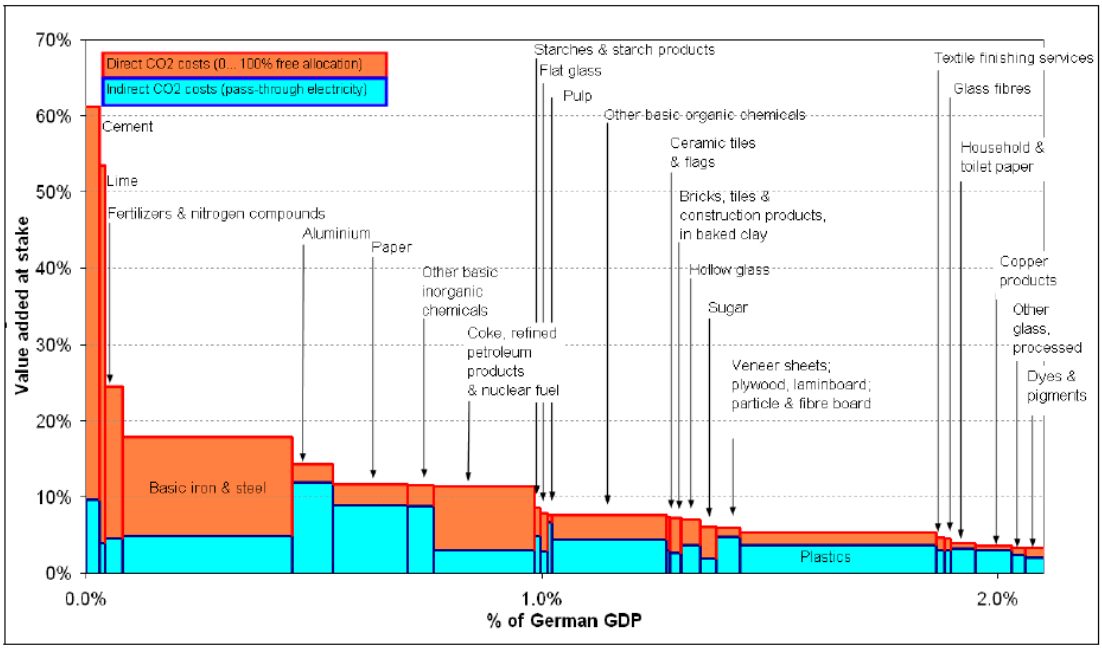



Data : Bluenext, EUROSTAT, own calculation
Note: electricity prices refer to average annual industrial consumer prices in €/MwH incl. tax. The industrial consumption price quoted refers to large industrial consumers consuming 70-150 000MwH/yr. Prices exclude VAT. $CO_2$ cost component assumes a pass-through of 90% of EUA price for coal-fired power and 0.9 $tCO_2$ emitted per MwH.

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**

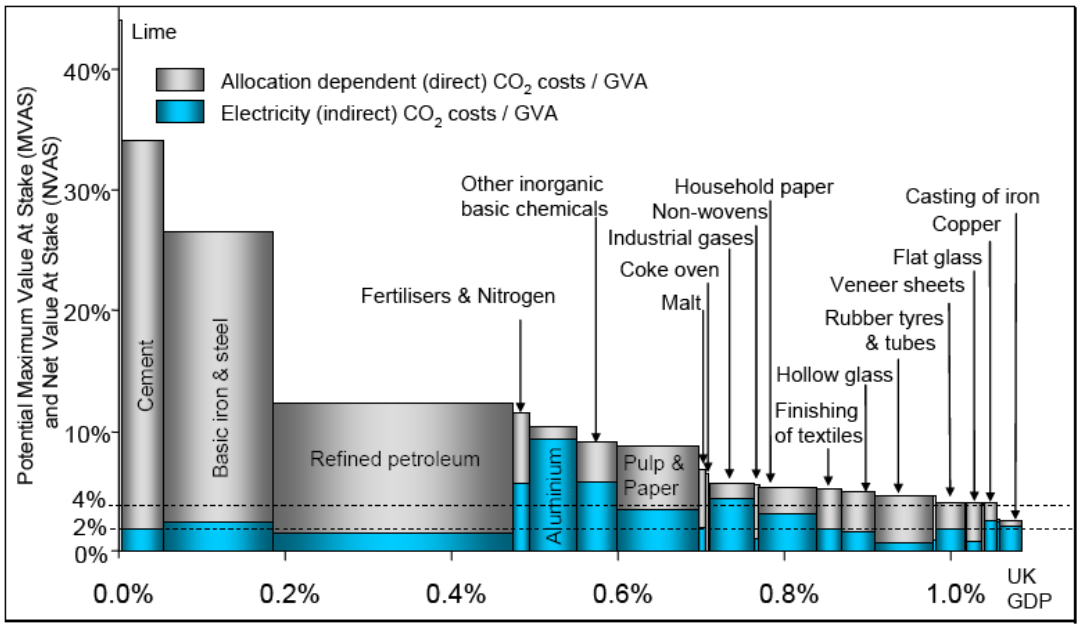



**Figure 1 $CO_2$ cost screen: Subsectors potentially exposed under unilateral $CO_2$ pricing**

*Source: Hourcade et al (2007)*

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 EU[12]. 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 leakage[13].

*2.1.3. The scope of the problem*

In recent years a growing body of literature on carbon leakage has emerged[14]. 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 simulations[15]. The carbon leakage literature does not find empirical proof of carbon leakage[16] (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, Ököinstitut, 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).

18 Sartor (2012); Cambridge Econometrics (2010), p. 48.

19 See Reinaud (2008), p. 6.

20 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 on 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

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[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[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[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)[29].

Empirical evidence of pass on rates suggests that, while significant[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[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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27 Case C-459/10 P, *Freistaat Sachsen und Sachsen-Anhalt v Commission*, para 34; Case C-113/00, *Spain v Commission*, para 70; Case C-156/98, *Germany v Commission*, para 30; Case C-86/89, *Italy v Commssion* para 18; Case T-396/08, *Freistaat Sachsen und Land Sachsen-Anhalt v Commission*, paras 46-48 and Case T-459/93, *Siemens SA v Commission*, para 48.

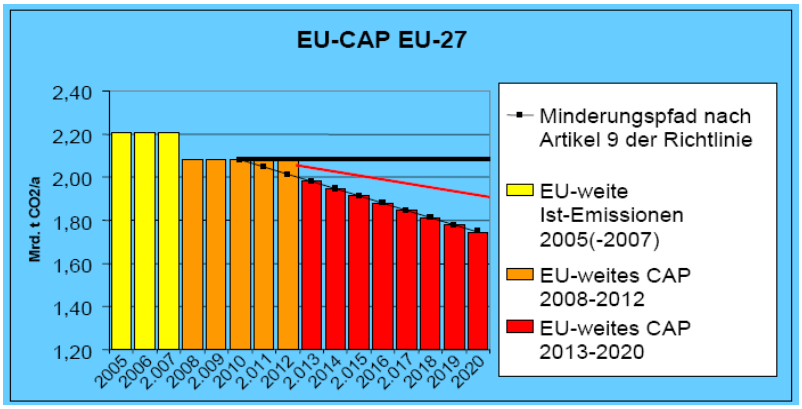
28 See e.g. de Bruyn et al (2010a); de Bruyn et al (2010b).

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

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%).

31 See e.g. Hobbs et al (2010).

Figure: CO2 caps during ETS 1, ETS 2 and ETS 3




*Source: Schafhausen, Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2009)*

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[32]. At the time of writing the price expectations for the 2013-2020 period is roughly in the €8-15/EUA range[33].

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[34].

### *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[35].

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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).

34 Carbon Market Daily of 25 October 2011.

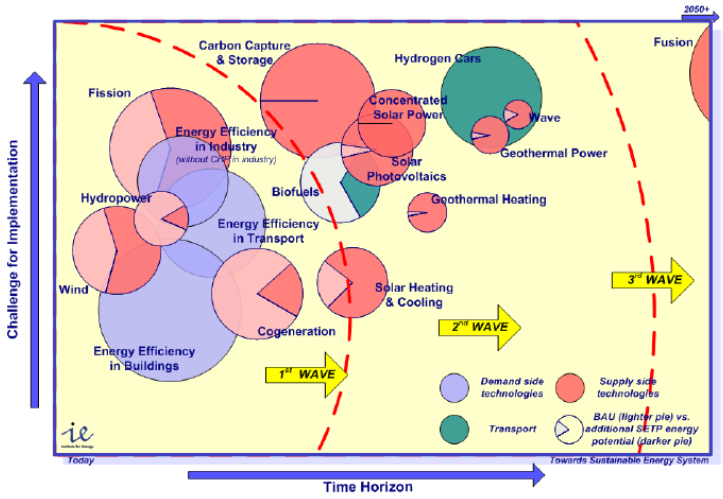
35 de Bruyn et al (2010a): de Bruyn et al (2010b).

## 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)[36]. 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[37]. Some commentators suggest that the degree of technological development in this area was underestimated when preparing for ETS 1 and ETS 2[38].

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

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).

37 See Energy Strategy 2050 Roadmap at p. 13 ("much depends on technological development"). See also European Commission (SEC(2009) 1297).

38 Grubb et al (2009), p. 20.

ETS[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 **unilaterally** reduced the CO2 intensity of their production[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[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)[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[43]. A cap and trade scheme in California will be launched in 2013[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[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[46]. South Korea is

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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.").

40 Article 10a(18) of the ETS Directive.

41 Recital 22 of the 2010 Carbon Leakage 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.

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.

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).

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.

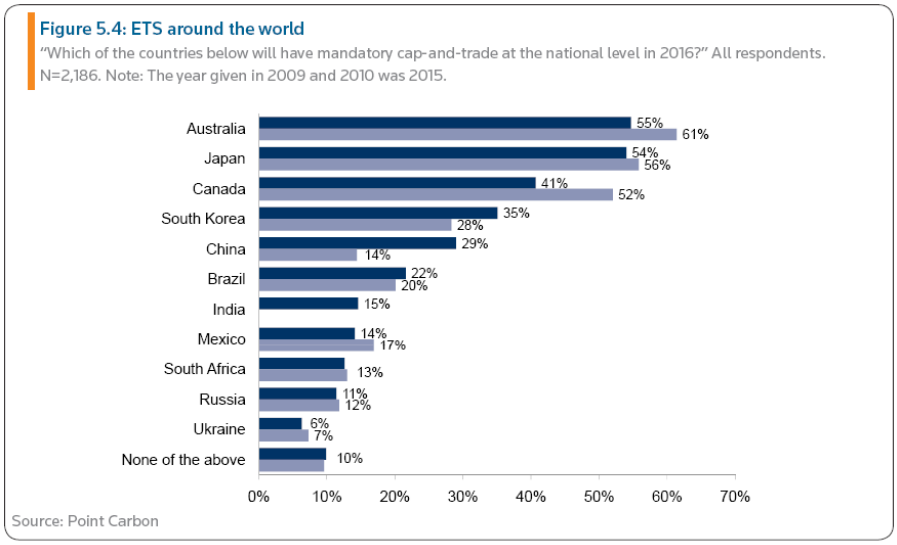
45 See reply to questionnaire by Client Earth. Annual Review of Low-Carbon Development in China (2011-2012) November 2011.

46 The pilot schemes concerned seven providences 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[47].

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)[48]. 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%[49].

Carbon leakage only arises if CO2 is emitted in such trading partners. Some third countries are characterised by CO2-free industrial production[50].




*Source: Carbon 2011*

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[51].

## 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

47 Carbon Market Daily, 14 November 2011.

48 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.

49 Carbon Market Daily of 14 November 2011.

50 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.

51 De Bruyn et al (2010).

component of that policy which lays down two binding targets to be achieved by 2020[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[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 **prevent carbon leakage**[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 **maintain the efficiency of the ETS**; in other words, carbon leakage should be prevented at least cost to the economy and society[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[56].

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52 Council document 7224/1/07 Rev 1.

53 Compared to a business as usual scenario baseline.

54 Article 10a(6) of the ETS Directive, recitals 24 and 27 of Directive 2009/29/EC and the Commission Statement; see also Commission Statement at Annex 6.

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 ).

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 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[61]. 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)[62].

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[63]. 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.

62 Commission Regulation (EC) No 1998/2006 of 15 December 2006 on the application of Articles 87 and 88 of the Treaty to de minimis aid, OJ L 379 of 28.12.2006, p. 5.

63 See IP/10/1520, "State aid: Commission opens in-depth investigation into subsidies for producers of non-ferrous metals in Germany", Brussels, 17th November 2010.

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.

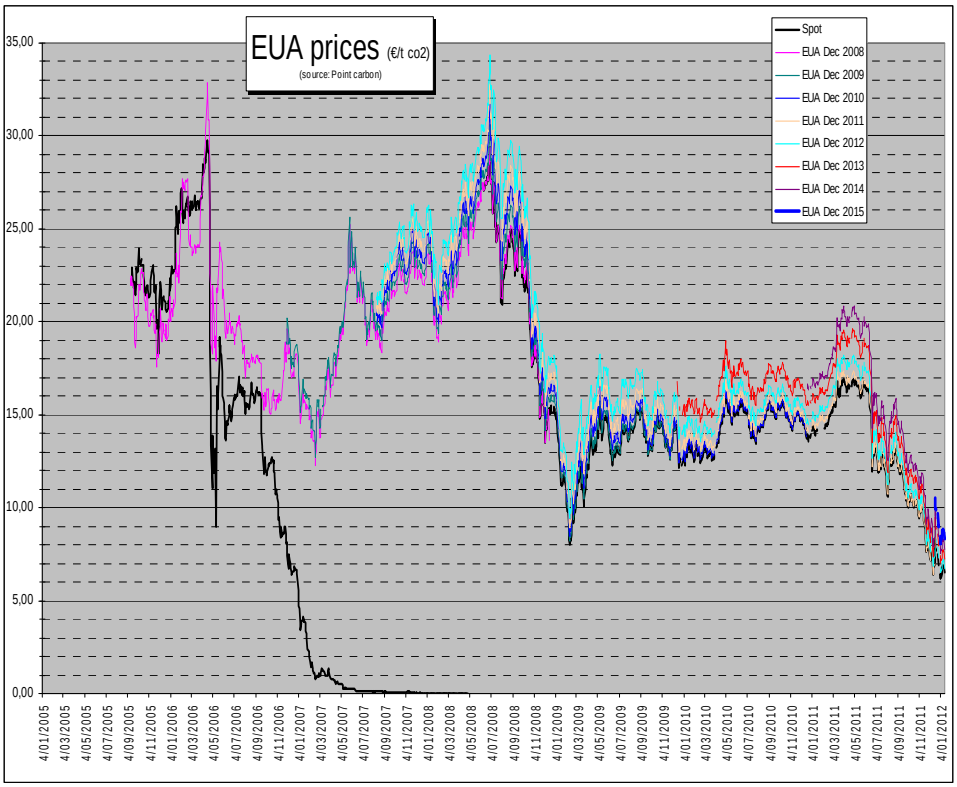
Options A1 to A4 are consequently based on the key elements in the "method" used for direct CO2 cost compensation. Three of the four options (A1, A2 and A4) rely on the two key forms of quantitative data referred to above, relating them to CO2 cost and trade intensity thresholds. The threshold values 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**[64]. 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).

[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[65]. By floor price is meant at 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€[66]. Another stakeholder supported a floor price of €30[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[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).

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65 One Member State advocated a floor price of €50.
66 See reply to questionnaire by Denmark.
67 See reply to questionnaire by Eurelectric.
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[69]. 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[70]. 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%[71].

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**

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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 constraints[73] an approach which finds support in the ETS Directive[74]. 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 literature[75] 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[76]. 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[77].

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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[76] For a detailed analysis see in particular Bergman et al (2007), pp. 89-92.

[77] See Bergman et al (2007), p. 53.

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[78]. 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[79] (see Annex 9)[80].

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)[81]; **Paper and paperboard** (NACE 2112); **Man-made fibres** (NACE 2470) and **copper** (NACE 2744) fulfil the 2.5% and inability to pass on cost 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[82].

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[83].

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

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[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 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**

[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[85].

### 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")[86]. 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.

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

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"[87]. Estimating the extra costs resulting from the ETS would require recourse to simulation models at EU level covering the entirety of the EU[88]. 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 EU.

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

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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).*

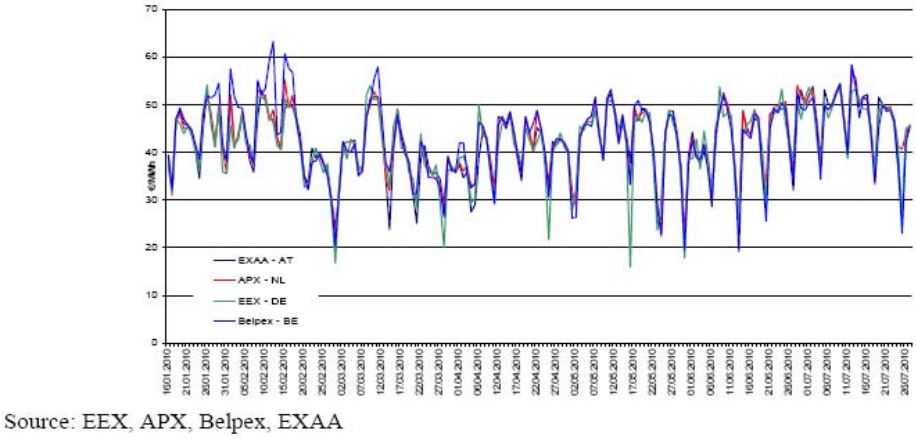
| | EU-27 | BE | BG | CZ | DK | DE | EE | IE | EL | ES | FR | IT | CY | LV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fossil | 55% | 41% | 47% | 65% | 71% | 62% | 99% | 91% | 88% | 64% | 11% | 81% | 100% | 30% |
| non-fossil | 45% | 59% | 53% | 35% | 29% | 38% | 1% | 9% | 12% | 36% | 89% | 19% | 0% | 70% |
| | LT | LU | HU | MT | NL | AT | PL | PT | RO | SI | SK | FI | SE | UK |
| Fossil | 24% | 75% | 56% | 100% | 87% | 36% | 96% | 81% | 57% | 37% | 29% | 34% | 2% | 74% |
| non-fossil | 76% | 25% | 44% | 0% | 13% | 64% | 4% | 19% | 43% | 63% | 71% | 66% | 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.

[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").

**Figure: Developments in electricity spot prices in the Netherlands, Germany, Belgium and Austria**




*Source: European Commission (SEC(2010) 1510)*

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 COt/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[90]. It

[90] The 2011 Benchmarking Decision used 2005-2008 or, if they were higher, 2009-2010, as reference years.

would also be consistent with the 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[91].

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[92].

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[93]. 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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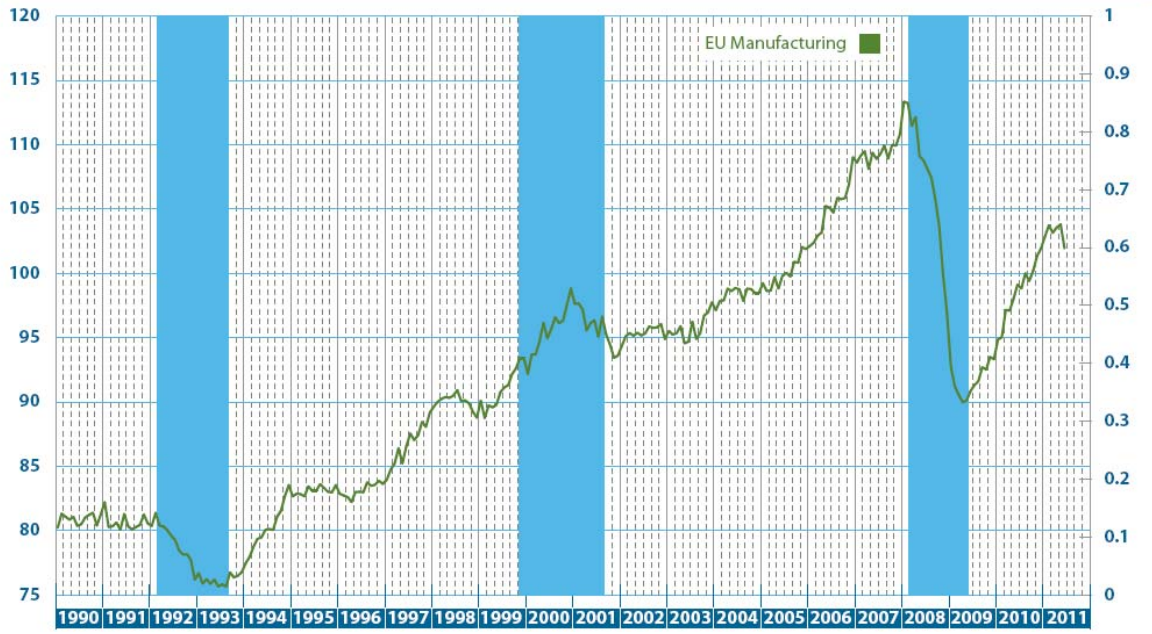
91 According to the explanatory memorandum "There is a need to limit the impact of CO2-related taxation on the sectors and subsectors deemed to be exposed to a significant risk of carbon leakage in the sense of Article 10(13 of {the 2010 Carbon Leakage Decision} Accordingly, transitional measures to 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.

**FIGURE I.2: Downturns and recoveries in EU-27 industrial production since 1990**




*Source: EU Industrial structure (2011)*

### 4.21. Four Packages of Options ("Maximalist", "Minimalist", "First Intermediate" and "Second Intermediate")

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 electro-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 Directive[98] estimated the aggregate cost impact (direct and indirect CO2 costs) at 0.58% of EU GDP[99]. 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 2020[100]. 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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98 See European Commission (SEC(2008) 85), Impact assessment accompanying the Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020 direct energy system costs.

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[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[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[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[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[105].

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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.

102 See European Commission (COM(2011) 885/2), p. 6.

103 OECD (2010), p. 56.

104 Employment Committee, Towards a greener labour market – The employment dimension of tackling environmental challenges. Final Report. 10 November 2010, p. 8.

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[106]. 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[107]. Nevertheless, Eco-industries in the EU have already expanded rapidly in the EU, growing to become a sector equivalent to chemicals[108]. 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[109].

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[110]. Auctioning revenues at a carbon price of €20 per EUA would roughly yield €20bn in revenues. The Member States may also use to 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'[111].

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)[112]. 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.

107 Towards a greener labour market – The employment dimension of tackling environmental challenges. Final Report. 10 November 2010 (referring to findings by the OECD). See also European Commission. Employment in Europe 2009. October 2009. pp. 105-145 Chapter 3 entitled "Climate change and labour market outcomes", pp. 113-115, 119-120.

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.

111 European Commission (2011) EU Industrial structure 2011 Trends and Performance DG Enterprise and Industry.

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)[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[114]. The amount of industrial electricity consumption that would not be insulated from the CO2 at all amounts to around 1219 TWh[115]. That consumption roughly amounts to a value of €100bn at a price of 10 cents/KWh[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

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113 Aldy and Pizer (2009); Reinaud (2010), p. 7.

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[117].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[118]. 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")[119].

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.

118 See e.g. Neuhoff (2008); European Commission (SEC(2008) 52 VOL. II), p. 22.

119 Reinaud (2008), p. 19.

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 scheme[123]. 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).
123 OECD (2010), pp. 20, 23.

Options C2 and C3)[124], the use of Option D1 – increases in aid for increased production – is more significant in terms of weakening the ETS incentives[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)[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.

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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.

125 OECD (2010), p.

126 See study by INFRAS: Energiepolitische Rahmenbedingungen (2009) (cited by a joint International Union of Railways/CER report entitled "EU Transport Greenhouse Gases (GHG): Routes to 2050 – A Railway Perspective").

*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).

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[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)[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: Summary of approximate electricity consumption (2007) from the large electricity consuming processes in the EU-27**

| Process | TWh |
|---|---|
| Aluminium electrolysis | 54.4 |
| Copper electrolysis | 1.13 |
| Zinc electrolysis | 6.7 |
| Chlorine production | 36.1 |

*Source: Ecofys and Fraunhofer*

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

[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 .

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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)).

133 European Commission (COM(2011) 112) and European Commission (SEC(2011) 289); on the relevance of CO2 price for investment in the electricity sector see New Energy Finance. Carbon Markets – EU ETS Research Note. Impact of the EU ETS on power sector investments – a survey of European utilities.

*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).

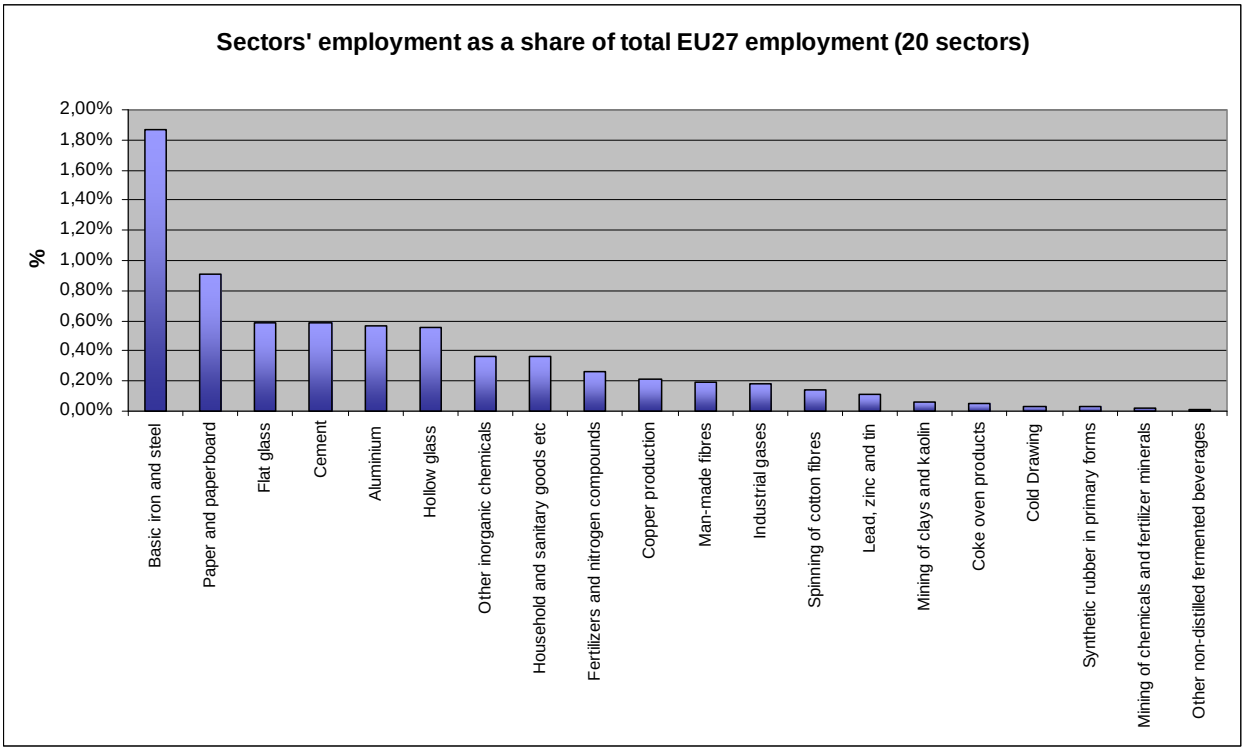
The following two sets of subsectors are also deemed eligible under the qualitative assessment: seamless steel pipes within **Manufacture of stainless steel pipes** (NACE 2722)

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).




*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

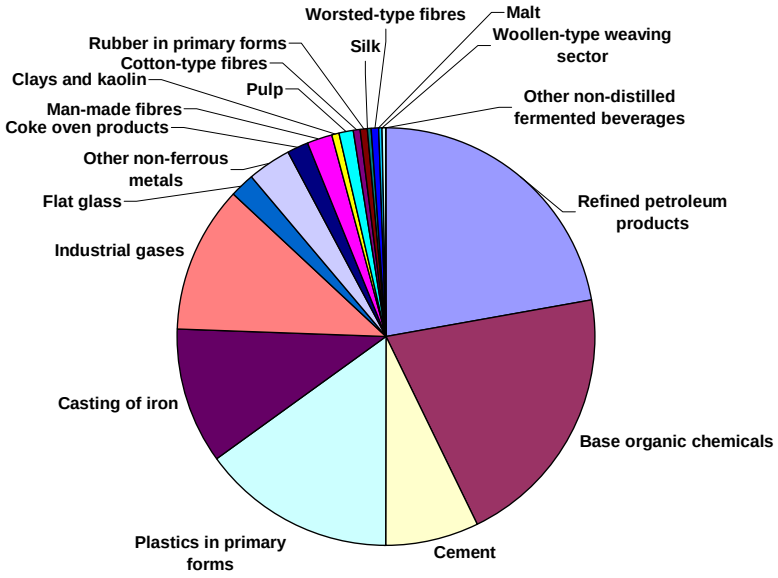
[134] Numerous the chemical (organic and inorganic), plastics, steel and cement industries.
[135] European Commission (COM(2010) 614).

considerable indirect employment[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:

136 For example, some sectors (such as steel production) generate more employmenth

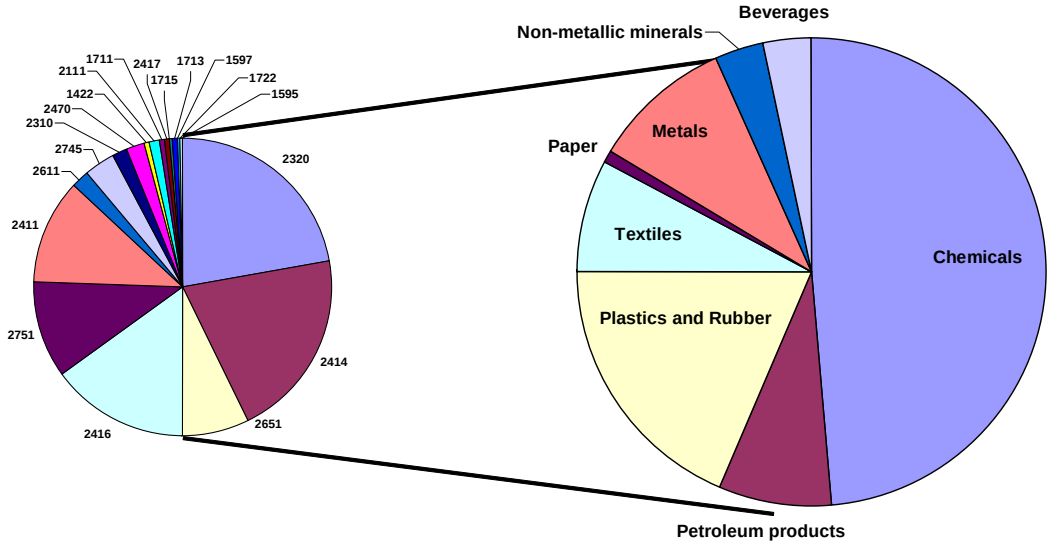
**Value-added of selected sectors on a stand-alone basis**




**Value-added: € 137 bn (6.8% of industrial production)**

Source: Eurostat 2006 data

**Value added of the value chains**




Sectors on a stand-alone basis

**Value-added: € 137 bn (6.8% of industrial production)**

Value Chains:

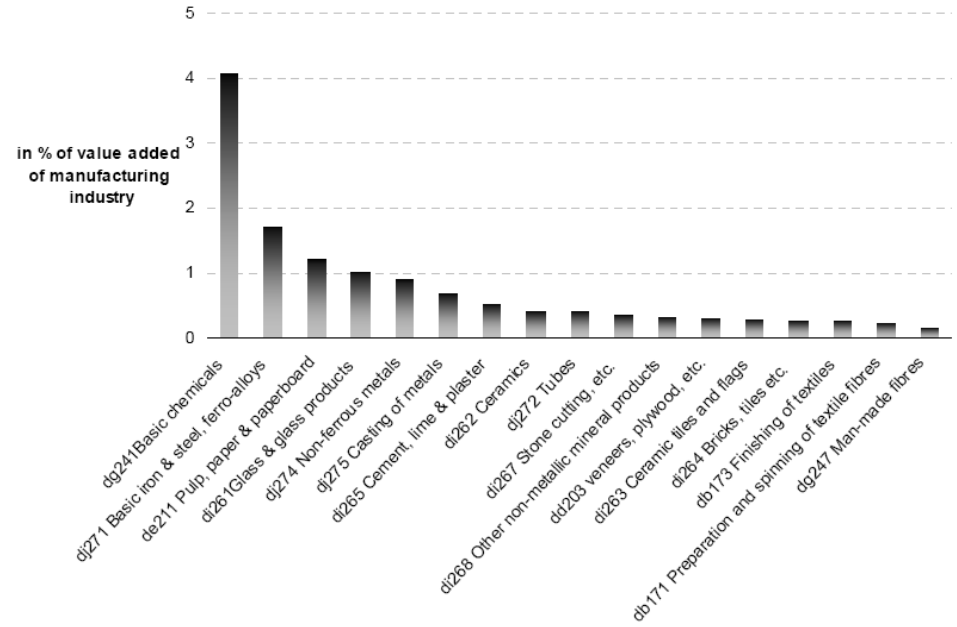
**Value-added: € 390 bn (19.5% of industrial production)**

Source: Eurostat 2006 data

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**

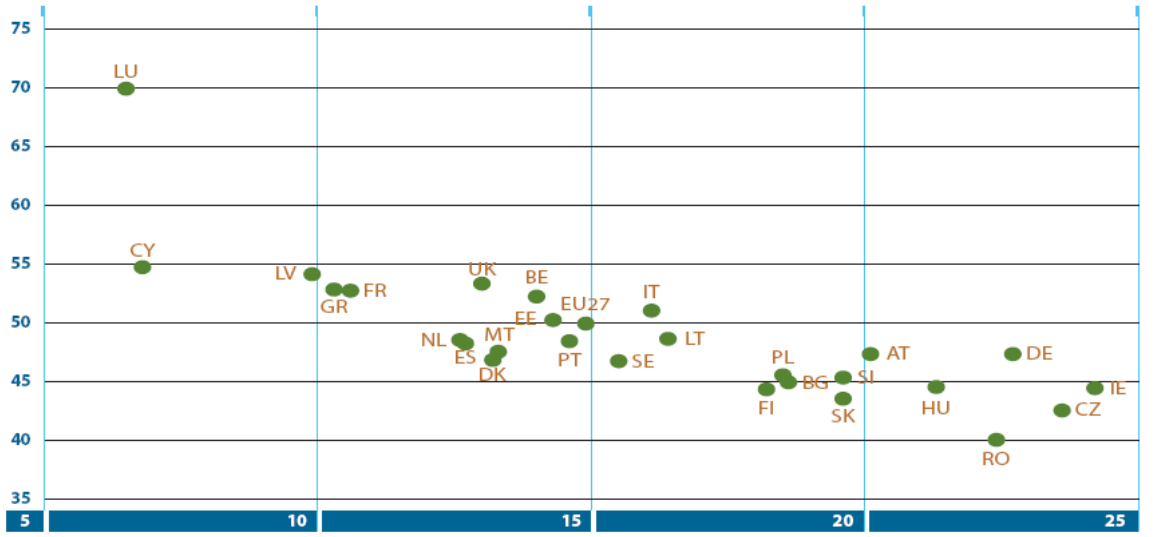



*Source: Eurostat: Structural business statistics*

*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).

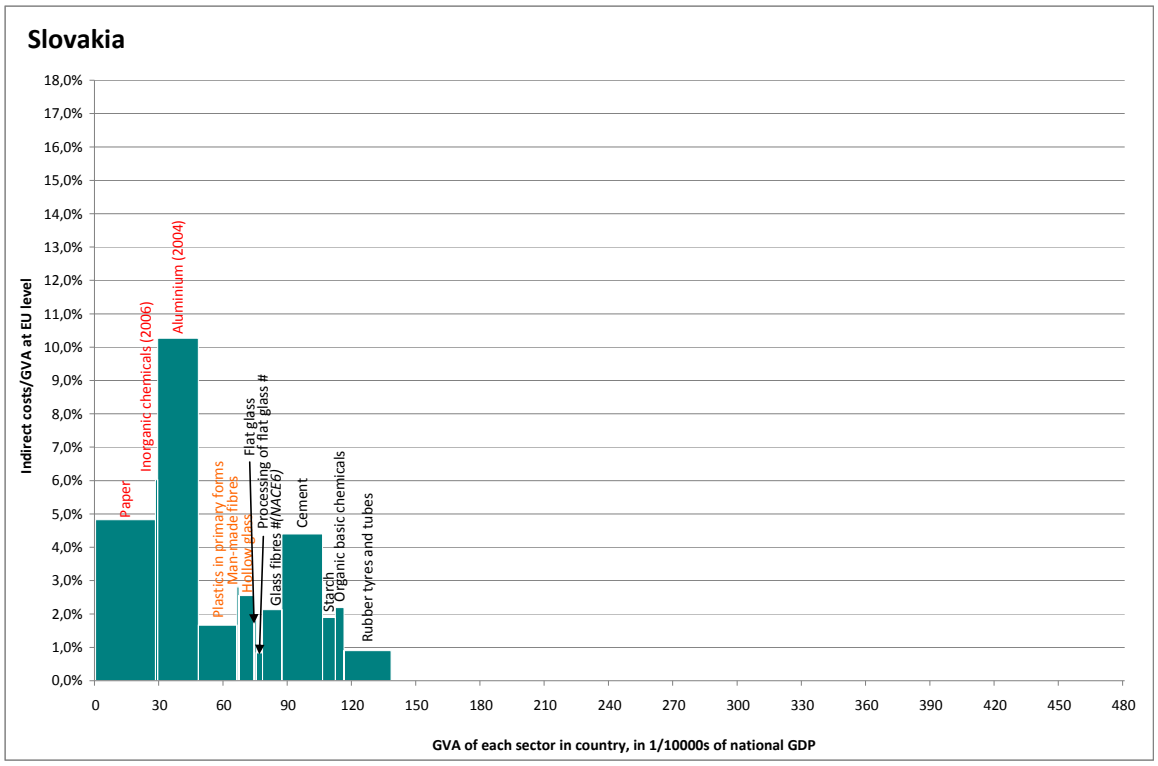
**FIGURE II.2: Distribution of EU countries by GDP shares of manufacturing and market services in 2009**




*Source:* own calculation using Eurostat data.

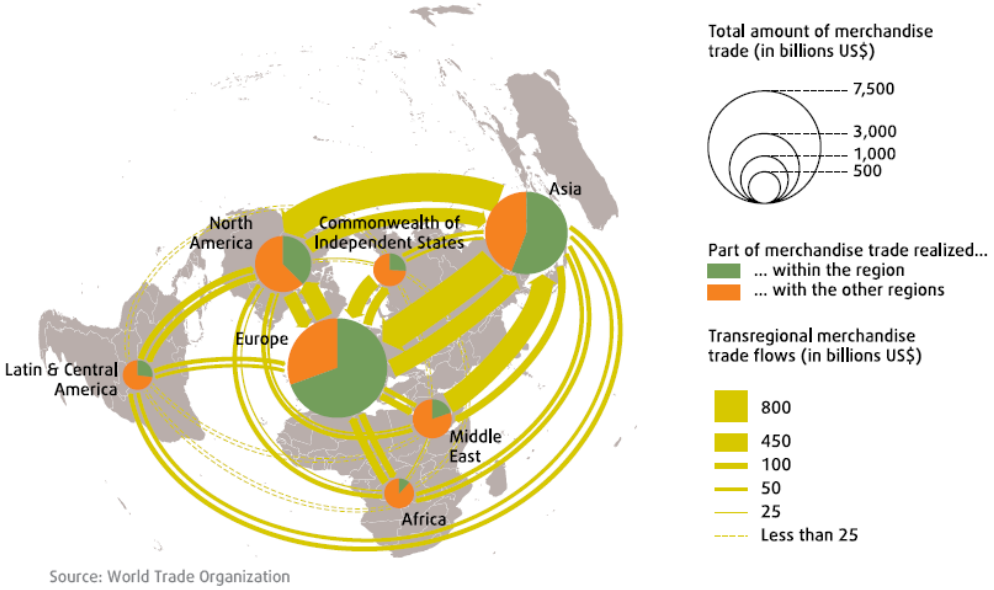
To further highlight potential impacts in different parts of the EU the figure below identifies in respect of one Member State (Slovakia) certain sectors which represent different shares of that Member State's GDP [137]. Graphs for other Member States and EEA countries for which data was available are 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).

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, 2008)




Source: World Trade Organization

## 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)*

| | **Minimising carbon leakage** | **Maintaining ETS incentives** | **Minimising internal market distortions** |
|---|---|---|---|
| **Sector coverage** | Positive | Negative | Neutral |
| **Aid intensity** | Positive | Negative | Neutral |
| **CO2 factor** | Positive | Negative | Neutral |
| **Eligible output** | Positive | Negative | Neutral |

*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)*

| | **Minimising carbon leakage** | **Maintaining ETS incentives** | **Minimising internal market distortions** |
|---|---|---|---|
| **Sector coverage** | Negative | Positive | Neutral |
| **Aid intensity** | Negative | Positive | Neutral |
| **CO2 factor** | Negative | Positive | Neutral |
| **Eligible Output** | Negative | Positive | Neutral |

*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)*

| | **Minimising carbon leakage** | **Maintaining ETS incentives** | **Minimising internal market distortions** |
|---|---|---|---|
| **Sector coverage** | Positive | Positive | Neutral |

| | | | |
|---|---|---|---|
| **Aid intensity** | Negative | Positive | Neutral |
| **CO2 factor** | Positive | Neutral | Neutral |
| **Eligible output** | Negative | Positive | Neutral |

*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)*

| | **Minimising carbon leakage** | **Maximising ETS efficiency** | **Minimising internal Market distortions** |
|---|---|---|---|
| **Sector coverage** | Positive | Negative | Neutral |
| **Aid intensity** | Neutral | Neutral | Neutral |
| **CO2 factor** | Neutral | Positive | Neutral |
| **Eligible output** | Positive | Negative | Neutral |

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 out[138].

## 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.

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[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-

[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*"[140].

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"[141].

## 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[142].

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[143]. 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.

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141 De Bruyn et al (2009), p. 17.

142 See e.g. reply to questionnaire by CEFIC.

143 See European Commission (SEC(2009) 1710), p. 21.

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.

EUROPEAN COMMISSION

Strasbourg, 22.5.2012
SWD(2012) 130 final

Part 2

**COMMISSION STAFF WORKING DOCUMENT**

**Impact Assessment Report**

***Accompanying the document***

**Communication of the Commission**

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

{C(2012) 3230 final}
{SWD(2012) 131 final}

# ANNEXES

## GLOSSARY

| Term | Explanation |
|---|---|
| Aid intensity | Aid intensity is an expression of the level of compensation granted by Member States. |
| Allowance (EUA) | Allowance to emit one tonne of carbon dioxide equivalent during a specified period, which shall be valid only for the purposes of meeting the requirements of the ETS Directive and which are transferable in accordance with the provisions of the ETS Directive |
| Baseline and Baseline Scenario | The baseline represents forecasted emissions under a business-as-usual scenario, often referred to as the 'baseline scenario', i.e. expected emissions if the emission reduction activities were not implemented. |
| Benchmarking | An allocation method in which allowances are distributed based on output (e.g. one allowance per MWh generated) or on intensity standards in the industry, based on best-performing companies. |
| Carbon leakage | Carbon leakage is defined as the prospect of an increase in global greenhouse gas emissions when companies shift production outside the Union because they cannot pass on the cost increases induced by the EU ETS to their customers without significant loss of market share. |
| CO2 emissions factor | Amount of CO2 released per unit of energy produced, measured in tCO2/MWh. |
| CO2 floor price | |
| Direct CO2 emission costs | Costs relating to CO2 emissions due to own use of mainly gas and coal. |
| EU Climate and Energy Package | Integrated EU approach to climate and energy policy that aims to combat climate change and increase the EU's energy security while strengthening its competitiveness. They committed Europe to transforming itself into a highly energy-efficient, low carbon economy. |
| EU Emissions Trading Scheme (ETS) | The Trading Scheme of Emission allowances within the European Union, launched on January 1, 2005. The scheme is based on Directive 2003/87/EC, which entered into force on 25 October 2003. The scheme consists of three phases: Phase I (2005 - 2007), Phase II (2008-2012) and Phase III (2013-2020). |
| European Semester | A governance framework set up as a six-month cycle, for the purpose of coordinating ex ante the budgetary and economic policies of the EU and the euro zone, in line with both the Stability and Growth Pact and the Europe 2020 strategy. |
| Europe 2020 Flagship initiatives | Europe 2020 is the EU's growth strategy set up to turn Europe into a smart, sustainable and inclusive economy. The seven Flagship Initiatives are those projects identified as engines for the completion of the Europe 2020 goals. |
| Indirect CO2 emission costs | Costs relating to CO2 emissions due to the EU ETS passed on in electricity prices. |
| Multiannual Financial | The multiannual financial framework lays down maximum amounts for |

| | |
|---|---|
| Framework | each broad category of expenditure for a period of several years. It aims to ensure EU expenditure develops in an orderly manner, within the limit of the EU's own resources. |
| NACE | NACE is the statistical classification system for economic activities within the European Community established by Council Regulation No 3037/90 of 09/10/1990. |
| Operating aid | Operating aid relieves undertakings of day-to-day costs that they would normally bear without requiring 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 cover all the costs. |
| PRODCOM | PRODCOM is a statistical classification of products in the European Community. All products are assigned an 8-digit code. The first four digits of this code correspond with the NACE code of the economic sector to which businesses that usually produce the respective product generally belong. |

## ANNEX 1

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## ANNEX 2

## Summary of replies to questionnaire relating to the consultation on the impact assessment (launched on 11.3.2011 – closed on 11.5.2011)

### Overview

Some 140 replies were received within the 2-month deadline. In terms of origin the replies were distributed as follows: Austria (5 replies); Belgium (8); Czech Republic (3); Denmark (1); Estonia (1); Finland (4); France (7); Germany (17); Hungary (2); Ireland (1); Italy (11); Latvia (1); Lithuania (1); Luxembourg (1); Netherlands (7); Norway (8); Poland (5); Slovakia (1); Spain (9); Sweden (7); UK (5) (see table below for more details).

Most of industry (close to 100 replies) and trade unions (seven replies) broadly argue in favour of wide sector eligibility and maximum aid amounts. The replies by most of the 19 EEA countries tend towards the other end of the spectrum, placing the emphasis on preserving the efficiency of the ETS and limiting distortions of competition in the internal market. The electricity producers and the NGOs (three replies) are also to be found in that camp.
All the submissions are published in DG COMP website[1].

The replies by industry (more than two thirds of all replies) are characterised by high degree of coordination as evidenced by the number of references e.g. by individual firms to the positions taken by the European industry federation. This coordination goes beyond intra-sector positioning. The *leitmotifs* in this respect include:

- The argument **that electricity cost increases due to the ETS should not be seen in isolation from other costs** imposed under environmental legislation at EU and national level (e.g. Lafarge)

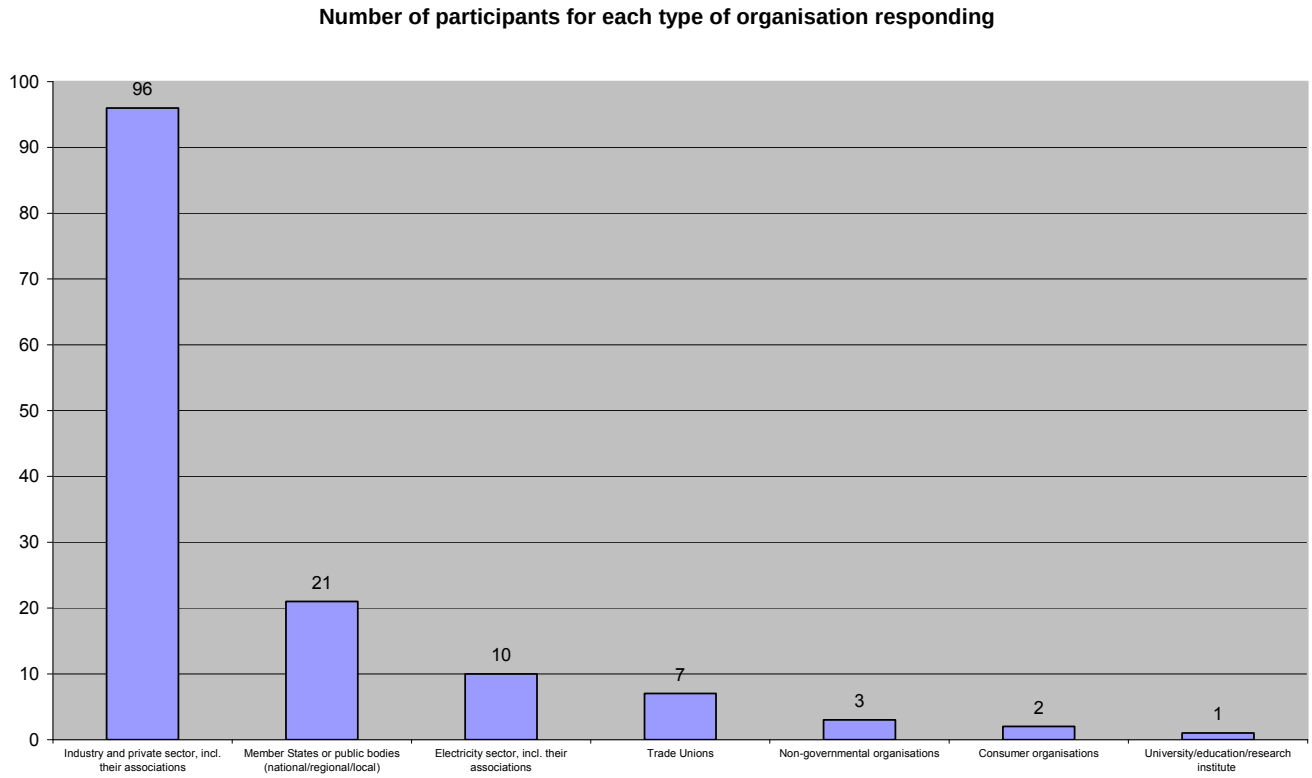
- The argument **that the electricity efficiency benchmarks are a sufficient incentive** (see e.g. Business Europe) to maintain ETS incentives. Generally it claimed that much in the way of energy and electricity savings has already been achieved, in particular compared to third country.

- The observation **that carbon leakage is a process which unfolds over time**, through production and investment leakage (relocation being a measure of last resort).

- The argument **that the ETS Guidelines should be kept in force until such time that a binding international agreement is reached** or that third countries otherwise become subject to similar CO2 costs.

- Claims referring to **possible knock-on effects due to linkages upstream and downstream** (e.g. EU Salt).

[1] http://ec.europa.eu/competition/consultations/2011_questionnaire_emissions_trading/index_en.html




Claims that s**everal of the sectors concerned manufacture products needed for the EU's transition** to a competitive low-carbon economy (e.g. Aurubis referring to the need for copper for the renewables sector).

**Sector and subsector eligibility**

A majority of industry is in favour of the wide eligibility option mirroring the 2010 Carbon Leakage Decision (i.e. 164 sectors and subsectors). Many industry replies emphasise the need for eligibility to be defined at subsector (Prodcom) level[2]. Member States – with the exception of Germany[3] – and NGOs are in generally in favour of a more limited list (e.g. UK Ireland, France, Austria, Belgium, the Netherlands, Italy, the Nordic countries and the new Member States). On this narrower view, State aid risks undermining the efficiency of the ETS as well as entailing distortions risks and subsidy races (e.g. Denmark, Eurelectric, Client Earth, Groeningen University, Hungarian Chemical Industry). Some replies even advocate that the Member States be obliged to provide State aid on the same basis to avoid distortions (Europia, ES Petroleum).

Industry in general takes the view that State aid will at most impose insignificant burdens on other sectors and other parts of society.

2 Exceptionally eligibility at NACE 6 level is advocated (i.e. the level between NACE 4 and Prodcom) (e.g. EU Glass Fibres).

3 Germany is the only Member State in favour of the 2010 Carbon Leakage Decision (164 sectors and subsectors eligible). As an alternative Germany proposes to use a totally new criterion based on electricity intensity in the production process, which is not inspired by the ETS Directive: sectors with electricity consumption >1KWh/1€ of GVA should be eligible for aid. This corresponds to a threshold where sectors with at least 1.4% indirect CO2 costs as a percentage of GVA would qualify. Under a 1.4% threshold 77 NACE 4 sectors would qualify.

**Fuel and electricity substitutability** is often cited by industry to support arguments in favour of wide sector eligibility. Sometimes these arguments are limited to those sectors and products where fuel and electricity substitutability was established by the 2011 Benchmarking Decision (Annex 9) (e.g. BE Chemicals Essencia, Chemicals VNCI).

A few replies advocate a trigger CO2 price below which no aid whatsoever would be paid (Denmark, Eurelectric, Norwegian electricity producers, Client Earth). Some replies propose that eligibility be subject to the recipients undertaking specific environmental measures (Eurelectric, Client Earth).

Some replies advocate clear objectives criteria to determine eligibility (e.g. Austria) whereas others advocate a much more case by case and qualitative approach (e.g. European Copper Institute).

**Aid intensity**

**Industry and trade unions are overwhelmingly in favour of 100% aid intensity without degressivity**. Member States are divided between the three options: 100% (e.g. Germany, Poland); less than 100% without degressivity and less than 100% with degressivity.

**The CO2 factor**

**A large majority of stakeholders** (including the electricity producers) **are against basing the CO2 factor on electricity supply contracts**, the risk of contract manipulation being cited as the main reason.

**A large majority** (including electricity generators such as EO.n) is also **in favour or treating auto-generated electricity on an equal footing** with electricity procured directly from the grid or under supply contracts (see Annex 10).

**A very significant majority of industry**, **Member States and electricity producers** argue in favour of **a CO2 factor based on marginal production**, the main argument being that such an approach will reduce the risk of overcompensation and under-compensation.

Most of these stakeholders are also **in favour of regional EU CO2 factors.** Different approaches are suggested on this issue. Some replies advocate the use of simulation models to determine the actual cost impact of the ETS (e.g. CEFIF), on the ground that the price-setting regions sometimes encompass more than one Member States. Other stakeholders advocate a similar more simple model based on different CO2 factors for different regions (e.g. EDF, Vattenfall, Fertilisers Europe).

A uniform EU-wide CO2 factors obtains support from a minority of replies average uniform least support (e.g. France, the Netherlands, NGOs and a few industry stakeholders such as the European Tyre industry)

**Product-specific electricity efficiency benchmarks**

Industry generally argues of the model applied in the context of compensation for direct CO2 costs which – to the extent feasible – uses the average of the 10% most efficient installations producing a specific product; for example Euromines and VIK (German federation of power producers). Other replies emphasise the importance of not placing small installations at a disadvantage compared to large installations (e.g. Euromines).

Fall-back factors will be required for products where primary benchmarks are not feasible. In general industry is against any reduction factor whereas some replies advocate reduction factors.[4]

[4] Client Earth argues in favour of a fall-back factor of 0.5 (ie. 50%).

## Table 1: Stakeholders replies on key topics

| Category of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | PRODCOM 8 | fuel substitutability | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| Industry and private sector, incl. their associations | A. Merati & C. Cartiera di Laveno Spa | | | | | ✓ | | ✓ | | | |
| | AkzoNobel Industrial Chemicals | | | | ✓ | | | | | | |
| | Alcan Aluminium UK Ltd. | | ✓ | | ✓ | | | ✓ | | | |
| | ArcelorMittal & Aperam | | | | ✓ | | | ✓ | | | |
| | Arkema | ✓ | | | ✓ | | | | | | ✓ |
| | Asociación de Productores de Productos Petroliferos (AOP) | ✓ | | | | | | | | | ✓ |
| | Asociación Nacional de Electroquímica (ANE, Chlor-alcali Association) | | ✓ | | | | | ✓ | | | |
| | Associazione Italiana fra gli Industriali della Carta, Cartoni e Paste per Carta (ASSOCARTA) | ✓ | | | | | | ✓ | | | |
| | Associazione Nazionale Industrie Metalli Non-Ferrosi (ASSOMET) | | ✓ | | ✓ | | | ✓ | | | |
| | Atlantic Copper S.A.U. | | ✓ | | ✓ | | | ✓ | | | |
| | Aurubis AG | ✓ | ✓ | | ✓ | | | ✓ | | | |
| | Austrian Chamber of Commerce (Wirtschaftskammer) | | | | ✓ | | | | | | |
| | Borealis AG | ✓ | | ✓ | ✓ | | | | | | |
| | Bormioli Luigi Spa | | | | | | | | | | |
| | Burgo Group | | ✓ | | ✓ | | | ✓ | | | |
| | BUSINESSEUROPE | | | | ✓ | | | | | | |
| | Carbone Savoie | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| | Cartiere del Garda Spa | ✓ | | | ✓ | | | ✓ | | | |
| | Cham Paper Group | | | | ✓ | | | ✓ | | | |
| | Chemelot (USG on its behalf) | ✓ | | ✓ | | | | ✓ | | | |
| | Chemicals Association - Vereniging van de Nederlandse Chemische Industrie (VNCI) | ✓ | | ✓ | ✓ | | | | | | |

| Category of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | PRODCOM 8 | fuel substitutability | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| **Industry and private sector, incl. their associations (cont'd)** | Chemicals Industries Association (CIA) | ✓ | | | ✓ | | | ✓ | | | |
| | Confederación Española de Organizaciones Empresariales (CEOE) | | | | ✓ | | | ✓ | | | |
| | Confederation of European Paper Industries (CEPI) | | ✓ | | ✓ | | | ✓ | | | |
| | Confederation of Netherlands Industry and Employers (VNO-NCW) | | | | | | | ✓ | | | |
| | Confederation of Swedish Enterprise | | | | | | | ✓ | | | |
| | Confederation of the German Textile and Fashion Industry (Gesamtverband der deutschen Textil- und Modeindustrie e.V.) | ✓ | | | | | | | | | |
| | Der Bundesverband Glasindustrie e.V. (BV Glas) | | | | | | | | ✓ | | |
| | Elkem | ✓ | | | ✓ | | | ✓ | | | |
| | Energy and Water Association - Bundesverband der Energie und Wasserwirtschaft (BDEW) | | | | | | | | | | ✓ |
| | ESD-SIC B.V. - Voorheen Kollo silicon carbide B.V. (CEFIC member) | ✓ | | | | | | | | | |
| | Essenscia – Belgian federation of chemistry and life sciences | ✓ | | ✓ | ✓ | | | ✓ | | | |
| | Euro Chlor | | | | ✓ | | | | | | |
| | EUROALLIAGES AISBL | | ✓ | | ✓ | | | ✓ | | | |
| | EUROFER | ✓ | | ✓ | ✓ | | | | | | |
| | Eurometaux, European Non-Ferrous Metals Association | | ✓ | | ✓ | | | ✓ | | | |
| | Euromines | | | | | | | ✓ | | | |

| Category of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | PRODCOM 8 | fuel substitutability | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| **Industry and private sector, incl. their associations (cont'd)** | European Aluminium Association (EAA) | | ✓ | | ✓ | | | ✓ | | | |
| | European Carbon Graphite Association (ECGA) | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| | European Cement Association (CEMBUREAU) | ✓ | | | | | | ✓ | | | |
| | European Chemical Industry Council (CEFIC) | ✓ | | | ✓ | | | | | ✓ | |
| | European Container Glass Federation (FEVE) | | | | ✓ | | | | | | |
| | European Copper Institute (ECI) | | ✓ | | ✓ | | | ✓ | | | |
| | European Glass Industries (CIPV) | | | | | | | | | | |
| | European Industrial Gases Association (EIGA) | ✓ | ✓ | ✓ | ✓ | | | | | | |
| | European Man-made Fibres Association (CIRFS) | | | | ✓ | | | | | | |
| | European Petroleum Industry Association (EUROPIA) | ✓ | | ✓ | ✓ | | | | | | ✓ |
| | European Salt Producers' Association (EuSalt) | | | | | | | ✓ | | | |
| | European Starch Industry Association (Association des Amidonniers et des Féculiers, AAF) | | | | | | | | | | |
| | European Steel Tube Association (ESTA) | ✓ | | | ✓ | | | | | | |
| | European Tyre & Rubber Manufacturers' Association (ETRma) | | | | | | | | | | |

| Type of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | Subsectors (Prodcom) | Substitutability between fuel and electricity as ground for eligibility | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| Industry and private sector, incl. their associations (cont'd) | Federación Empresarial de la Industria Química Española FEIQUE (Spanish Chemical Industry Business Federation) | ✓ | | | ✓ | | | | | | |
| | Federation of German Industries (Bundesverband der Deutschen Industrie e. V., BDI) | | | | | | | | | | |
| | Federation of Norwegian Industries | | | | ✓ | | | ✓ | | | |
| | Fedustria | | | | ✓ | | | | | | |
| | Fertiberia | ✓ | | ✓ | ✓ | | | | | | |
| | Fertilizers Europe | ✓ | | ✓ | ✓ | | | | | | |
| | Fesil AS | | ✓ | | ✓ | | | ✓ | | | |
| | Finnfjord AS | | ✓ | | ✓ | | | ✓ | | | |
| | Glass for Europe | | | | | | | | | | |
| | GlassFibreEurope (APFE) | ✓ | | | | | | | | | |
| | GPN SA | ✓ | | ✓ | ✓ | | | | | | |
| | Graftech Iberica | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| | Hutnictví železa, a.s. (Steel Federation, Inc.) | ✓ | | | ✓ | | | | | | |
| | Hydro | | ✓ | | ✓ | | | ✓ | | | |
| | Industrievereinigung Chemiefaser e.V. (IVC) | | | | ✓ | | | | | | |
| | INEOS ChlorVinyls | ✓ | | | ✓ | | | | | | |
| | International Paper Kwidzyn Sp.z o.o. | | | | | | | | | ✓ | |
| | International Zinc Association Europe (IZA Europe) | | ✓ | | ✓ | | | ✓ | | | |
| | KGHM Polska Miedź S.A. | | ✓ | | ✓ | | | | | ✓ | |
| | Lafarge | ✓ | | | | | | | | | |
| | LKAB Group | | ✓ | | ✓ | | | ✓ | | | |
| | Mondialcarta Spa | | | | | | | ✓ | | | |
| | PEC-RHIN | ✓ | | ✓ | | | | | | | |
| | PlasticsEurope | ✓ | | ✓ | ✓ | | | | | ✓ | |
| | Polska Izba Przemysłu Chemicznego (Polish Chamber of Chemical Industry, PIPC) | | | ✓ | | | | | | ✓ | |

| Category of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | PRODCOM 8 | fuel substitutability | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| Industry and private sector, incl. their associations (cont'd) | SGL Carbon Graphite | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| | Sicem Saga | ✓ | | | | | | ✓ | | | |
| | Solvay SA | | | | ✓ | | | | | | ✓ |
| | German Steel Federation (Wirtschaftsvereinigung Stahl, WVS) | ✓ | | | | | | ✓ | | | |
| | Svaz chemického průmyslu ČR (Association of Chemical Industry of the Czech Republic) | ✓ | | | ✓ | | | | | ✓ | |
| | SveMin, Association of Mines, Mineral and Metal Producers in Sweden | | | | ✓ | | | ✓ | | | |
| | The Dow Chemical Company (Dow Belgium) | | | | ✓ | | | | | | |
| | The Hungarian Chemical Industry Association (MAVESZ) | ✓ | | | | | | | | | |
| | UK Steel Trade Association | | | | ✓ | | | ✓ | | | |
| | Union des Industries Chimiques (UIC) | ✓ | | | | | | | | | |
| | Union des Syndicats des Industries des Produits Amylacés et de leurs dérivés (USIPA) | | | | | | ✓ | | | | ✓ |
| | Union Nacional de Industrias del Cobre (UNICOBRE) | ✓ | ✓ | | ✓ | | | ✓ | | | |
| | Verband der Chemischen Industrie e.V. (VCI) | ✓ | | ✓ | ✓ | | | ✓ | | | |
| | Vestolit GmbH & Co. KG | | | | ✓ | | | ✓ | | | |
| | Wacker Chemicals Norway AS Holla Metall | | | ✓ | ✓ | | | ✓ | | | |
| | WirtschaftsVereinigung Metalle (WVM) | ✓ | ✓ | | ✓ | | | ✓ | | | |
| | Xstrata Zink GmbH | | | | ✓ | | | ✓ | | | |
| | ZGH Bolesław S.A. | | | | | | | | | ✓ | |

| Category of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | PRODCOM 8 | fuel substitutability | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| Member States or public bodies (national/regional /local) | Austria | | | | | | ✓ | | | | |
| | Belgium | | | ✓ | | | ✓ | | | | |
| | Bulgaria | | | | ✓ | | | ✓ | | | |
| | Denmark | | | | | | | ✓ | | | |
| | Estonia | | | | ✓ | | | | | ✓ | |
| | Finland | | | | | | ✓ | ✓ | | | |
| | Flemish Region (Belgium) | | | | | ✓ | | | | | |
| | France | | | | ✓ | | | | | | ✓ |
| | Germany | ✓ | ✓ | | ✓ | | | ✓ | | | |
| | Hungary | | | | | | | ✓ | | ✓ | |
| | Ireland | | | | | | | | | | |
| | Italy | | ✓ | | | | | ✓ | | | |
| | Latvia | ✓ | | | | | ✓ | | | ✓ | |
| | Lithuania | | | | | | | | | | |
| | Lower Sassony (Germany) | ✓ | | | ✓ | | | | | | |
| | Netherlands | | | | | ✓ | | | | ✓ | ✓ |
| | Norway | | | | | | | ✓ | | | |
| | Poland | | | | ✓ | | | ✓ | | | |
| | Slovakia | | | | | | | | | | |
| | Sweden | | | | | | | ✓ | | | |
| | UK | | | | | | | | | | |

| Category of organisation | Name | Sector and subsector eligibility | | | Aid intensity | | | CO2 factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 164 sectors and subsectors | PRODCOM 8 | fuel substitutability | 100% | <100% & flat | <100% & degressive | marginal | EU average | regional | uniform across EU |
| **Electricity sector, incl. their associations** | E.ON AG | | | | | | | | | | ✓ |
| | EDF | | | | | | | | | ✓ | |
| | EnergyNorway | | | | | | | | | | |
| | ENI Spa | ✓ | | | ✓ | | | ✓ | | | |
| | EURELECTRIC AISBL | | | | | | | | | ✓ | ✓ |
| | Federation of Energy and Power Industry - Verband der Industriellen Energie- und Kraftwirtschaft (VIK) | ✓ | | ✓ | ✓ | | | ✓ | | ✓ | |
| | HC Energía | | | | | | | ✓ | | | |
| | RWE AG | | | | | | | | | | ✓ |
| | Svensk Energi - Swedenergy - AB | | | | | | | ✓ | | | |
| | Vattenfall AB | | | | | | | ✓ | | | |
| **Trade Unions** | Austrian Chamber of Labour | | | | | | | | | | |
| | European Metalworkers' Federation (EMF) | ✓ | | | | | | | | | |
| | Federation of Trade Unions Nordic-IN | | | | ✓ | | | | | | |
| | Finnish Metalworkers' Union (Metallityöväen Liitto ry) | | | | ✓ | | | | | | |
| | Industrial Union TEAM | | | | ✓ | | | | | | |
| | The Norwegian Confederation of Trade Unions (LO-N) | | | | | | | ✓ | | | |
| | Trade Unions Federation (Osterreichischer Gewerkschaftsbund) | | | | | | | | | | |
| **Non-governmental organisations** | ClientEarth | | | | | | ✓ | | | | |
| | INFORSE Europe | | | | | | ✓ | | | | |
| | Inter-Environnement Wallonie | | | | | | | | | | |
| **Consumer organisations** | Association of Large Energy Consumers SVSE, member of IFIEC EUROPE | ✓ | | ✓ | ✓ | | | ✓ | | | |
| | International Federation of Industrial Energy Consumers (IFIEC Europe) | ✓ | | ✓ | ✓ | | | | | | |
| **University / education / research** | University of Groningen (Centre of Energy Law) | | | | | | | | | | |

**Table 2 List of stakeholders submitting responses, by country**

| Country | Organisation | Name |
|---|---|---|
| Austria | Member State | |
| Austria | Association | Austrian Chamber of Commerce (Wirtschaftskammer) |
| Austria | Association | Austrian Chamber of Labour |
| Austria | Association | Trade Unions Federation (Österreichischer Gewerkschaftsbund) |
| Austria | Company | Borealis AG |
| Austria | Company | Salinen Austria AG |
| Belgium | Member State | |
| Belgium | Region | Flemish Region |
| Belgium | Association | Essenscia – Belgian federation of chemistry and life sciences |
| Belgium | Association | Inter-Environnement Wallonie |
| Belgium | Company | The Dow Chemical Company (Dow Belgium) |
| Belgium | Company | Fedustria |
| Belgium | Company | Hydro |
| Belgium | Company | Solvay SA |
| Bulgaria | Member State | |
| Czech Republic | Association | Association of Large Energy Consumers SVSE, member of IFIEC EUROPE |
| Czech Republic | Association | Hutnictví železa, a.s. (Steel Federation, Inc.) |
| Czech Republic | Association | Svaz chemického průmyslu ČR (Association of Chemical Industry of the Czech Republic) |
| Denmark | Member State | |
| Estonia | Member State | |
| EU | Association | BUSINESSEUROPE |
| EU | Association | ClientEarth |
| EU | Association | Confederation of European Paper Industries (CEPI) |
| EU | Association | EURELECTRIC AISBL |
| EU | Association | Euro Chlor |
| EU | Association | EUROALLIAGES AISBL |
| EU | Association | EUROFER |
| EU | Association | Eurometaux, European Non-Ferrous Metals Association |
| EU | Association | Euromines |
| EU | Association | European Aluminium Association (EAA) |
| EU | Association | European Carbon Graphite Association (ECGA) |
| EU | Association | European Cement Association (CEMBUREAU) |
| EU | Association | European Chemical Industry Council (CEFIC) |
| EU | Association | European Container Glass Federation (FEVE) |
| EU | Association | European Copper Institute (ECI) |
| EU | Association | European Glass Industries (CIPV) |
| EU | Association | European Industrial Gases Association (EIGA) |
| EU | Association | European Man-made Fibres Association (CIRFS) |
| EU | Association | European Metalworkers' Federation (EMF) |
| EU | Association | European Petroleum Industry Association (EUROPIA) |
| EU | Association | European Salt Producers' Association (EuSalt) |
| EU | Association | European Starch Industry Association (Association des Amidonniers et des Féculiers, AAF) |
| EU | Association | European Steel Tube Association (ESTA) |
| EU | Association | European Tyre & Rubber Manufacturers' Association (ETRma) |
| EU | Association | Fertilizers Europe |

| Country | Organisation | Name |
|---|---|---|
| EU | Association | Glass for Europe |
| EU | Association | GlassFibreEurope (APFE) |
| EU | Association | INFORSE Europe |
| EU | Association | International Federation of Industrial Energy Consumers (IFIEC Europe) |
| EU | Association | International Zinc Association Europe (IZA Europe) |
| EU | Association | PlasticsEurope |
| Finland | Member State | |
| Finland | Association | Finnish Metalworkers' Union (Metallityöväen Liitto ry) |
| Finland | Association | Industrial Union TEAM |
| Finland | Company | Zinc smelter Boliden Kokkola Oy |
| France | Member State | |
| France | Association | Union des Syndicats des Industries des Produits Amylacés et de leurs dérivés (USIPA) |
| France | Association | Union des Industries Chimiques (UIC) |
| France | Company | Arkema |
| France | Company | Carbone Savoie |
| France | Company | EDF |
| France | Company | PEC-RHIN |
| France | Company | GPN SA |
| France | Company | Lafarge |
| Germany | Member State | |
| Germany | Region | Nieder Sachsen (Lower Sassony) |
| Germany | Association | Confederation of the German Textile and Fashion Industry (Gesamtverband der deutschen Textil- und Modeindustrie e.V.) |
| Germany | Association | Der Bundesverband Glasindustrie e.V. (BV Glas) |
| Germany | Association | Energy and Water Association - Bundesverband der Energie und Wasserwirtschaft (BDEW) |
| Germany | Association | Federation of Energy and Power Industry -Verband der Industriellen Energie- und Kraftwirtschaft (VIK) |
| Germany | Association | Federation of German Industries (Bundesverband der Deutschen Industrie e. V., BDI) |
| Germany | Association | Industrievereinigung Chemiefaser e.V. (IVC) |
| Germany | Association | German Steel Federation (Wirtschaftsvereinigung Stahl, WVS) |
| Germany | Association | Verband der Chemischen Industrie e.V. (VCI) |
| Germany | Association | WirtschaftsVereinigung Metalle (WVM) |
| Germany | Company | Aurubis AG |
| Germany | Company | E.ON AG |
| Germany | Company | RWE AG |
| Germany | Company | SGL Carbon Graphite |
| Germany | Company | Vestolit GmbH & Co. KG |
| Germany | Company | Xstrata Zink GmbH |
| Hungary | Member State | |
| Hungary | Association | The Hungarian Chemical Industry Association (MAVESZ) |
| Ireland | Member State | |
| Italy | Member State | |
| Italy | Association | Associazione Italiana fra gli Industriali della Carta, Cartoni e Paste per Carta (ASSOCARTA) |
| Italy | Association | Associazione Nazionale Industrie Metalli Non-Ferrosi (ASSOMET) |
| Italy | Company | A. Merati & C. Cartiera di Laveno Spa |
| Italy | Company | Bormioli Luigi Spa |
| Italy | Company | Burgo Group |

| Country | Organisation | Name |
|---|---|---|
| Italy | Company | Cartiere del Garda Spa |
| Italy | Company | Cham Paper Group |
| Italy | Company | ENI Spa |
| Italy | Company | Mondialcarta Spa |
| Italy | Company | Sicem Saga |
| Latvia | Member State | |
| Lithuania | Member State | |
| Luxembourg | Company | ArcelorMittal & Aperam |
| Netherlands | Member State | |
| Netherlands | Association | Chemicals Association - Vereniging van de Nederlandse Chemische Industrie (VNCI) |
| Netherlands | Association | Confederation of Netherlands Industry and Employers (VNO-NCW) |
| Netherlands | Company | AkzoNobel Industrial Chemicals |
| Netherlands | Company | Chemelot (USG on its behalf) |
| Netherlands | Company | ESD-SIC B.V. - Voorheen Kollo silicon carbide B.V. (CEFIC member) |
| Netherlands | University | University of Groningen (Centre of Energy Law) |
| Norway | Member State | |
| Norway | Association | EnergyNorway |
| Norway | Association | Federation of Norwegian Industries |
| Norway | Association | The Norwegian Confederation of Trade Unions (LO-N) |
| Norway | Company | Elkem |
| Norway | Company | Fesil AS |
| Norway | Company | Finnfjord AS |
| Norway | Company | Wacker Chemicals Norway AS Holla Metall |
| Poland | Member State | |
| Poland | Association | Polska Izba Przemysłu Chemicznego (Polish Chamber of Chemical Industry, PIPC) |
| Poland | Company | ZGH Bolesław S.A. |
| Poland | Company | KGHM Polska Miedź S.A. |
| Poland | Company | International Paper Kwidzyn Sp.z o.o. |
| Slovakia | Member State | |
| Spain | Association | Asociación de Productores de Productos Petroliferos (AOP) |
| Spain | Association | Asociación Nacional de Electroquímica (ANE, Chlor-alcali Association) |
| Spain | Association | Confederación Española de Organizaciones Empresariales (CEOE) |
| Spain | Association | Federación Empresarial de la Industria Química Española FEIQUE (Spanish Chemical Industry Business Federation) |
| Spain | Association | Union Nacional de Industrias del Cobre (UNICOBRE) |
| Spain | Company | Atlantic Copper S.A.U. |
| Spain | Company | Fertiberia |
| Spain | Company | Graftech Iberica |
| Spain | Company | Hc Energía |
| Sweden | Member State | |
| Sweden | Association | Confederation of Swedish Enterprise |
| Sweden | Association | Federation of Trade Unions Nordic-IN |
| Sweden | Association | SveMin, Association of Mines, Mineral and Metal Producers in Sweden |
| Sweden | Association | Svensk Energi - Swedenergy - AB |
| Sweden | Company | LKAB Group |
| Sweden | Company | Vattenfall AB |
| UK | Member State | |
| UK | Association | Chemicals Industries Association (CIA) |

| Country | Organisation | Name |
|---|---|---|
| UK | Association | UK Steel Trade Association |
| UK | Company | Alcan Aluminium UK Ltd. |
| UK | Company | INEOS ChlorVinyls |

## ANNEX 3

## Summary of replies to the consultation on the draft ETS Guidelines

## (launched on 21.12. 2012 - closed on 31.1.2012)

### Overview

Around 160 replies were received to the consultation, counting those that came in after the two-month deadline. These included submissions by Member States (21), industries (37 companies, 84 associations), NGOs (10) and several individuals (4). Most of the stakeholders that had taken part in the first consultation submitted new comments. In addition, submissions were received from many new stakeholders (see table 1 below). All the submissions are published on the DG COMP website[5].

As in the case of the first public consultation, most Member States, with notable exceptions, favoured a restrictive list of sectors and predominantly emphasised the need to limit distortions. Most of the industry submissions, on the other hand, again argued in favour of wide sector eligibility and high aid maximum aid amounts.

The replies by industry were again characterised by a very high degree of coordination. Recurring themes are the need for wide sector inclusion (on the basis of the list of the 2010 Carbon Leakage Decision), the need for assessment at Prodcom level, opposition to a CO2 floor price, full and non-degressive compensation, the use of actual production data as well as support for a fallback efficiency benchmark of 0.97.

### Sectoral eligibility

Member States welcomed the methodology of selecting eligible sectors on the basis of quantitative criteria and a qualitative assessment. As in the first consultation, a clear majority of Member States favoured a restrictive list. A majority (14 Member States) explicitly asked the Commission to keep the list short in view of the competition distortions (risk of subsidy races) and the risk of weakening the ETS incentives. Some Member States argued in favour adding specific additional sectors. Two Member States advocated a longer list of sectors (around 30). Some Member States argued that the aid should not be automatically granted to all installations within the eligible sector and that they should be able to check the necessity of the aid at installation level.

Industry submissions generally advocated inclusion of their respective sectors. As in the first public consultation, many favoured wide eligibility mirroring the 2010 Carbon Leakage Decision. Many industries again indicated the need for the possibility to assess eligibility at the product (Prodcom) level. In total, claims were received for the inclusion of 25 additional sectors[6]

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5 http://ec.europa.eu/competition/consultations/2012_emissions_trading/index_en.html

6 Mining of iron ores, salt production, carbon graphite, Synthetic rubber, Plastics, other chemicals, Textile industry – textile & clothing, Man-made fibres, Steel pipes, Industrial gases, Glass industry – glass fibres,

based on alleged risks of carbon leakage. Green NGOs typically were against this type of aid or argued for as strict as possible assessment criteria.

### Maximum aid amount

## The CO2 floor price

The introduction of a CO2 floor price (i.e. compensating only for the part of the CO2 price above the floor) had since the first consultation gained momentum among Member States, in particular in view of the current very low CO2 prices combined with budgetary constraints. At least eleven Member States strongly supported a floor price ranging between 15 and 20€, whereas one advocated a floor price of up to €50. Those Member States argued that such a threshold is necessary to avoid over-compensation when CO2 prices are low. They also referred to a large surplus of free EUAs. They also by and large underlined that there is no risk of carbon leakage at the current CO2 price (€8). In their view the political agreement on the energy and climate package in 2008 was based on a CO2 price assumption of €30.

One Member state, together with the majority of the industry associations, opposed any floor price. That camp argued that that carbon leakage occurs at any CO2 price and that it would be contrary to equal treatment with installations compensated for direct CO2 costs. They also contended that the floor price issue had not been properly addressed in the course of the consultation and that such a system would alter the very basis of the system.

### Aid intensity

Eight Member States favoured partial and degressive compensation, although some of them argued for a less steep reduction. Six Member States were in favour of 100% compensation without any reduction. Two out of the eleven Member States which were in favour of a floor price indicated that they would accept 100% compensation on the condition that a CO2 floor price was applied. Two Member States considered that the aid intensity should not exceed 50%.

As in the previous public consultation, industry argued for 100% compensation without degressivity. They claimed inter alia that the compensation should reflect the real costs, that degressivity would not increase efficiency incentives as consumers were unable to influence the energy mix and that the ETS Directive was based on a full compensation logic.

### Actual or historic output

12 Member States asked the Commission to review its position and to use actual as opposed to historic production data. They argued that actual production would avoid the risk of under- and over- compensation. They also criticised the 40% variation threshold (i.e. account only being taken of capacity increases of at least 40%) as arbitrary, too stringent or as insufficiently rewarding new investments. Two Member States supported the Commission proposal of using a historical baseline.

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Tyres and rubber, wood based panels, Pulp, Ceramics, Foundries, Cement, refineries, wool, ferro-silicon, starch, nickel, sugar, mining.

Industry overwhelmingly favoured the use of actual production, arguing that compensation should reflect as far as possible the actual costs borne and that over and under-compensation should be avoided. New investments would be discouraged by the 40% threshold. That threshold was also perceived as arbitrary. Some companies and associations agreed with the use of historic output, albeit on the condition that the worst crisis years would be excluded or that a choice would be given between the periods 2005-2008 and 2009-2011, to so as to best reflect the normal market situations.

**CO2 emission factor**

A clear majority of Member States (14) supported regional CO2 factors. Some Members States, however, expressed concerns about the relatively high values for a number of regions and the risk of over-compensation, requesting some flexibility allowing for the use of a lower CO2 factor. Some of them pointed out that the proposed slip to Central Western Europe into two zones (CWE 1 and 2) was artificial and undesirable.

Industry views diverged somewhat on this point. While some (e.g. Confindustria) supported a uniform emission factor, considering that regional factors would penalise the best performing countries and lead to additional distortions of the internal market, most industry stakeholders supported regional differentiation as being closest to actual costs (e.g. BDEW). Several stakeholders pointed out that the CWE 1 and 2 split was artificial and undesirable (e.g. IFIEC Europe, AFEP). Many industry stakeholders also made the case for Denmark to be included in the Nordic area and some suggested a method to calculate a CO2 factor based on the actual market coupling situation for every hour of the year (e.g. Essenscia, BASF). Some submissions favoured a method to calculate the CO2 emission factor on an installation level basis (e.g. British Glass Manufacturers Association, ALFED).

**Efficiency Benchmarks**

While most Member States, insofar as they commented on this point, were generally in favour of electricity efficiency benchmarks, some pointed to the danger of discriminating sectors without product specific benchmarks and especially those that are already comparatively efficient. Those Member States argued for as many product specific benchmarks as possible and/or the use of their average as a fallback.

Industry generally considered the fallback threshold of 0.70 as unacceptable, very arbitrary and unnecessarily punishing those sectors where a sector specific benchmark cannot be determined or sectors that have taken early action in the field of energy efficiency. Most industry stakeholders argued in favour of the approach used for direct emissions, i.e. a fallback benchmark of 0.97 fallback.

**Table: list of additional stakeholders submitting responses (who did not submit during 1st consultation), by country**

| Country | Organisation | Name |
|---|---|---|
| Austria | Association | Osterreich E-Wirtschaft – Austrian Association of Electricity Industry |
| Bulgaria | Company | EVN Bulgaria |
| Czech Republic | Member State | |
| Czech Republic | NGO | Centre for Transport and Energy |
| Czech Republic | NGO | Environmental Law Service |
| Czech Republic | Individual | Vladimir Toman |
| Czech Republic | Individual | Jana Hays |
| Denmark | Company | DONG Energy |
| EU | Association | Cerame-Unie – European Ceramic Industry Association |
| EU | Association | Euratex |
| EU | Association | CAEF – European Foundry Association |
| EU | Association | Eurima – European Insulation Manufacturers Association |
| EU | Association | CPME – PET Manufacturers in Europe |
| EU | Association | Nickel Institute |
| EU | Association | CEFIF Sector Group Sodium Chlorates |
| EU | NGO | Bellona Europa |
| EU | NGO | E3G |
| EU | NGO | Climate Action Network Europe |
| EU | NGO | Greenpeace |
| Finland | Association | Confederation of Finish Industries |
| Finland | Association | Finish Energy Industries |
| Finland | Association | Finish Federation of Technology Industries |
| Finland | Company | Outokumpu Oyj |
| France | Association | UFE – Union Française de l'Electricité |
| France | Association | AFEP – Association française des entreprises privées |
| France | Association | Copacel – French Confederation of Paper, Cardboard and Cellulose |
| Germany | Association | IG BCE (Mining Chemical and Energy Industrial Union) |
| Germany | Association | IGV – German Industrial Gases Association |
| Germany | Association | VKS – German Association of Kali and Salt Producers |
| Germany | Association | VDZ – German Cement Association |
| Germany | Association | IVH – Industrieverband Hamburg |
| Germany | Association | German Association of New Energy Suppliers |
| Germany | Association | VKU - German Association of Municipal Undertakings |
| Germany | Company | SÜDSALZ |
| Germany | Company | Tokai Erftcarbon |
| Germany | Company | BASF |
| Germany | Company | Evonik Industries |
| Germany | Company | Bayer MaterialScience |
| Germany | Company | Graphite Cova |
| Germany | Company | ESCO – European Salt Company |
| Germany | Company | Deutsche Bahn |

| | | |
|---|---|---|
| Germany | Company | Wintershall |
| Germany | Company | ThyssenKrupp |
| Germany | NGO | Oko-Institut – Institute for Applied Ecology |
| Germany | NGO | FOS – Green Budget Germany |
| Germany | NGO | BUND Friends of the Earth Germany |
| Germany | NGO | Deutsche Umwelthilfe |
| Germany | Individual | Dr. Jörg Geerlings |
| Greece | Association | Greek Cement Industry Association |
| Greece | Company | Public Power Corporation |
| Italy | Association | Confindustria – Italian General Confederation of Industries |
| Italy | Association | Federchimica – Italian Association of the Chemical Industry |
| Italy | Association | Assovetro – Italian Association of Glass Producers |
| Italy | Individual | Dr. Mario Andrea Valori |
| Lithuania | Association | Association of Lithuanian Chemical Industry Enterprises |
| Luxembourg | Member State | |
| Netherlands | Company | SABIC in Europe |
| Netherlands | Company | Lanxess Elastomers |
| Netherlands | Company | DEXPlastomers |
| Netherlands | Company | Dow Chemical |
| Norway | Association | Norwegian Ferrosilicon and Silicon Producers |
| Norway | Company | Norsk Hydro |
| Poland | Association | Polish Association of Wood-based Panels Producers |
| Poland | Association | FOEEiG - Polish Consumers Forum for Electricity and Gas |
| Romania | Member State | |
| Slovakia | Company | Slovalco |
| Spain | Member State | |
| Spain | Association | Acogen – Spanish Association of Cogeneration |
| Spain | Association | AFGIM – Spanish Association of Medical and Industrial Gases Producers |
| Spain | Association | UNECID – Spanish Association of Steel Producers |
| Spain | Company | La Farga Group |
| Spain | Company | Cunext |
| Sweden | Association | SKGS – Energy Intensive Industries Cooperation |
| UK | Association | British Glass Manufacturers Confederation |
| UK | Association | MCCG – UK Manufacturers' Climate Change Group |
| UK | Association | British Ceramic Confederation |
| UK | Association | Tees Valley Unlimited |
| UK | Association | CoalPro – Confederation of UK Coal Producers |
| UK | Association | Alfed – UK Aluminium Federation |

## ANNEX 4

## Implementation of the comments by the Impact Assessment Board (draft versions of 11 November 2011 and 20 April 2020)

**Response to the Opinion of the Impact Assessment Board of 11 November 2011**

The impact assessment was presented to the Impact Assessment Board on 9 November 2011. The Board issued its Opinion on 11 November.

In line with that Opinion the resubmitted Report has been significantly (by around 20%) shortened (to some 40 pages excluding graphs, tables and the table of content), even allowing for the second consultation which brought the number of stakeholder submissions well over the 300 mark.

The revised presents a robust and fully fledged Baseline Scenario (including expected impacts in terms of carbon leakage, ETS efficiency and distortions), drawing on the available data.

The problem definition has been substantially strengthened. The incidence of carbon leakage is addressed. More emphasis is placed on key drivers. The relative importance of carbon leakage compared to other factors affecting international competitiveness has been more prominently highlighted. Further proxies for identifying the sectors most at risk of carbon leakage have been added. The operational objective has been reinforced and linked to progress indicators.

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 four new Option Packages are explicitly linked to the specific options in section 3 and their impacts are assessed accordingly. The assessment also places greater emphasis on possible distortions in the internal market not only within but also between sectors.

A new option (A4) on sector eligibility based on a threshold combining direct and indirect CO2 costs is – as requested by the Opinion - examined as part of one of the four Option Packages. The selection criteria of sectors that may undergo a qualitative assessment under Option A3 have been clarified.

As regards aid intensity a new Option B2 (aid falling from an initial aid intensity level of 100%) has been added and is examined as part of one Option Package. As regards Option D2 (aid to be based on the installation's historical production) more data has been added to inform decision-making as to the representative benchmark years to determine the level of production under Option D.

As recommended by the Opinion the comparison of the impacts of the Option Packages departs from expected impacts under a Baseline Scenario. The quantitative dimension of the assessment Option Packages has been strengthened. The gross value added at stake as well as the potential degree of insulation through State aid is estimated per Package. Additional data relevant to

assessing employment impacts are also integrated. Sectoral eligibility under the different Option Packages is explicitly stated.

The four Option Packages are presented in a more transparent way in the form of one Maximalist, one Minimalist and two Intermediate Packages. To identify the best performing Option Package or Packages, the selection criteria are set out more explicitly and a summary option comparing the four packages is added.

**Implementation of the comments by the Impact Assessment Board - Opinion of 11.11.2011**

| Recommendations by the Impact Assessment Board | The specific sections of the Report where the recommendations are implemented |
|---|---|
| The Report should present a more robust Baseline Scenario. | The recommendations regarding the Baseline Scenario are addressed in the new section 3.4 and in particular in the new section 5.2. |
| The Report should provide greater clarity on the precise scope of the problem. It should summarise the available evidence on the incidence of carbon leakage problems and on the drivers of this problem, in order to better indicate how the situation with regard to carbon leakage and related impacts (e.g. efficiency of the ETS/distortion of the internal market) is likely to evolve in the absence of new EU action to modify the State aid regime. | The recommendations are addressed in particular in the section 2.1 (covering inter alia the scope of the problem). Three key drivers of the problem are addressed in sections 2.2, 2.3 and 2.4. The issue to how carbon leakage and other key impacts may evolve in the absence of new EU action is addressed in the considerably beefed up in section 5.2 on the Baseline Scenario. |
| The Report should clearly identify which sectors are most at risk of carbon leakage.<br>On that basis the Report should explicitly acknowledge the precautionary character of the proposed Guidelines, which are designed to address problems that are likely to arise, including when carbon prices would increase significantly above their current levels. | A proxy for the sectors most at risk under the Baseline Scenario is applied the under Baseline Scenario (section 5.2.1.1). Sectors deemed most at risk of carbon leakage under the eligibility criteria in respect of each Option and Option Package are clearly identified in sections 4.5 (and Annex 7), 4.6, 4.7 (in particular 4.7.2.5), 4.8, 5.4.1, 5.5.1, 5.6.1 and 5.7.1). The recommendation as regards the precautionary nature of the proposed Guidelines is addressed at section 2.2.1 as well as in section 4.4 on the CO2 price assumption. |
| The observation in the Report about the relative importance of carbon leakage for the competitiveness of most sectors in comparison with exchange rates and labour, capital and other input costs should be integrated in the problem definition. | The recommendation is addressed at section 2.1.3 (scope of the problem) *in fine*. |
| The Baseline Scenario should clarify what the current State aid regime allows Member States to do with respect to the prevention of carbon leakage. | The recommendation is addressed at sections 2.1.5, 3.2 and 3.4 (Baseline Scenario). |
| The Report should improve the presentation by of the options by providing a more transparent presentation of the options in politically relevant packages (with a clear identification of sectors covered) that would allow for a more concrete comparison of | The recommendation is addressed at sections 4.2, 4.21, 5 (impacts of option packages) and section 6 (comparison of the four Option Packages). |

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| impacts. | |
| The various option packages should be clearly linked to the specific objectives to be achieved, such as preventing illegal operating aid, and avoiding distortions in the single market and between sectors. | The recommendation is addressed at section 4.2, section 4.21. |
| The Report should consider introducing an additional option using a combined threshold for direct and indirect costs, rather than proposing a 5% threshold for indirect costs alone (as is done in option A2) or provide clear arguments why such an option has been discarded. | The recommendation is addressed by introducing an additional Option A4 at section 4.10, which is presented and assessed as an integral part of one of the four Option Packages (Second Intermediate Package) (see section 4.21). |
| The report should also better explain the selection of sectors that would undergo a qualitative assessment under option A3. | The recommendation is addressed at section 4.7.1. |
| A sensitivity analysis should be conducted for carbon prices, for instance with 10, 20 and 40€/t. | The recommendation is addressed at sections 1.3, 2.2.1, 4.4, 5.1.1, 5.4.1 and 5.6.1. |
| It should be considered to differentiate options on the stringency of the state aid regime in function of the availability of concrete evidence of carbon leakage, or as an approximation for such evidence, of specific levels of carbon prices. | The recommendation to differentiate the option packages is principally carried out using the metric of different CO2 prices (sections 4.4, 5.1.1, 5.3.1, 5.4.1 and 5.6.1). Other proxies with a bearing on carbon leakage is carried out in the context of the qualitative assessment under Option A3 (corresponding to the First Intermediate Option Package) (see the sector specific assessments in Annex 10). The available evidence of carbon leakage and possible ramifications thereof are set out in section 2.1.3. |
| On the issue of aid intensity, a combined option should be considered, which would begin at 100% and subsequently decline over time to provide a stronger incentive to reduce CO2 emissions (option B1 coupled with B2b). | The recommendation is addressed at section 4.11 by the introduction of a new aid intensity option (Option B2) which is presented an assessed as an integral part of one of the four Option Packages (First Intermediate Package) (see section 4.21). |
| With respect to the production level used to determine the eligibility of (sub-)sectors an additional option could be considered, using the historical output and monitoring its evolution. | The recommendation is addressed at section 4.20 |
| Where options have been discarded early on in the process, the Report should clearly state why they were no longer considered relevant. | A previously discarded option – a combined direct and indirect CO2 costs – threshold is no longer discarded. It is considered in the revised Report (as Option A4) (see section 4.8). More generally, the recommendation is |

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| | addressed at section 4.3. |
| The Report should strengthen the presentation of the costs and benefits of the different options, and should address the possible consequences of non-alignment of the treatment of direct and indirect costs. | The recommendation is addressed at new and detailed section 5.2 and in particular in section 5.2.1.1 (Baseline Scenario). In respect of the Four Option Packages the broad scale of potential costs and benefits (value at stake and the degree of potential insulation of certain sectors of the economy) is considered in section 5 (in particular 5.3.2, 5.3.3, 5.4.2, 5.4.3, 5.5.3 and 5.5.4, 5.6.2 and 5.6.3). The recommendation as to the treatment of direct versus indirect CO2 costs is addressed in the context of inter-sector distortions at sections 3.2, 4.4, 5.2.2, 5.3.4, 5.4.4, 5.4.5, 5.5.5, 5.6.4 and section 6.1 |
| The Report should complement its qualitative assessment of the most important option packages with the available quantitative evidence. | The recommendation is addressed at sections 5.2.1.1, 5.2.1.2 and 5.2.1.3, i.e. an assessment – reinforced by the available quantitative evidence - of economic, social and environmental impacts under the Baseline Scenario (section 5.2), against which the impacts under the Option Packages are compared. Throughout Section 5 the assessment of impacts in terms of carbon leakage and impacts in terms of maintaining ETS incentives have been strengthened with the available quantitative evidence (aggregate GVA of sectors at stake and aggregate amount of electricity consumption at stake). |
| The Report should indicate which sectors would be most likely to be included in the application of the Guidelines under different option packages. | The recommendation is addressed at sections 5.1.1, 5.3.1, 5.4.1, 5.5.1 and 5.6.1. |
| The Report should illustrate the broader impacts by providing an indication of the relative importance, geographical distribution, and number of people employed in these sectors. | The recommendation is addressed at sections 2.2.1, 5.2.1.1, 5.2.1.2, 5.4.2, 5.5.2 and 5.6.2. Reference is also made to information under the "Sector and production description" heading in the sector specific Annex 10 which relates to the qualitative eligibility assessment under Option A3 (which is an integral part of the First Intermediate Option Package). |
| The Report should explicitly address the possible creation of new market distortions within sectors as a consequence of non-alignment of the treatment of direct and indirect costs. | The recommendation is addressed in sections 3.2, 4.4, 5.2.3, 5.3.4, 5.4.4, 5.6.4 and 6.1. |
| It should also discuss the possible long-run | The recommendation is addressed in sections |

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| consequences of a burden shift from energy intensive sectors (aid eligible), which are capital intensive, to more labour intensive sectors. | 5.2.1.1, 5.2.1.2, 5.2.1.3 and 5.2.2. See also Annex 5 relating to the wider policy context, in particular as regards the sectors outside the ETS covered by the so-called effort-sharing decision. |
| Against the background of the current economic difficulties, the Report should, in summing up the expected impacts, clearly assess competitiveness issues, as well as the distribution of impacts across Member States. | The recommendation in so far as it concerns the relevance of competitiveness of EU industry vis-à-vis third countries is addressed in sections 2.1.2, 2.1.3, 2.2.2, 2.4, Annex 5 on the wider policy context. The sector-specific Annex 10 (relating to Option A3/First Intermediate Option Package) takes account of available evidence on the current challenging economic conditions. The precautionary principle also takes into account competitiveness impacts resulting under different price scenarios (see section 2.2.1 as well as section 4.4. The concluding section 6.2 also takes into account possible competitiveness impacts in the future (in view of the relatively short time span relevant to the issue of carbon leakage due to the Emissions Trading System. As regards Member-State specific impacts see section 5.7 |
| The Report should compare the option packages in a more transparent way, and explicitly state the criteria which should guide the selection of the preferred option.<br>It should better explain the reasoning behind the qualifications in the partial comparison tables, and provide a summary table that explicitly compares the most relevant option packages. On this basis it should indicate which option would perform best, subject to different assumptions about the value of key variables, such as prevailing carbon prices. The report should explicitly state the criteria by which this preferred option would be selected. | The recommendation in so far as it concerns the option packages is addressed in sections 4.4, 4.21, section 5 and section 5.1. The recommendation in so far as it concerns the criteria guiding the selection of the options (and option packages) is addressed in section 6. |

**Response to the Opinion of the Impact Assessment Board of 20 April 2012**

**Implementation of the comments by the Impact Assessment Board - Opinion of 20.04.2012**

| **Recommendations by the Impact** | **The specific sections of the Report where** |
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| Assessment Board | the recommendations are implemented |
|---|---|
| Linkage of the Option Packages to the issue of illegal operating aid | The recommendation is addressed in particular at sections 3.2 and 3.4. |
| Taking account of the "floor price" issue raised in the context of the second consultation. | The recommendation is addressed in particular at section 4.4 |
| The use of the future CO2 price in connection with determining the maximum aid amount | The recommendation is addressed in section 4.9 |
| Better use of the available quantitative data in the context of assessing the impacts | The recommendation is addressed generally in section 5.7. The estimated extent of the key impacts in terms of the share of the EU industrial electricity consumption sheltered and the amount of industrial value added concerned under each Option Package is set out in sections 5.3.2, 5.3.3, 5.4.2, 5.4.3, 5.5.2, 5.5.3, 5.6.2 and 5.6.3. The quantitative data is also reflected in section 6.2 (comparison of the Option Packages). |
| Mentioning the sectors and subsectors qualifying under each Option Package | The eligible sectors and subsectors under each Package have been clarified in sections 4.6, 4.7 and 4.8. The number of sectors and subsectors qualifying under the Maximalist Package makes it more appropriate to outline those sectors at Annex 4.5. |
| Illustration of the broader impacts (e.g. distribution of impacts across Member States). | The recommendation is in particular addressed in section 5.7 |
| Explanation of the criteria for the selection of the preferred Option Package. | The recommendation is addressed in sections 6.1, 6.2, 6.3 and 6.4 |
| Presentation of the Baseline Scenario within the problem definition. | The recommendation is addressed at section 3.4 |
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| Presentation of the section on subsidiarity and proportionality. | The recommendation is addressed at section 4.22 |
| Shortening of the text | The text has been shortened in particular section 2 (problem definition). |
| Glossary of technical terms and abbreviations used in the Annexes. | The recommendation is addressed in the revised Glossary preceding the Annexes. |

## ANNEX 5

## The wider EU policy context

### 1. The Climate and Energy Package of 2007 and its follow-up

**The EU ETS Directive (**as amended in 2009) **is a core pillar of the EU's Climate and Energy Package** laid down by the European Council in March 2007. The Package has two binding targets to be achieved by 2020[7]:

a) to **reduce CO2 emissions** by 20% from the emissions level in 1990;

b) to increase, over the same time span, the share of **renewable energy** sources in the EU to 20% of overall energy consumption.

The European Council also established a (non-binding) target to increase **energy efficiency** by 20% by 2020[8].

On 29-30 October 2009 the European Council agreed on the need to reduce by 2050 the global emissions by 50%, with developed countries reducing their emissions by 80-95%, as compared too 1990 levels. The Europe Council supported the EU objective to reduce by 80-95% by 2050 as compared to 1990 levels.[9]

As regards the more immediate 2020 targets, the European Council stated that the EU's intention is to increase its CO2 reduction target to 30% (from the current 20%) if other developed and developing countries make sufficient commitments to reduce or limit CO2 emissions[10].

The ETS Directive (as amended in 2009)[11] required the Commission to carry out an assessment of the feasibility of a 30% reduction target by June 2010, including an assessment of the risk of carbon leakage.

In a Communication of May 2010 the Commission estimated the potential impacts of moving to a 30% reduction target by 2020[12]. The Commission concluded that the conditions for a 30% reduction target were not at hand and that the risk of carbon leakage was limited (provided that the measures already taken to prevent carbon leakage by free allocation of EUAs due to direct CO2 emissions costs remained in place)[13].

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7 Council document 7224/1/07 Rev 1.

8 Compared to a business as usual scenario baseline.

9 Presidency Conclusion 30/10/2009 Nr:15265/1/09 REV1 (paragraph 7: "… It supports an EU objective, in the context of necessary reductions according to the IPCC by developed countries as a group, to reduce emissions by 80-95% by 2050 compared to 1990 levels.")

10 Ibidem, paragraph 8.

11 Recital 25 and Article 10b(1).

12 COM(2010) 265 final.

13 COM(2010) 265 final.

In October 2010 the Council[14] invited the Commission to further elaborate operations for moving to a 30% reduction and to conduct analyses on the effects at Member State level. At the time of writing the Commission had not finalized that assessment.

In its conclusions of 4 February 2011 the European Council "looked forward to the elaboration of a low carbon 2050 strategy providing the framework for the longer term action in the energy and other related sectors. Reaching the EU objective, in the context of necessary reductions according to the IPCC by developed countries as a group, of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990 as agreed in October 2009 would – according to the European Council - require a revolution in energy systems, which had start immediately.[15] The ultimate aim is for the EU to make its contribution prevent the global temperature from rising by more than 2˚C above pre-industrial levels. The envisaged decarbonisation of the electricity in this Report is a fundamental part of the EU's objectives for 2050.

Responding to the European Council's call, the **Roadmap for moving to a competitive low carbon economy in 2050** was adopted in **March 2011**[16.] The Roadmap sets out possible cost-effective pathways towards a low-carbon economy with a view to reducing the EU's CO2 emissions by 80 to 95% by 2050 from the 1990 level.

In its conclusions of 4 February 2011, the European Council also insisted on delivery of **the 2020 20% energy efficiency target**.[17] To this end, the Commission adopted an Energy Efficiency Plan in March 2011[18] which aims at stepping up measures in this area as the EU is on course to achieve only half of the 20% objective by 2020. The proposed Energy Efficiency Directive serves the same end[19].

The Commission proposal for a revised Energy Taxation Directive[20] seeks to address EU's climate change and energy policies highlighted above and complement the third phase of the EU ETS. Sectors covered by the ETS are not subject to the Energy Taxation Directive and vice versa.

The 20% CO2 reduction target therefore remains valid for the time being.

**The burden of achieving this reduction is shared.** First, the sectors covered by the ETS - mainly electricity generators, manufacturing industry and mining as well as (as from 2012) aviation – must reduce CO2 emissions by 21% over 2005-2020. Second, the non-ETS ("effort-sharing") sectors must reduce their CO2 emissions by 10% over the same period (2005-2020)

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14 Council of the European Union, Environmental Council conclusions, 14 October 2010 (14979/10).

15 See paragraph 15 of the Conclusions (4/2/2011 Nr: EUCO 2/1/11).

16 COM(2011) 112 final. See also impact assessment on "Investing in the Development of Low Carbon Technologies (SET-Plan) (SEC (2009) 1297) at p. 20 ("*The inherent high upfront learning investments in the energy sector (e.g. full-scale CCS about €1bn) combined with the long life cycles of existing plants (e.g. 40 years for coal-fired plant, 25 years for a CCG plant … and infrastructure and network investment create a lock-in effect that favours established technologies and thus impedes innovation of new technologies in the energy sector"*).

17 See paragraph of 8 of European Council conclusions of 4 February 2011.

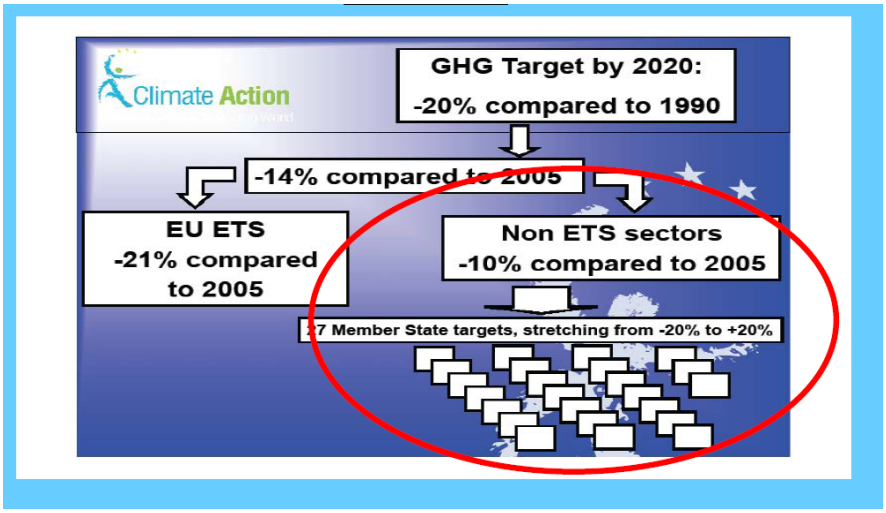
18 COM(2011) 109 final.

19 COM(2011)370.

20 Proposal for a Council Directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity, COM(2011) 169/3, SEC(2011) 409, SEC(2011) 410, 13 April 2011.

(see figure below). The non-ETS sectors include among others the entire transport sector, construction and agriculture[21].

**Figure: The 2020 reduction target of non-ETS sectors (compared to ETS-sectors)**




*Source: Schafhausen, Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2009)*

As the scope and nature of the Guidelines governing State aid in the context of the ETS to be adopted may potentially impact on both the CO2 price and the electricity price, the Report also considers the impact of different Options on sectors and parts of society which will not be eligible to receive State aid under the Guidelines. These categories may include ETS sectors and non-ETS sectors as well as society at large (households, services and the public sector).

**The Europe 2020 Strategy and other EU policy frameworks**

In setting out the broad EU policy framework it is necessary refer to the **EU's Europe 2020 Strategy aimed at promoting smart, sustainable and inclusive growth**[22] Sustainable growth is understood to mean *"building a resource-efficient, sustainable and competitive economy, … Europe's leadership in the race to develop new processes and technologies, including green technologies*"[23].

The Europe 2020 Strategy is underpinned by a number of thematic Flagship Initiatives, several of which are particularly relevant to the Guidelines at issue:

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21 The non-ETS sectors reductions are carried out under national plans subject to the "effort-sharing" decision (Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020), OJ L 140, 5.6.2009, p. 136–148.

22 European Commission COM (2010) 2020.

23 European Commission (COMP (2010) 2020), p. 14. See also 2011 Competitiveness Report at p. 187 (forthcoming): "The EU as a whole remains ahead of international comparators such as Japan and the US on the use of renewable energy, but countries such as China are also rapidly developing their technology and capacity. See also section 2.2.1 of SEC (2009) 1297 on ' Competitiveness of EU business and EU citizens are affected' (impact assessment on Investing in the Development of Low Carbon Technologies (SET-Plan) ("Should the needed investment happen, important 'first-mover advantages' could result for the EU-based industry that could have positive spill-over effects for the EU citizens").

First, **an Integrated Industrial Policy for the Globalisation Era – Putting Competitiveness and Sustainability at Centre Stage**[24]: This Flagship is particularly aimed at safeguarding and strengthening the competitiveness of EU industrial sectors vis-à-vis third country competitors. At the heart of this Report is the extent to which the expected pass-on of the CO2 component in electricity costs will adversely affect the competitive position of certain EU sectors and subsectors in relation to their third country competitors, a situation explicitly envisaged in recital 24 of the ETS Directive:

"In the event that other developed countries and other major emitters of greenhouse gases do not participate in this international agreement, this could lead to an increase in greenhouse gas emissions in third countries where industry would not be subject to comparable carbon constraints (carbon leakage), and at the same time **could put certain energy-intensive sectors and subsectors in the Community which are subject to international competition at an economic disadvantage**. This could undermine the environmental integrity and benefit of actions by the Community" (emphasis added).

This key aspect of competitiveness – which includes EU firms' cost competitiveness vis-à-vis their country competitors - is thus an integral part of the issues addressed by this Report. The "competitiveness proofing" referred of the 2010 Industrial Policy Communication is thus built into the core of the problem addressed in this Report[25].

**Resource-Efficient Europe (REE)**[26]: The REE is a Flagship initiative under EU2020, which aims to create an integrated framework for different policies (including those mentioned in relation to the EU Climate and Energy Package) to support the shift towards a low-carbon and resource-efficient economy.[27] The European Commission's Roadmap[28] for a resource-efficient Europe, a Communication adopted on 20 September 2011 reiterates, inter alia, the need for phasing out environmentally harmful subsidies notably in the field of fossil fuels.

**New Skills for New Jobs - Anticipating and matching labour market and skills needs**[29]: The Communication notes that the transition to a low-carbon economy offers great potential for the creation of sustainable jobs. Many studies and policy documents and reports draw attention to the job-creation potential ("green jobs") in the low-carbon and renewable energy area[30].

The above pillars of the Europe 2020 Strategy mainly concern action at the *EU level*. **The *national* dimension of the Europe 2020 is subject to the new "European Semester" governance framework**. Based on integrated assessments of the Member States' fiscal and structural reform plans, the Commission has proposed recommendations to each Member States to be adopted by the Council before the national budgetary procedures begins in earnest in the autumn. Such recommendations (albeit not legally binding) constitute policy advice by the EU as to how a Member State should orient its budgetary resources as a matter of priority. This is also

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24 European Commission (COM (2010) 614).

25 European Commission (COM (2010) 614), p. 31.

26 European Commission, (COM (2011) 21).

27 European Commission (COM(2011) 21), p. 5.

28 European Commission (COM(2011) 571), p. 10

29 European Commission (COM (2010) 682, p. 9 ("Indeed, significant investments in "green" skills need to be made to ensure Europe lives up to its ambition of having 3 million green collar workers by 2020").

30 According to the International Labour Organization, the global market for ecological services and products should double and reach USD 2740 billion in 2020. ILO, Green jobs Facts and figures, 2008.

relevant to the issue of large-scale State aid expenditure. A special situation applies to five of the EU's Member States which subject to particularly rigorous rules on their expenditure under so-called fiscal adjustment programmes involving EU and IMF support ("Programme Countries").

The Annual Growth Survey 2012[31] – that Commission's primary input into the European Semester for that year – refers to smart recycling of both auctioning revenues an revenues from CO2 pricing by the sectors outside the ETS as a way of spurring jobs and growth while combating climate change.

The Commission's proposal for the Multiannual Financial Framework (MFF) for 2014-2020 is fully aligned with the Europe 2020 Strategy[32]. The MFF's headline targets include CO2 reductions of 20% or 30% if the conditions are right. The Commission proposes increasing the share of the EU budget spent on further Europe's transition to a low carbon and climate-resilient society to at least 20%. This would take financial support for climate-related purposes to around €200 billion for 2014-2020. The Commission's proposal for the 2014-2020 cohesion policy[33] includes a mandatory concentration of European Regional Development Fund (ERDF) resources on energy efficiency and renewables at a level of a minimum of 20% of the national ERDF resources for transition and more developed regions and a minimum of 6% of less developed regions At the EU levels this equates at a minimum to €17.1bn.

31 COM(2011)815 final of 23 November 2011.
32 COM(2011)500/I and II.
33 COM(2011)615.

## ANNEX 6

## The Commission statement as regards recital 27 and Article 10a(6) of the ETS Directive

***Commission Statement***

## Commission's non-paper submitted to the European Parliament and the Council on 19 November 2008 (Annex 2 15713/1/08)

***Emissions indirectes***

### PROPOSED ASSESSMENT CRITERIA FOR STATE AID TO COMPENSATE FOR ELECTRICITY COST INCREASES DUE TO PASS ON OF $CO_2$ COSTS

1. This document presents an approach for measures to ensure that increases in electricity costs resulting from pass-through of ETS-related $CO_2$ costs can be compensated ("indirect emissions"). It proposes a method to assess the compatibility of state aid schemes with Community state aid rules.

2. It should be underlined that in the event that an international climate agreement is concluded, the need for any compensation would have to be re-evaluated.

3. Aid could be reasoned to be necessary to achieve the environmental objective of the ETS where the costs of ETS burden companies to an extent that they would leave the EU without overall emission reductions (i.e. carbon leakage). The support should in principle only offer a compensation for the part of the increase in electricity prices due to the ETS-related pass-through of $CO_2$ costs from the electricity generator. The actual pass-on of $CO_2$ costs of electricity experienced by the installations depends on conditions of supply to the particular installation or the existence of non-emitting electricity sources at industrial sites i.e. standard medium-term contracts, long-term contracts, regulated tariffs, direct supply from a dedicated, $CO_2$ free power generation unit. Therefore the definition of the aid necessary seems only possible through a case-by-case analysis at installation level.

4. In addition, companies concerned should pay a part of the increased $CO_2$ cost in order to maintain an incentive to save energy and to stimulate a shift in demand from grey to green electricity. Any support system should furthermore promote energy efficiency by linking the extent of support to energy efficiency performance.

5. A scheme might be set up as follows:

If a Member State would like to provide such aid, it would have to notify a scheme to the Commission. The Commission's assessment of the scheme would follow three steps:

*Step 1:* confirmation by the Member State that all intended beneficiaries are covered by a list of (sub)sectors identified at EU level to be subject to risk of carbon leakage due to $CO_2$ costs of indirect emissions (necessity of the aid).

*Step 2:* confirmation by the Member State that at the level of each installation, $CO_2$ costs are being passed on in electricity prices (necessity of the aid).

*Step 3*: confirmation that the Member State will use a method to determine the compensation that does not exceed the maximum allowed for each eligible installation, in order to avoid overcompensation, avoid distortion on the common market and maintain the environmental incentive of the ETS (proportionality of the aid).

***Step 1: The measure must target beneficiaries for which risk of carbon leakage exists due to increases in electricity costs***

6. The Commission would establish a list of (sub)sectors exposed to the risk of carbon leakage due to *indirect* emissions. The Commission 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.

7. For the assessment of a state aid scheme, Member States would have to confirm that each beneficiary is covered by the list of (sub)sectors for indirect emissions established by the Commission.

***Step 2: Within sectors identified as being at risk of carbon leakage, aid can be granted only to companies subject to pass on of $CO_2$ costs in electricity prices***

8. In the second step the Commission would assess if a Member State is able to establish that real actual electricity prices paid by potential beneficiaries are likely to include the costs of $CO_2$, taking into account regulated tariffs, own production from non-emitting sources or long-term contracts.

9. The method to verify that beneficiaries are affected by the ETS should include the following elements:

   1) Verification of the basis of payment for electricity for each of the benefiting companies (contract, regulated tariff, wholesale market, and auto-generation).

   2) Exclusion of beneficiaries buying electricity at a price specified in a regulated tariff if tariffs do not include $CO_2$ costs of the power generator.

   3) Exclusion of compensation to installations buying electricity on the basis of a long term

contract signed before 1.1.2005 if it does not include $CO_2$ costs.

***Step 3: The aid granted to companies identified in step 1 and 2 must be proportional and must maintain an incentive to improve on energy efficiency/or switch to cleaner electricity***

10. In the third step the Commission would assess that compensation granted by Member States is proportional to the pass on of $CO_2$ costs and maintains an incentive to reduce electricity consumption. In order to maintain this incentive, the Commission would set out maximum aid intensities that are lower than the full potential cost increase.

11. The Commission would provide the following data, which Member States would have to use to calculate the maximum aid allowed:

- A percentage of the $CO_2$ costs for which aid can be provided (possibly linked to the degree of risk of carbon leakage but, in any event, lower than the full $CO_2$ costs)
- The average $CO_2$ intensity in the EU's total electricity production, which is the intensity that all Member States have to use. This figure would be revised every four years to reflect any major changes in the electricity mix.
- The average allowance price of the preceding year[s]. This would ensure that the maximum state aid reflects the recent allowance price development.
- Electricity use benchmarks for the concerned sectors linked to best performing technique.

12. The assessment of performance should take into account on site production of electricity. This is to ensure that good environmental performance is rewarded.

13. The Member State would have to provide independently verified historic production data for the concerned installations, by which the benchmarks and the other data above will be multiplied.

14. The Member States that provide the aid would have to provide a report to the Commission for the aid related to the previous year.

**Summary**

15. The maximum amount of aid that a Member State could provide for an installation would be:

- a percentage (possibly linked to the degree of carbon leakage) *times*
- the EU wide average $CO_2$ content per MWh *times*
- the average price of $CO_2$ allowances of the preceding year[s] *times*
- the electricity consumption that is necessary with the best performing technique *times*

- average production data in the preceding years for the installation in question.

The first four variables would be determined by the Commission.

*As a formula*

16. Maximum compensation for indirect costs increase (EUR) = X%* EU wide $CO_2$ content of electricity ($tCO_2$/MWh)* average price of $CO_2$ allowances (EUR/allowance)* benchmark for efficient electricity use for the product (MWh/t)* historic (e.g. average preceding years) production data (t).

*Reminder*

17. This approach assumes that no free allocation of allowances is granted to power plants owned and operated by ETS participants other than power companies.

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Part 3

**COMMISSION STAFF WORKING DOCUMENT**

**Impact Assessment Report**

***Accompanying the document***

**Communication of the Commission**

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

{C(2012) 3230 final}
{SWD(2012) 131 final}

# ANNEXES

## ANNEX 7

## Selection of sectors exposed to a significant risk of carbon leakage in the 2010 Carbon Leakage Decision

In selecting sectors and subsectors exposed to a significant risk of carbon leakage the Commission Statement (Annex 5) provides that "[t]he Commission 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).

The broad elements of this method (in the context of direct CO2 costs) was laid down in Articles 10a(15-17) of the ETS Directive and implemented through the 2010 Carbon Leakage Decision. The Decision defines the sectors and subsectors deemed to be exposed to a significant risk of carbon leakage. Installations falling within the scope of that Decision will – under the 2011 Benchmarking Decision - receive free EUAs (i.e. emissions allowances) to cover their *direct* CO2 emission costs (essentially their own use of gas and coal).

In order to define criteria for the selection of sectors and subsectors due **to their *indirect* CO2 costs** (i.e. the CO2 price component passed on in electricity prices) it is thus necessary to set out in some detail the precise criteria in Article 10a(14-17) of the ETS Directive and their application in the form of the 2010 Carbon Leakage Decision. Sector or subsector eligibility is a *sine qua non* condition for the payment of State aid in favour of any installation.

Under the 2010 Carbon Leakage Decision 164 sectors and subsectors were considered to be exposed to a significant risk of carbon leakage. Of these 151 were "sectors" and 13 "subsectors". **159 sectors and subsectors qualified according to three sets of purely <u>quantitative</u> criteria** in the form of thresholds related to CO2 costs as a share of the **sector's gross value added and/or the international trade exposure** of the sector or subsector. **Five sectors qualified under purely <u>qualitative</u> criteria**. These criteria and the sectors and subsectors which qualified under them will serve as a starting point for the analysis of the compensation for the indirect costs and are thus described in detail below.

### 1. Qualification of the 164 sectors and subsectors (2010 Carbon Leakage Decision)

The 146 sectors entered the carbon leakage list via three sets of criteria set out in the ETS Directive (Article 10a(14), (15), (16) and (17)). The three first sets of criteria (paragraphs (15) to (16)) consist in quantitative thresholds concerning the impact on the sector/subsector of CO2 costs as a percentage of the sector's/subsector's gross value added assessed at EU level and/or the degree to which the sector or subsector is exposed to trade with non-EU countries.

The fourth set of criteria in paragraph (17) allows further sectors to be added based on a qualitative assessment as to the sector's or subsector's exposure to carbon leakage. [1]

[1] In accordance with the second subparagraph of article 10a(13) of the ETS Directive, the Commission may add every year a sector or a subsector to the carbon leakage list. By Commission decision (2011/745/EU)

1.1. The qualification of eleven sectors under paragraph 15 of Article 10a

Eleven sectors (listed in the Annex) were deemed eligible based on paragraph (15) of Article 10a of the ETS Directive, i.e. they qualified under the following first set of quantitative criteria; in other words, they passed the (direct and indirect) CO2 cost threshold (5% of gross value added) and the trade intensity threshold (10%):

"(a) the sum of direct and indirect additional costs induced by the implementation of this Directive would lead to a substantial increase in production costs, calculated as a proportion of the gross value added, of at least 5%; and

(b) the intensity of trade with third countries, defined as the ratio between the total value of exports to third countries plus the value imports from third countries and the total market size for the Community (annual turnover plus total imports from third countries is above 10%".

| NACE Code | Description |
|---|---|
| 1562 | Manufacture of starches and starch products |
| 1583 | Manufacture of sugar |
| 1595 | Manufacture of other non-distilled fermented beverages |
| 1592 | Production of ethyl alcohol from fermented materials |
| 2112 | Manufacture of paper and paperboard |
| 2320 | Manufacture of refined petroleum products |
| 2611 | Manufacture of flat glass |
| 2613 | Manufacture of hollow glass |
| 2630 | Manufacture of ceramic tiles and flags |
| 2721 | Manufacture of cast iron tubes |
| 2743 | Lead, zinc and tin production |

1.2. The qualification of two sectors under point (a) of paragraph 16 of Article 10a

Two further sectors (listed in the Annex) were deemed eligible based on point (a) of paragraph (16) of Article 10a of the ETS Directive, i.e. they qualified under the following quantitative criterion; in other words, they passed the standalone (direct and indirect) CO2 cost threshold (30% of gross value added):

"the sum of direct and indirect additional costs induced by the implementation of this Directive would lead to a particularly high increase of production costs, calculated as a proportion of the gross value added, of at least 30% [...]".

| NACE Code | Description |
|---|---|
| 2651 | Manufacture of cement |
| 2652 | Manufacture of lime |

the following sectors and subsectors deemed to be exposed to a significant risk of carbon leakage: Production of Salt (NACE 1440), Cocoa paste (prodcom code 15841100), Cocoa butter, fat and oil (prodcom code 15841200), Cocoa powder, not containing added sugar or other sweetening matter (15841300)and Manufacture of bricks, tiles and constructions products in baked clay (NACE 2640).

1.3. The qualification of two sectors under point (b) of paragraph 16 of Article 10a

117 sectors (listed in the Annex) were deemed eligible based on point (b) of paragraph (16) of Article 10a of the ETS Directive, i.e. they qualified under the following quantitative criterion related to trade intensity; in other words, they passed the standalone trade intensity threshold (30%).

"the intensity of trade with third countries, defined as the ratio between the total value of exports to third countries plus the value of imports from third countries and the total market size for the Community (annual turnover plus total imports from third countries), is above 30%".

| **NACE Code** | **Description** |
|---|---|
| 1110 | Extraction of crude petroleum and natural gas |
| 1310 | Mining of iron ores |
| 1320 | Mining of non-ferrous metal ores, except uranium and thorium ores |
| 1411 | Quarrying of ornamental and building stone |
| 1422 | Mining of clays and kaolin |
| 1450 | Other mining and quarrying n.e.c. |
| 1520 | Processing and preserving of fish and fish products |
| 1541 | Manufacture of crude oils and fats |
| 1591 | Manufacture of distilled potable alcoholic beverages |
| 1593 | Manufacture of wines |
| 1712 | Preparation and spinning of woollen-type fibres |
| 1713 | Preparation and spinning of worsted-type fibres |
| 1714 | Preparation and spinning of flax-type fibres |
| 1715 | Throwing and preparation of silk, including from noils, and throwing and texturing of synthetic or artificial filament yarns |
| 1716 | Manufacture of sewing threads |
| 1717 | Preparation and spinning of other textile fibres |
| 1721 | Cotton-type weaving |
| 1722 | Woollen-type weaving |
| 1723 | Worsted-type weaving |
| 1724 | Silk-type weaving |
| 1725 | Other textile weaving |
| 1740 | Manufacture of made-up textile articles, except apparel |
| 1751 | Manufacture of carpets and rugs |
| 1752 | Manufacture of cordage, rope, twine and netting |
| 1753 | Manufacture of non-wovens and articles made from non-wovens, except apparel |
| 1754 | Manufacture of other textiles n.e.c. |
| 1760 | Manufacture of knitted and crocheted fabrics |
| 1771 | Manufacture of knitted and crocheted hosiery |
| 1772 | Manufacture of knitted and crocheted pullovers, cardigans and similar articles |
| 1821 | Manufacture of workwear |

| | |
|---|---|
| 1822 | Manufacture of other outerwear |
| 1823 | Manufacture of underwear |
| 1824 | Manufacture of other wearing apparel and accessories n.e.c. |
| 1830 | Dressing and dyeing of fur; manufacture of articles of fur |
| 1910 | Tanning and dressing of leather |
| 1920 | Manufacture of luggage, handbags and the like, saddlery and harness |
| 1930 | Manufacture of footwear |
| 2010 | Sawmilling and planing of wood; impregnation of wood |
| 2052 | Manufacture of articles of cork, straw and plaiting materials |
| 2111 | Manufacture of pulp |
| 2124 | Manufacture of wallpaper |
| 2215 | Other publishing |
| 2330 | Processing of nuclear fuel |
| 2412 | Manufacture of dyes and pigments |
| 2420 | Manufacture of pesticides and other agro-chemical products |
| 2441 | Manufacture of basic pharmaceutical products |
| 2442 | Manufacture of pharmaceutical preparations |
| 2452 | Manufacture of perfumes and toilet preparations |
| 2463 | Manufacture of essential oils |
| 2464 | Manufacture of photographic chemical material |
| 2465 | Manufacture of prepared unrecorded media |
| 2466 | Manufacture of other chemical products n.e.c. |
| 2470 | Manufacture of man-made fibres |
| 2511 | Manufacture of rubber tyres and tubes |
| 2615 | Manufacture and processing of other glass, including technical glassware |
| 2621 | Manufacture of ceramic household and ornamental articles |
| 2622 | Manufacture of ceramic sanitary fixtures |
| 2623 | Manufacture of ceramic insulators and insulating fittings |
| 2624 | Manufacture of other technical ceramic products |
| 2625 | Manufacture of other ceramic products |
| 2626 | Manufacture of refractory ceramic products |
| 2681 | Production of abrasive products |
| 2722 | Manufacture of steel tubes |
| 2741 | Precious metals production |
| 2861 | Manufacture of cutlery |
| 2862 | Manufacture of tools |
| 2874 | Manufacture of fasteners, screw machine products, chain and springs |
| 2875 | Manufacture of other fabricated metal products n.e.c. |
| 2911 | Manufacture of engines and turbines, except aircraft, vehicle and cycle engines |
| 2912 | Manufacture of pumps and compressors |
| 2913 | Manufacture of taps and valves |
| 2914 | Manufacture of bearings, gears, gearing and driving elements |
| 2921 | Manufacture of furnaces and furnace burners |
| 2923 | Manufacture of non-domestic cooling and ventilation equipment |
| 2924 | Manufacture of other general purpose machinery n.e.c. |
| 2932 | Manufacture of other agricultural and forestry machinery |

| | |
|---|---|
| 2941 | Manufacture of portable hand held power tools |
| 2942 | Manufacture of other metalworking machine tools |
| 2943 | Manufacture of other machine tools n.e.c. |
| 2951 | Manufacture of machinery for metallurgy |
| 2952 | Manufacture of machinery for mining, quarrying and construction |
| 2953 | Manufacture of machinery for food, beverage and tobacco processing |
| 2954 | Manufacture of machinery for textile, apparel and leather production |
| 2955 | Manufacture of machinery for paper and paperboard production |
| 2956 | Manufacture of other special purpose machinery n.e.c. |
| 2960 | Manufacture of weapons and ammunition |
| 2971 | Manufacture of electric domestic appliances |
| 3001 | Manufacture of office machinery |
| 3002 | Manufacture of computers and other information processing equipment |
| 3110 | Manufacture of electric motors, generators and transformers |
| 3120 | Manufacture of electricity distribution and control apparatus |
| 3130 | Manufacture of insulated wire and cable |
| 3140 | Manufacture of accumulators, primary cells and primary batteries |
| 3150 | Manufacture of lighting equipment and electric lamps |
| 3162 | Manufacture of other electrical equipment n.e.c. |
| 3210 | Manufacture of electronic valves and tubes and other electronic components |
| 3220 | Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy |
| 3230 | Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods |
| 3310 | Manufacture of medical and surgical equipment and orthopaedic appliances |
| 3320 | Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment |
| 3340 | Manufacture of optical instruments and photographic equipment |
| 3350 | Manufacture of watches and clocks |
| 3511 | Building and repairing of ships |
| 3512 | Building and repairing of pleasure and sporting boats |
| 3530 | Manufacture of aircraft and spacecraft |
| 3541 | Manufacture of motorcycles |
| 3542 | Manufacture of bicycles |
| 3543 | Manufacture of invalid carriages |
| 3550 | Manufacture of other transport equipment n.e.c. |
| 3621 | Striking of coins |
| 3622 | Manufacture of jewellery and related articles n.e.c. |
| 3630 | Manufacture of musical instruments |
| 3640 | Manufacture of sports goods |
| 3650 | Manufacture of games and toys |
| 3661 | Manufacture of imitation jewellery |
| 3662 | Manufacture of brooms and brushes |
| 3663 | Other manufacturing n.e.c. |

1.4. The qualification of 16 sectors based on both paragraphs (15) and (16) of Article 10a

In addition, 16 sectors (listed in the Annex) were deemed eligible based on both paragraphs (15) and (16) of Article 10a of the ETS Directive, i.e. they qualified under more than one of the three sets of quantitative criteria listed above.

| NACE Code | Description |
|---|---|
| 1010 | Mining and agglomeration of hard coal |
| 1430 | Mining of chemical and fertilizer minerals |
| 1597 | Manufacture of malt |
| 1711 | Preparation and spinning of cotton-type fibres |
| 1810 | Manufacture of leather clothes |
| 2310 | Manufacture of coke oven products |
| 2413 | Manufacture of other inorganic basic chemicals |
| 2414 | Manufacture of other organic basic chemicals |
| 2415 | Manufacture of fertilizers and nitrogen compounds |
| 2417 | Manufacture of synthetic rubber in primary forms |
| 2710 | Manufacture of basic iron and steel and of ferro-alloys |
| 2731 | Cold drawing |
| 2742 | Aluminium production |
| 2744 | Copper production |
| 2745 | Other non-ferrous metal production |
| 2931 | Manufacture of agricultural tractors |

1.5. The qualification of 13 subsectors under the quantitative criteria in paragraphs 15 and 16 of Article 10a

The 13 subsectors were deemed to fulfil the quantitative criteria set in paragraphs 15 and 16 of Article 10a of the ETS Directive ("Beyond NACE-4 level based on the quantitative criteria set out in paragraphs 15 and 16 of Article 10a of Directive 2003/87/EC").

Recital 6 of Decision 2010/2/EU adds the explanation for the selection of 13 sectors at a more detailed level than the NACE 4 level:

"Sectors and subsectors should be included in the list of sectors and subsectors using the most accurate NACE description. Some sectors not found to be exposed to a significant risk of carbon leakage at the NACE-4 level were disaggregated and a number of corresponding sub-sectors, for which certain characteristics led to a significantly different impact from the rest of the sector, were assessed"

| Prodcom Code | Description |
|---|---|
| 15331427 | Concentrated tomato puree and paste |
| 155120 | Milk and cream in solid forms |
| 155153 | Casein |
| 155154 | Lactose and lactose syrup |
| 15891333 | Dry bakers' yeast |

| | |
|---|---|
| 24111150 | Hydrogen (including the production of hydrogen in combination with syngas) |
| 24111160 | Nitrogen |
| 24111170 | Oxygen |
| 243021 | Prepared pigments, opacifiers and colours, vitrifiable enamels and glazes, engobes, liquid lustres and the like; glass frit |
| 24621030 | Gelatin and its derivatives; isinglass (excluding casein glues and bone glues) |
| 261411 | Slivers, rovings, yarn and chopped strands, of glass fibre |
| 26821400 | Artificial graphite, colloidal, semi-colloidal graphite and preparations |
| 26821620 | Exfoliated vermiculite, expanded clays, foamed slag and similar expanded mineral materials and mixtures thereof |

## 2. The qualification of five sectors under the qualitative criteria in paragraph 17 of Article 10a

Five sectors qualified under a qualitative assessment under paragraph 17 of Article 10a of the ETS Directive (explained in greater detail in recitals 17-21 of Decision 2010/2/EU).

Paragraph 17 reads as follows:

"17. The list referred to in paragraph 13 may be supplemented after completion of a qualitative assessment, taking into account, where the relevant data are available, the following criteria:

(a) the extent to which it is possible for individual installations in the sector or subsector concerned to reduce emission levels or electricity consumption, including, as appropriate, the increase in production costs that the related investment may entail, for instance on the basis of the most efficient techniques;

(b) current and projected market characteristics, including when trade exposure or direct and indirect cost increase rates are close to one of the thresholds mentioned in paragraph 16;

(c) profit margins as a potential indicator of long-run investment or relocation decisions."

| **NACE Code** | **Description** |
|---|---|
| 1730 | Finishing of textiles |
| 2020 | Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards |
| 2416 | Manufacture of plastics in primary forms |
| 2751 | Casting of iron |
| 2753 | Casting of light metals |

## 3. Selection mechanism in the context of indirect emissions

Even if several of the 164 sectors and subsectors qualified for inclusion on the carbon leakage list in the 2010 Carbon Leakage Decision in part due to their indirect CO2 costs, all installations

belonging to these 164 sectors and subsectors will (according to the ETS Directive) **only receive compensation for their *direct* CO2 emissions costs in the form of free allocation of EUAs** (each such allowances authorising the emission of one tonne of CO2).

Compensation for indirect CO2 costs can only be granted in the form of State aid.

a) Assessment of risk to be done at Union (not Member State) level

Building on the method used in respect of compensation for direct CO2 emissions costs[2], it is first of clear that **the assessment of sectors will be carried out at Union level and not at the level of Member States** (Article 10a(14): " … *the Commission shall assess, at Community level*"). Some stakeholders have argued in favour of a Member State-specific level of assessment.

b) The level of disaggregation of the assessment: sectors and subsectors

It is clear from the regulatory framework that **both sectors and subsectors may qualify** (see Article 10a(6)). Under the method used in the context of free allocation in respect of direct CO2 emission costs 151 "sectors" qualified (defined at the four-digit **NACE 4 level**).[3] In addition, 13 subsectors defined by an eight-digit "Prodcom Code" qualified. **Prodcom** defines EU manufacturing, mining and quarrying activities in terms of 'products'. The first four of the eight digits correspond to a NACE 4 code. According to the version of the NACE[4] classification system relevant to this Report there were **258 manufacturing, mining and quarrying NACE 4 sectors divided into around 4 500 products at Prodcom level**.

A key issue therefore concerns the **relevant level of sector aggregation**. The ETS Directive's starting point is the NACE 3 level (recital 24). In the public consultation no interested party advocated that level of assessment. **Most stakeholder replies were based on an assessment at NACE 4 level** (i.e. the essential basis of the assessment in the 2010 Carbon Leakage Decision). **Several stakeholders also advocated an assessment at the more disaggregated Prodcom level** (or "subsectors" to use the terms of the ETS Directive and the implementing Decision). However, opposite views very also expressed.[5]

c) Compensation for indirect CO2 costs

Given that the specific legal framework, in particular Article 10a(6) and recital 27, both refer to the possibility for Member States to "adopt financial measures in favour sectors or subsectors determined to be exposed to a significant risk of carbon leakage *due to costs relating to greenhouse gas emissions passed on in electricity prices* .. " this Report will not consider any standalone options based on a pure trade-intensity criteria[6].

While it is not legally excluded (see reference to "subsectors" in Article 10a(6)) a *stand-alone*

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2 See Commission Statement (Annex 4).

3 See recital 24 of the ETS Directive.

4 Rev 1.1. NACE.

5 See reply to questionnaire by Chemelot stating that statistical data for many subsectors are "rather unreliable" for which reasons "a huge improvement of data quality should be realized which probably would take several years".

6 Corresponding to point (b) of Article 10a(16)).

*quantitative* option involving an assessment at the eight-digit Prodcom level will not be considered in this Report.[7]

Nevertheless, Option A1 in this Report involves "mirroring" the approach taken in 2010 Carbon Leakage Decision. To this extent "subsectors" would be included in the list of eligible sectors and subsectors in the Guidelines albeit not on a stand-alone basis. Moreover, the qualitative assessment under Option A3 in principle also allows for assessment of subsectors (including Prodcom level sectors).

It should be reiterated that the **lack of relevant statistical and comparable data is particularly acute in the context** of assessing the risk of carbon leakage for sectors and subsectors due to the CO2 price component passed on in **electricity costs.** Electricity data is not even collected by Eurostat below NACE 3 level.[8]

[7] It appears from the 2010 Carbon Leakage Decision that subsectors (such as those defined at Prodcom level) were assessed based on certain characteristics which "led to be significantly different impact from the rest of the [NACE 4] sector". In this context, it should be noted that Eurostat does not produce data on electricity consumption at Prodcom level. It is thus not possible to determine if the effect of electricity prices on a particular subsector's gross value added would lead to a "significantly different impact" compared to the impact on the NACE 4 sectors to which that subsector belongs.

[8] See Annex I of European Commission's impact assessment (SEC(2009)1710) accompanying the 2010 Carbon Leakage Decision on indirect CO2 cost data as a share of gross value added relied on in this report.

## ANNEX 8

## Ranking between sectors in terms of indirect CO2 costs and trade intensity

### NACE 4 BY INDIRECT COSTS (ALL SECTORS ABOVE 1%)

| Ranking | NACE 4 | Description | Indirect costs |
|---|---|---|---|
| **Indirect costs of more than 3%** | | | |
| 1 | 2742 | Aluminium production | 10.3% |
| 2 | 2411 | Manufacture of industrial gases | 7.5% |
| 3 | 1430 | Mining of chemicals and fertilizer minerals | 6.6% |
| 4 | 2413 | Manufacture of other inorganic chemicals | 6% |
| 5 | 2743 | Lead, zinc and tin | 6% |
| | 1810 | Manufacture of leather clothes | 5%<x<30% |
| 6 | 2112 | Manufacture of paper and paperboard | 4.8% |
| 7 | 2310 | Manufacture of coke oven products | 4.6% |
| 8 | 2651 | Manufacture of cement | 4.4% |
| 9 | 1711 | Preparation and spinning of cotton fibres | 4.0% |
| 10 | 2415 | Manufacture of fertilizers and nitrogen compounds | 3.7% |
| 11 | 2710 | Manufacture of basic iron and steel | 3.6% |
| 12 | 1597 | Manufacture of malt | 3.5% |
| 13 | 2744 | Copper production | 3.4% |
| **Indirect costs in range 2-3%** | | | |
| 14 | 2122 | Manufacture of household and sanitary goods and of toilet requisites | 2.9% |
| 15 | 1422 | Mining of clays and kaolin | 2.8% |
| 16 | 2470 | Manufacture of man-made fibres | 2.8% |
| 17 | 2613 | Manufacture of hollow glass | 2.6% |
| 18 | 1713 | Preparation and spinning of worsted-type fibres | 2.6% |
| 19 | 2020 | Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards | 2.6% |
| 20 | 1715 | Throwing and preparation of silk, including from noils, and throwing and texturing of synthetic or artificial filament yarns | 2.4% |
| 21 | 1450 | Other mining and quarrying n.e.c. | 2.3% |
| 22 | 1722 | Woollen-type weaving | 2.3% |
| 23 | 2414 | Manufacture of other organic basic chemicals | 2.2% |
| 24 | 2614 | Manufacture of glass fibres | 2.1% |
| 25 | 2745 | Other non-ferrous metal production | 2% |

| Ranking | NACE 4 | Description | Indirect costs |
|---|---|---|---|
| **Indirect costs in range 1-2%** | | | |
| 26 | 1562 | Manufacture of starches and starch products | 1.9% |
| 27 | 1724 | Silk-type weaving | 1.9% |
| 28 | 2522 | Manufacture of plastic packing goods | 1.9% |
| 29 | 2611 | Manufacture of flat glass | 1.8% |
| 30 | 2416 | Manufacture of plastics in primary forms | 1.7% |
| 31 | 2615 | Manufacture and processing of other glass, including technical glassware | 1.6% |
| 32 | 1320 | Mining of non-ferrous metal ores, except uranium and thorium ores | 1.5% |
| 33 | 2630 | Manufacture of ceramic tiles and flags | 1.5% |
| 34 | 2412 | Manufacture of dyes and pigments | 1.4% |
| 35 | 2734 | Wire drawing | 1.4% |
| 36 | 3140 | Manufacture of accumulators, primary cells and primary batteries | 1.4% |
| 37 | 2721 | Manufacture of cast iron tubes | 1.3% |
| 38 | 1411 | Quarrying of ornamental and building stone | 1.2% |
| 39 | 2320 | Manufacture of refined petroleum products | 1.2% |
| 40 | 2682 | Manufacture of other non-metallic mineral products n.e.c. | 1.2% |
| | 2417 | Manufacture of synthetic rubber in primary forms | <5% |
| | 2731 | Cold Drawing | <5% |
| | 1595 | Manufacture of other non-distilled fermented beverages | <5% |
| | 1310 | Mining of iron ores | <5% |
| | 2111 | Manufacture of pulp | <5% |

## NACE 4 BY TRADE INTENSITY (ALL SECTORS)

| Ranking | NACE 4 | Description | Trade Intensity |
|---|---|---|---|
| 1 | 1450 | Other mining and quarrying n.e.c. | 181.96 |
| 2 | 3350 | Manufacture of watches and clocks | 107.41 |
| 3 | 2465 | Manufacture of prepared unrecorded media | 105.07 |
| 4 | 3622 | Manufacture of jewellery and related articles n.e.c. | 102.61 |
| 5 | 1830 | Dressing and dyeing of fur; manufacture of articles of fur | 101.89 |
| 6 | 1824 | Manufacture of other wearing apparel and accessories n.e.c. | 99.37 |
| 7 | 3661 | Manufacture of imitation jewellery | 88.18 |
| 8 | 3001 | Manufacture of office machinery | 87.75 |
| 9 | 1920 | Manufacture of luggage, handbags and the like, saddler | 87.48 |
| 10 | 1320 | Mining of non-ferrous metal ores, except uranium and thorium ores | 86.23 |
| 11 | 2441 | Manufacture of basic pharmaceutical products | 85.82 |
| 12 | 1310 | Mining of iron ores | 84.92 |
| 13 | 3002 | Manufacture of computers and other information processing equipment | 83.53 |
| 14 | 3210 | Manufacture of electronic valves and tubes and other electronic components | 81.39 |
| 15 | 3530 | Manufacture of aircraft and spacecraft | 79.65 |
| 16 | 3630 | Manufacture of musical instruments | 78.19 |
| 17 | 2463 | Manufacture of essential oils | 76.97 |

| | | | |
|---|---|---|---|
| 18 | 3220 | Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy | 76.79 |
| 19 | 3650 | Manufacture of games and toys | 76.09 |
| 20 | 1823 | Manufacture of underwear | 75.56 |
| 21 | 2741 | Precious metals production | 73.87 |
| 22 | 2745 | Other non-ferrous metal production | 73.81 |
| 23 | 2941 | Manufacture of portable hand held power tools | 73.43 |
| 24 | 3310 | Manufacture of medical and surgical equipment and orthopaedic appliances | 72.73 |
| 25 | 2954 | Manufacture of machinery for textile, apparel and leather production | 71.70 |
| 26 | 1822 | Manufacture of other outerwear | 70.63 |
| 27 | 3230 | Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods | 70.54 |
| 28 | 3511 | Building and repairing of ships | 69.64 |
| 29 | 3640 | Manufacture of sports goods | 66.55 |
| 30 | 3340 | Manufacture of optical instruments and photographic equipment | 66.10 |
| 31 | 2464 | Manufacture of photographic chemical material | 65.68 |
| 32 | 2861 | Manufacture of cutlery | 64.62 |
| 33 | 1772 | Manufacture of knitted and crocheted pullovers, cardigans and similar articles | 63.87 |
| 34 | 2952 | Manufacture of machinery for mining, quarrying and construction | 62.97 |
| 35 | 3512 | Building and repairing of pleasure and sporting boats | 62.04 |
| 36 | 1430 | Mining of chemicals and fertilizer minerals | 61.09 |
| 37 | 3663 | Other manufacturing n.e.c. | 60.38 |
| 38 | 1110 | Extraction of crude petroleum and natural gas | 60.22 |
| 39 | 1930 | Manufacture of footwear | 59.74 |
| 40 | 3320 | Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment | 59.62 |
| 41 | 2442 | Manufacture of pharmaceutical preparations | 58.64 |
| 42 | 1723 | Worsted-type weaving | 58.27 |
| 43 | 1722 | Woollen-type weaving | 58.27 |
| 44 | 1724 | Silk-type weaving | 58.27 |
| 45 | 1725 | Other textile weaving | 58.27 |

| Ranking | NACE 4 | Description | Trade Intensity |
|---|---|---|---|
| 46 | 1721 | Cotton-type weaving | 58.27 |
| 47 | 2621 | Manufacture of ceramic household and ornamental articles | 56.98 |
| 48 | 2921 | Manufacture of furnaces and furnace burners | 56.75 |
| 49 | 2624 | Manufacture of other technical ceramic products | 54.57 |
| 50 | 3140 | Manufacture of accumulators, primary cells and primary batteries | 54.34 |
| 51 | 1591 | Manufacture of distilled potable alcoholic beverages | 53.62 |
| 52 | 1010 | Mining and agglomeration of hard coal | 53.44 |
| 53 | 3541 | Manufacture of motorcycles | 52.67 |
| 54 | 1810 | Manufacture of leather clothes | 52.07 |
| 55 | 2911 | Manufacture of engines and turbines, except aircraft, vehicle and cycle engines | 51.03 |
| 56 | 3542 | Manufacture of bicycles | 50.41 |
| 57 | 1520 | Processing and preserving of fish and fish products | 49.65 |
| 58 | 2466 | Manufacture of other chemical products n.e.c. | 49.56 |
| 59 | 1541 | Manufacture of crude oils and fats | 49.42 |
| 60 | 3621 | Striking of coins | 49.35 |
| 61 | 2625 | Manufacture of other ceramic products | 49.12 |
| 62 | 2615 | Manufacture and processing of other glass, including technical glassware | 49.06 |
| 63 | 1422 | Mining of clays and kaolin | 49.02 |
| 64 | 2956 | Manufacture of other special purpose machinery n.e.c. | 48.70 |
| 65 | 2942 | Manufacture of other metalworking machine tools | 48.53 |
| 66 | 2943 | Manufacture of other machine tools n.e.c. | 48.09 |
| 67 | 1760 | Manufacture of knitted and crocheted fabrics | 47.69 |
| 68 | 1910 | Tanning and dressing of leather | 47.52 |
| 69 | 2912 | Manufacture of pumps and compressors | 47.42 |
| 70 | 2913 | Manufacture of taps and valves | 47.17 |
| 71 | 1740 | Manufacture of made-up textile articles, except apparel | 46.69 |
| 72 | 2955 | Manufacture of machinery for paper and paperboard production | 46.55 |
| 73 | 2924 | Manufacture of other general purpose machinery n.e.c. | 46.35 |
| 74 | 2414 | Manufacture of other organic basic chemicals | 46.26 |
| 75 | 2111 | Manufacture of pulp | 46.12 |
| 76 | 2452 | Manufacture of perfumes and toilet preparations | 45.32 |
| 77 | 2722 | Manufacture of steel tubes | 45.17 |
| 78 | 3162 | Manufacture of other electrical equipment n.e.c. | 44.77 |
| 79 | 1821 | Manufacture of workwear | 44.65 |
| 80 | 2330 | Processing of nuclear fuel | 44.30 |
| 81 | 1411 | Quarrying of ornamental and building stone | 44.18 |
| 82 | 2953 | Manufacture of machinery for food, beverage and tobacco processing | 43.63 |
| 83 | 3110 | Manufacture of electric motors, generators and transformers | 43.52 |
| 84 | 3662 | Manufacture of brooms and brushes | 43.27 |
| 85 | 2412 | Manufacture of dyes and pigments | 43.10 |
| 86 | 2862 | Manufacture of tools | 42.54 |
| 87 | 2951 | Manufacture of machinery for metallurgy | 42.08 |
| 88 | 3150 | Manufacture of lighting equipment and electric lamps | 41.31 |
| 89 | 2420 | Manufacture of pesticides and other agro-chemical products | 41.06 |
| 90 | 2971 | Manufacture of electric domestic appliances | 40.68 |
| 91 | 1711 | Preparation and spinning of cotton fibres | 40.50 |
| 92 | 1713 | Preparation and spinning of worsted-type fibres | 40.50 |

| Ranking | NACE 4 | Description | Trade Intensity |
|---|---|---|---|
| 93 | 1715 | Throwing and preparation of silk, including from noils, and throwing and texturing of synthetic or artificial filament yarns | 40.50 |
| 94 | 1712 | Preparation and spinning of woollen-type fibres | 40.50 |
| 95 | 1714 | Preparation and spinning of flax-type fibres | 40.50 |
| 96 | 1716 | Manufacture of sewing threads | 40.50 |
| 97 | 1717 | Preparation and spinning of other textile fibres | 40.50 |
| 98 | 2681 | Production of abrasive products | 40.49 |
| 99 | 1771 | Manufacture of knitted and crocheted hosiery | 39.28 |
| 100 | 3120 | Manufacture of electricity distribution and control apparatus | 39.28 |
| 101 | 2914 | Manufacture of bearings, gears, gearing and driving elements | 39.00 |
| 102 | 2124 | Manufacture of wallpaper | 38.65 |
| 103 | 2417 | Manufacture of synthetic rubber in primary forms | 38.08 |
| 104 | 1754 | Manufacture of other textiles n.e.c. | 37.39 |
| 105 | 2626 | Manufacture of refractory ceramic products | 37.17 |
| 106 | 2215 | Other publishing | 37.16 |
| 107 | 2875 | Manufacture of other fabricated metal products n.e.c. | 37.12 |
| 108 | 2511 | Manufacture of rubber tyres and tubes | 37.05 |
| 109 | 3550 | Manufacture of other transport equipment n.e.c. | 36.60 |
| 110 | 2052 | Manufacture of articles of cork, straw and plaiting materials | 36.50 |
| 111 | 2874 | Manufacture of fasteners, screw machine products, chain and springs | 36.16 |
| 112 | 2742 | Aluminium production | 35.90 |
| 113 | 3543 | Manufacture of invalid carriages | 34.98 |
| 114 | 2744 | Copper production | 34.59 |
| 115 | 2623 | Manufacture of ceramic insulators and insulating fittings | 34.53 |
| 116 | 2923 | Manufacture of non-domestic cooling and ventilation equipment | 34.52 |
| 117 | 1752 | Manufacture of cordage, rope, twine and netting | 34.07 |
| 118 | 2960 | Manufacture of weapons and ammunition | 33.61 |
| 119 | 2470 | Manufacture of man-made fibres | 32.78 |
| 120 | 2731 | Cold Drawing | 32.67 |
| 121 | 3130 | Manufacture of insulated wire and cable | 32.63 |
| 122 | 2710 | Manufacture of basic iron and steel | 32.31 |
| 123 | 2413 | Manufacture of other inorganic chemicals | 31.67 |
| 124 | 1593 | Manufacture of wines | 31.45 |
| 125 | 1751 | Manufacture of carpets and rugs | 31.21 |
| 126 | 2931 | Manufacture of agricultural tractors | 31.12 |
| 127 | 2932 | Manufacture of other agricultural and forestry machinery | 31.06 |
| 128 | 1597 | Manufacture of malt | 30.89 |
| 129 | 1753 | Manufacture of non-wovens and articles made from non-woven | 30.86 |
| 130 | 2010 | Sawmilling and planing of wood; impregnation of wood | 30.77 |
| 131 | 2622 | Manufacture of ceramic sanitary fixtures | 30.21 |
| 132 | 2863 | Manufacture of locks and hinges | 29.76 |
| 133 | 3410 | Manufacture of motor vehicles | 28.91 |
| 134 | 2630 | Manufacture of ceramic tiles and flags | 28.58 |
| 135 | 3614 | Manufacture of other furniture | 28.52 |
| 136 | 2972 | Manufacture of non-electric domestic appliances | 28.18 |
| 137 | 2721 | Manufacture of cast iron tubes | 27.96 |
| 138 | 2670 | Cutting, shaping and finishing of ornamental and building stone | 27.57 |
| 139 | 2415 | Manufacture of fertilizers and nitrogen compounds | 27.36 |

| Ranking | NACE 4 | Description | Trade Intensity |
|---|---|---|---|
| 140 | 2416 | Manufacture of plastics in primary forms | 27.14 |
| 141 | 2743 | Lead, zinc and tin | 26.83 |
| 142 | 2922 | Manufacture of lifting and handling equipment | 26.56 |
| 143 | 2513 | Manufacture of other rubber products | 26.52 |
| 144 | 2051 | Manufacture of other products of wood | 25.96 |
| 145 | 2462 | Manufacture of glues and gelatines | 25.88 |
| 146 | 2112 | Manufacture of paper and paperboard | 25.72 |
| 147 | 1595 | Manufacture of other non-distilled fermented beverages | 25.35 |
| 148 | 1588 | Manufacture of homogenized food preparations and dietetic food | 25.13 |
| 149 | 3430 | Manufacture of parts and accessories for motor vehicles and their engines | 24.75 |
| 150 | 2613 | Manufacture of hollow glass | 24.32 |
| 151 | 2214 | Publishing of sound recordings | 24.30 |
| 152 | 2020 | Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards | 23.82 |
| 153 | 2614 | Manufacture of glass fibres | 23.40 |
| 154 | 2451 | Manufacture of soap and detergents, cleaning and polishing preparations | 23.09 |
| 155 | 1589 | Manufacture of other food products n.e.c. | 22.22 |
| 156 | 2734 | Wire drawing | 21.87 |
| 157 | 1533 | Processing and preserving of fruit and vegetables n.e.c. | 21.58 |
| 158 | 3161 | Manufacture of electrical equipment for engines and vehicles n.e.c. | 21.16 |
| 159 | 2873 | Manufacture of wire products | 21.03 |
| 160 | 2611 | Manufacture of flat glass | 21.01 |
| 161 | 2430 | Manufacture of paints, varnishes and similar coatings, printing ink and mastics | 20.75 |
| 162 | 3611 | Manufacture of chairs and seats | 20.40 |
| 163 | 2521 | Manufacture of plastic plates, sheets, tubes and profiles | 20.35 |
| 164 | 2524 | Manufacture of other plastic products | 20.00 |
| 165 | 2732 | Cold rolling of narrow strip | 19.66 |
| 166 | 1583 | Manufacture of sugar | 19.54 |
| 167 | 1542 | Manufacture of refined oils and fats | 19.38 |
| 168 | 1532 | Manufacture of fruit and vegetable juice | 18.99 |
| 169 | 2682 | Manufacture of other non-metallic mineral products n.e.c. | 17.91 |
| 170 | 2871 | Manufacture of steel drums and similar containers | 17.78 |
| 171 | 2666 | Manufacture of other articles of concrete, plaster and cement | 17.66 |
| 172 | 2211 | Publishing of books | 17.42 |
| 173 | 1592 | Production of ethyl alcohol from fermented materials | 17.01 |
| 174 | 3520 | Manufacture of railway and tramway locomotives and rolling stock | 16.44 |
| 175 | 2320 | Manufacture of refined petroleum products | 16.13 |
| 176 | 2461 | Manufacture of explosives | 15.91 |
| 177 | 2822 | Manufacture of central heating radiators and boilers | 15.34 |
| 178 | 1562 | Manufacture of starches and starch products | 14.53 |
| 179 | 2821 | Manufacture of tanks, reservoirs and containers of metal | 14.52 |
| 180 | 2522 | Manufacture of plastic packing goods | 13.99 |
| 181 | 2125 | Manufacture of other articles of paper and paperboard n.e.c. | 13.59 |
| 182 | 2612 | Shaping and processing of flat glass | 13.48 |
| 183 | 2122 | Manufacture of household and sanitary goods and of toilet requisites | 12.81 |
| 184 | 2830 | Manufacture of steam generators, except central heating hot water boilers | 12.60 |
| 185 | 1440 | Production of salt | 12.52 |
| 186 | 1584 | Manufacture of cocoa; chocolate and sugar confectionery | 12.46 |
| 187 | 1586 | Processing of tea and coffee | 12.39 |

| Ranking | NACE 4 | Description | Trade Intensity |
|---|---|---|---|
| 188 | 1600 | Manufacture of tobacco products | 12.03 |
| 189 | 2872 | Manufacture of light metal packaging | 11.06 |
| 190 | 1511 | Production and preserving of meat | 11.05 |
| 191 | 1585 | Manufacture of macaroni, noodles, couscous and similar farinaceous products | 10.63 |
| 192 | 3612 | Manufacture of other office and shop furniture | 10.57 |
| 193 | 3420 | Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers | 10.28 |
| | 1030 | Extraction and agglomeration of peat | <10% |
| 194 | 1587 | Manufacture of condiments and seasonings | 9.95 |
| 195 | 1572 | Manufacture of prepared pet foods | 9.94 |
| 196 | 2523 | Manufacture of builders' ware of plastic | 9.39 |
| 197 | 2123 | Manufacture of paper stationery | 9.37 |
| 198 | 2030 | Manufacture of builders’ carpentry and joinery | 9.02 |
| 199 | 2811 | Manufacture of metal structures and parts of structures | 8.43 |
| 200 | 3615 | Manufacture of mattresses | 8.29 |
| 201 | 1561 | Manufacture of grain mill products | 7.92 |
| 202 | 1543 | Manufacture of margarine and similar edible fats | 7.77 |
| 203 | 2665 | Manufacture of fibre cement | 7.72 |
| 204 | 1551 | Operation of dairies and cheese making | 7.63 |
| 205 | 2040 | Manufacture of wooden containers | 7.38 |
| 206 | 3613 | Manufacture of other kitchen furniture | 7.27 |
| 207 | 1596 | Manufacture of beer | 7.15 |
| 208 | 2512 | Retreading and rebuilding of rubber tyres | 7.11 |
| 209 | 2651 | Manufacture of cement | 6.75 |
| 210 | 2653 | Manufacture of plaster | 6.49 |
| 211 | 2224 | Pre-press activities | 6.44 |
| 212 | 1413 | Quarrying of slate | 6.42 |
| 213 | 1512 | Production and preserving of poultrymeat | 6.31 |
| 214 | 1598 | Production of mineral waters and soft drinks | 6.28 |
| 215 | 1582 | Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes | 6.10 |
| 216 | 1531 | Processing and preserving of potatoes | 5.94 |
| 217 | 2662 | Manufacture of plaster products for construction purposes | 5.69 |
| 218 | 2121 | Manufacture of corrugated paper and paperboard and of containers of paper and paperboard | 5.16 |
| | 1120 | Service activities incidental to oil and gas extraction, excluding surveying | <5% |
| | 1200 | Mining of uranium and thorium ores | <5% |
| 219 | 2733 | Cold forming or folding | 4.94 |
| 220 | 1412 | Quarrying of limestone, gypsum and chalk | 4.36 |
| 221 | 2411 | Manufacture of industrial gases | 4.17 |
| 222 | 1421 | Operation of gravel and sand pits | 3.74 |
| 223 | 2222 | Printing n.e.c. | 3.71 |
| 224 | 1594 | Manufacture of cider and other fruit wines | 3.63 |
| 225 | 2812 | Manufacture of builders’ carpentry and joinery of metal | 3.34 |
| 226 | 1513 | Production of meat and poultrymeat products | 3.31 |

| Ranking | NACE 4 | Description | Trade Intensity |
|---|---|---|---|
| 227 | 2221 | Printing of newspapers | 3.29 |
| 228 | 2223 | Bookbinding | 3.29 |
| 229 | 2225 | Ancillary activities related to printing | 3.29 |
| 230 | 2213 | Publishing of journals and periodicals | 2.90 |
| 231 | 1552 | Manufacture of ice cream | 2.83 |
| 232 | 1571 | Manufacture of prepared feeds for farm animals | 2.79 |
| 233 | 2640 | Manufacture of bricks, tiles and construction products, in baked clay | 2.69 |
| 234 | 2652 | Manufacture of lime | 2.56 |
| 235 | 2664 | Manufacture of mortars | 2.09 |
| 236 | 1730 | Finishing of textiles | 1.5 |
| 237 | 2661 | Manufacture of concrete products for construction purposes | 1.47 |
| 238 | 1581 | Manufacture of bread; manufacture of fresh pastry goods and cakes | 0.91 |
| 239 | 1020 | Mining and agglomeration of lignite | 0.87 |
| 240 | 2212 | Publishing of newspapers | 0.24 |
| 241 | 2663 | Manufacture of ready-mixed concrete | 0.05 |
| | 2231 | Reproduction of sound recording | n.a. |
| | 2232 | Reproduction of video recording | n.a. |
| | 2233 | Reproduction of computer media | n.a. |
| | 2751 | Casting of iron | n.a. |
| | 2752 | Casting of steel | n.a. |
| | 2753 | Casting of light metals | n.a. |
| | 2754 | Casting of other non-ferrous metals | n.a. |
| | 2840 | Forging, pressing, stamping and roll forming of metal; powder metallurgy | n.a. |
| | 2851 | Treatment and coating of metals | n.a. |
| | 2852 | General mechanical engineering | n.a. |
| | 3330 | Manufacture of industrial process control equipment | n.a. |
| | 3710 | Recycling of metal waste and scrap | n.a. |
| | 3720 | Recycling of non-metal waste and scrap | n.a. |

# ANNEX 9

## Exchangeability of fuel and electricity (2011 Benchmarking Decision)

2. **Definition of product benchmarks and system boundaries with consideration of exchangeability of fuel and electricity**

| Product benchmark | Definition of products covered | Definition of processes and emissions covered (system boundaries) | Carbon leakage exposure as determined by Decision 2010/2/EU for the years 2013 and 2014 | Benchmark value (allowances/t) |
|---|---|---|---|---|
| Refinery products | Mix of refinery products with more than 40 % light products (motor spirit (gasoline) including aviation spirit, spirit type (gasoline type) jet fuel, other light petroleum oils/light preparations, kerosene including kerosene type jet fuel, gas oils) expressed as $CO_2$ weighted tonne (CWT) | All processes of a refinery matching the definition of one of the CWT process units as well as ancillary non-process facilities operating inside the refinery fence-line such as tankage, blending, effluent treatment, etc. are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,0295 |
| EAF carbon steel | Steel containing less than 8 % metallic alloying elements and tramp elements to such levels limiting the use to those applications where no high surface quality and processability is required | All processes directly or indirectly linked to the process units electric arc furnace, secondary metallurgy, casting and cutting, post-combustion unit, dedusting unit, vessels heating stands, casting ingots preheating stands, scrap drying and scrap preheating are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,283 |

| Product benchmark | Definition of products covered | Definition of processes and emissions covered (system boundaries) | Carbon leakage exposure as determined by Decision 2010/2/EU for the years 2013 and 2014 | Benchmark value (allowances/t) |
|---|---|---|---|---|
| EAF high alloy steel | Steel containing 8 % or more metallic alloying elements or where high surface quality and processability is required | All processes directly or indirectly linked to the process units electric arc furnace, secondary metallurgy, casting and cutting, post-combustion unit, dedusting unit, vessels heating stands, casting ingots preheating stands, slow cooling pit, scrap drying and scrap preheating are included. The process units FeCr converter and cryogenic storage of industrial gases are not included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,352 |
| Iron casting | Casted iron expressed as tons of liquid iron ready alloyed, skinned, and ready for casting | All processes directly or indirectly linked to the process steps melting shop, casting shop, core shop and finishing are included.<br>For the determination of indirect emissions, only the electricity consumption of melting processes within the system boundaries shall be considered | yes | 0,325 |
| Mineral wool | Mineral wool insulation products for thermal, acoustic and fire applications manufactured using glass, rock or slag | All processes directly or indirectly linked to the production steps melting, fibreising and injection of binders, curing and drying and forming are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | no | 0,682 |
| Plasterboard | The benchmark covers boards, sheets, panels, tiles, similar articles<br>of plaster/compositions based on plaster,<br>(not) faced/reinforced with paper/paperboard only,<br>excluding articles agglomerated with plaster, ornamented (in tonnes of stucco).<br>High-density gypsum fibreboards not covered by this product benchmark | All processes directly or indirectly linked to the production steps milling, drying, calcining and board drying are included.<br>For the determination of indirect emissions, only the electricity consumption of heat pumps applied in the drying stage shall be considered | no | 0,131 |

| Product benchmark | Definition of products covered | Definition of processes and emissions covered (system boundaries) | Carbon leakage exposure as determined by Decision 2010/2/EU for the years 2013 and 2014 | Benchmark value (allowances/t) |
|---|---|---|---|---|
| Carbon black | Furnace carbon black. Gas- and lamp black products are not covered by this benchmark | All processes directly or indirectly linked to the production of furnace carbon black as well as finishing, packaging and flaring are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 1,954 |
| Ammonia | Ammonia ($NH_3$), to be recorded in tons produced | All processes directly or indirectly linked to the production of the ammonia and the intermediate product hydrogen are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 1,619 |
| Steam cracking | Mix of high value chemicals (HVC) expressed as total mass of acetylene, ethylene, propylene, butadiene, benzene and hydrogen excluding HVC from supplemental feed (hydrogen, ethylene, other HVC) with an ethylene content in the total product mix of at least 30 mass-percent and a content of HVC, fuel gas, butenes and liquid hydrocarbons of together at least 50 mass-percent of the total product mix | All processes directly or indirectly linked to the production of high value chemicals as purified product or intermediate product with concentrated content of the respective HVC in the lowest tradable form (raw C4, unhydrogenated pygas) are included except C4 extraction (butadiene plant), C4-hydrogenation, hydrotreating of pyrolysis gasoline and aromatics extraction and logistics/storage for daily operation.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,702 |
| Aromatics | Mix of aromatics expressed as $CO_2$ weighted tonne (CWT) | All processes directly or indirectly linked to the aromatics sub-units pygas hydrotreater, benzene/toluene/xylene (BTX) extraction, TDP, HDA, xylene isomerisation, P-xylene units, cumene production and Cyclo-hexane production are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,0295 |

| Product benchmark | Definition of products covered | Definition of processes and emissions covered (system boundaries) | Carbon leakage exposure as determined by Decision 2010/2/EU for the years 2013 and 2014 | Benchmark value (allowances/t) |
|---|---|---|---|---|
| Styrene | Styrene monomer (vinyl benzene, CAS number: 100-42-5) | All processes directly or indirectly linked to the production of styrene as well as the intermediate product ethylbenzene (with the amount used as feed for the styrene production) are included.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,527 |
| Hydrogen | Pure hydrogen and mixtures of hydrogen and carbon monoxide having a hydrogen content ≥ 60 % mole fraction of total contained hydrogen plus carbon monoxide based on the aggregation of all hydrogen- and carbon-monoxide-containing product streams exported from the sub-installation concerned expressed as 100 % hydrogen | All relevant process elements directly or indirectly linked to the production of hydrogen and the separation of hydrogen and carbon monoxide are included. These elements lie between:<br>(a) the point(s) of entry of hydrocarbon feedstock(s) and, if separate, fuel(s);<br>(b) the points of exit of all product streams containing hydrogen and/or carbon monoxide;<br>(c) the point(s) of entry or exit of import or export heat.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 8,85 |
| Synthesis gas | Mixtures of hydrogen and carbon monoxide having a hydrogen content < 60 % mole fraction of total contained hydrogen plus carbon monoxide based on the aggregation of all hydrogen- and carbon-monoxide-containing product streams exported from the sub-installation concerned referred to 47 volume-percent hydrogen | All relevant process elements directly or indirectly linked to the production of syngas and the separation of hydrogen and carbon monoxide are included. These elements lie between:<br>(a) the point(s) of entry of hydrocarbon feedstock(s) and, if separate, fuel(s);<br>(b) the points of exit of all product streams containing hydrogen1 and/or carbon monoxide1;<br>(c) the point(s) of entry or exit of import or export heat.<br>For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered | yes | 0,242 |

| Product benchmark | Definition of products covered | Definition of processes and emissions covered (system boundaries) | Carbon leakage exposure as determined by Decision 2010/2/EU for the years 2013 and 2014 | Benchmark value (allowances/t) |
|---|---|---|---|---|
| Ethylene oxide/ ethylene glycols | The ethylene oxide/ethylene glycol benchmark covers the products ethylene oxide (EO, high purity), monoethylene glycol (MEG, standard grade + fibre grade (high purity)), diethylene glycol (DEG), triethylene glycol (TEG).<br>The total amount of products is expressed in terms of EO-equivalents (EOE), which are defined as the amount of EO (in mass) that is embedded in one mass unit of the specific glycol | All processes directly or indirectly linked to the process units EO production, EO purification and glycol section are included.<br>The total electricity consumption (and the related indirect emissions) within the system boundaries is covered by this product benchmark | yes | 0,512 |

## ANNEX 10

## Sector assessments within the framework of Option A3

### Mining of iron ore (NACE 1310)

Sector and product description

Iron ore is mainly produced outside Europe. The market is highly consolidated, dominated by three major producers in Brazil and Australia (Vale, Rio Tinto and BHP Billiton), accounting for 35 % of world production in 2010. LKAB produces around 90 % of all iron ore in the EU[9]. Its share of world seaborne trade is around 2 %. and its world market share is around 1 %.

The first production step involves mining. Only the second step – the grinding of iron into pellets and fines – causes CO2 emissions. The two mines operated by LKAB are said to account for 2% of Sweden's electricity production.

The NACE 1310 code is split into two subsectors (see Annex 11).

GVA in 2008 was €13bn in 2008, €4bn in 2009 and €15bn[10].

Industry and other submissions in support of eligibility

Substitutability between fuel and electricity is cited as a ground for eligibility.

While emphasising the high quality of LKAB's iron ore pellets, the sector claims that this product is nevertheless a commodity with global benchmark prices set through quarterly negotiations between the three major iron ore producers. The Asian spot price for standard grade Fe (iron)-content pellets are said to serve as the benchmark. According to the sector data for monthly, quarterly and index prices are published in Platts, The Steel Industry or Metal Bulletin.

Furthermore the sector argues that there are only small price variations for the quality add-on relating to the products manufactured by the Swedish group.

A real carbon leakage risk, according to the sector, exists at a CO2 price of €17. The risk is said to take the form of slow and sustained erosion of market shares. In the sector's view the pelletisation part of the operation could easily relocate.

Elements of assessment

[9] All iron ore production in the ETS is attributable to LKAB.

[10] Information by LKAB. The fall in demand in 2009 is claimed to have been a direct result of the financial crisis.

The indirect costs amount to <5% of GVA (which does not make it feasible to rank the sector in terms of indirect CO2 costs) (Annex 8).

According to data provided by LKAB (which makes up virtually all EU iron ore production) the NACE 1310 sector had indirect CO2 costs/GVA of between 2.5-2.7% during 2005-2007. The data was – like the fundamental indirect CO2 costs data relied on by this Report - based a CO2 price assumption of €30 and a CO2 factor of 0.465 Cot/MWh[11].

Given the concentrated nature of the market and the reference pricing resulting from the contracts negotiated by the major players[12] in worldwide markets the contention that EU producers are price-takers is plausible.

Iron ore is a highly traded product[13] as reflected by the very high trade intensity at 85% (ranking as No 12 in terms of trade intensity) (Annex 8). As to the broad trading patterns, see figure 38 in Annex 16).

There is strong competition from large-scale, high grade overseas operations capable of producing metalliferous ores under low-cost conditions, inducing the EU extractive industry to compete by e.g. supplying quality materials and diversifying its products[14].

According to a decision in the merger control area the geographic scope of the iron ore markets for inter alia pellets comprises all seaborne customer areas; in other words, all regions fully or partly dependent on seaborne supplies[15]. In that decision the Commission also found that no further distinction should be made between seaborne areas, particularly between Western Europe and East Asia. The Commission found that that benchmark price levels and contractual conditions were effectively based on overall market conditions in the seaborne market, and were not significantly determined by local factors[16].

The 2011 Benchmarking Decision does not establish fuel and electricity substitutability in respect of products falling within this NACE 4 sector (Annex 9)

**Production of salt (NACE 1440)**

Sector and production description

Salt (NaCl) can be produced by different processes and technologies. Evaporated salt production from brine through so-called Mechanical Vapour Recompression (MVR) is relatively more electro-intensive (wtih electricity as the main energy input).

The sector's GVA at factor cost in 2007 was €549.5m and employment was 179 200 (Annex 14).

11 Based on the definitions of gross value added used by the Swedish statistical office and the OECD.

12 See the 2011 Competitiveness Report.

13 It would appear the most of such trade takes place by sea as land transport tends to be expensive (European Commission (SEC (2009) 1111 final), p. 134).

14 European Commission (SEC (2009) 1111 final), p. 139.

15 See paragraph 17 of Commission Decision of 18 July 2003 in Case No COMP/M.3161.

16 See paragraph 19 of Commission Decision of 18 July 2003.

Submissions by and in support of industry

The industry submits that the vast majority of salt produced is used as a primary source material in the production of many chemical industrial applications, notably chlorine and soda ash (within NACE 2413). In the industry's view, the location of salt at the beginning of an extensive value chain, additional burdens on the salt sector would likely have a substantial economical impact on the downstream sectors.

The salt sector claims that salt is a commodity subject to competitive pricing.

Elements of assessment

The indirect CO2 costs amount to 1.7% of the sector's GVA (Annex 8).

The trade intensity amounts to 12.5% (ranking as No 185 in terms of trade intensity) (Annex 8).

A consultancy study found that the subsector in question – i.e. salt produced through the MVR process – had a weighted average trade intensity of 11.7% during 2006-2007. It also found that the indirect CO2 costs for the subsector as a share of the GVA amounted to an average of 14.2% during 2005-2007. However, the data related only to half of the subsector. Moreover, the calculation was based on CO2 emission factors ranging from 0.61 to 1.12 CO2t/MWh.

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of salt (Annex 9).

**Manufacture of starch and starch products (NACE 1562)**

Sector and product description

The starch industry extracts starch from cereal grains and potatoes and processes it into several hundreds products, from native starches to physically or chemically modified starches as well as into liquid and solid sugars. Starch products are used as ingredients and functional supplements in food, non-food and feed applications. It also generates co-products in the form of animal feed (e.g. wheat proteins, corn gluten feed) and food (e.g. wheat gluten).

Starch and starch products can be very simple or – as the products are transformed along the value chain – very complex.

The sector's GVA in 2007 was €2bn. It employed 18 400 persons (Annex 14).

Submissions by or in support of industry

The starch industry claims that the sector produces more than half the electricity it uses on site, for self-consumption (auto-generation). Using both electricity purchased on the grid and auto-generated electricity would – the industry argues – bring the indirect CO2 costs per GVA over

5%. The equivalent figure for France is claimed to be 6.2%. The French data are considered representative by the sector as France accounts for 30% of EU production.

The sector specifies that the auto-generation takes the form of cogeneration, a process which captures both the electricity and heat/steam produced. In the sector's view purchases from the grid would be less environmentally friendly.

The industry asserts that the EU starch production faces competition from perfectly substitutable products that can and are in fact imported from the US, the BRIC countries and Thailand.

According to the industry's estimates some relocation would take place at a CO2 price of €30 and that growth would stagnate at €15.

The indirect CO2 costs cannot, in the industry's opinion, be passed on due to strong international competition and substitutable nature of starch and starch products. Sugar can replace glucose and tapioca starches can replace maize, barley, rice or potato starches). The industry considers that the paper sector, a key customer, is at risk of carbon leakage.

Imports of tapioca starches are said to have risen six-fold from 1997 to 2007. The industry mentions that the fact that tapioca starch is not produced in the EU means, according to the industry, that it is not included in the trade intensity calculations which are based on the NACE codes.

The trend in the starch sector is to increase the value added through further stages of transformation. According to the industry, CO2 emissions rise with each level of transformation (regardless of the use of heat/steam or electricity).

In the industry's opinion the starch sector may be disadvantaged compared to other sectors producing competing materials (such as the chemicals sector), notably in the area of non-food products where starch-based products compete with fossil fuel based products. Both the starch and chemicals sectors produce, for example, paper coatings, plastics, adhesives (glues), detergents and solvents.

Elements of assessment

The indirect CO2 costs amount to 1.9% of the sector's GVA (ranking as No 26 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 14.5% (ranking as No 178 in terms of trade intensity) (Annex 8).

Data relating to France suggest that indirect CO2 costs in that country amounts to 1.34% of EU starch industry turnover (based on a CO2 price of 30€/t CO2 and an emission ratio of 0,465 tCO2/MWh).

As regards the lack of comparable data on auto-generation see sections 2.14 and 4.5.

Tapioca starch is covered by the Prodcom code 15622300 (see Annex 11).

The 2011 Benchmarking Decision does not establish fuel and electricity substitutability in respect of products falling within this NACE 4 sector (Annex 9).

**Preparation and spinning of cotton-type fibres (NACE 1711)**

Sector and product description

Cotton fibres are produced from raw cotton are the most used natural fibre in the world. The fibres are transformed into yarns through cotton spinning. The ring spinning process is particularly electro-intensive17.

The sector's GVA at factor cost in 2007 was €680m and employment was 29 900 (Annex 14). The sector mainly comprises medium sized firms, some of which are vertically integrated with fabric production and and in some cases with finishing.

Cotton spinning forms part of the textiles and clothing production value chain. Spinners of cotton-type fibres supply cotton yarns to textiles producers who in turn supply clothing manufacturers.

The WTO Agreement on Textiles and Clothing expired at the end of 2004. Since then increased production by and competition from Asian firms have been a main driver behind a substantial restructuring of the European textiles and clothing sector. China, India, Pakistan and Uzbekistan are the largest producers of cotton yarns. Asia accounts for 27m tonnes, the US for 1.5m tonnes and the EU for 1m tonnes.

Industry and other submissions in support of eligiblity

Sudden increases in the global price for raw cotton are said to have taken place in recent years. Export restrictions by e.g. India and Pakistan reportedly caused the price rises. Raw cotton is claimed to make up 45% of yarn production costs.

Relying on ITMF[18] data, the industry claims that electricity costs in the EU - in particular in Italy (the EU's largest producer) - increased by 80% between 2006 and 2010. Electricity prices have, according to the industry, remained stable for key non-EU competitors such as India. stable.

The WTO Agreement on Textiles and Clothing in 2004 and the financial crisis have, according the industry, adversely affected the cotton-fibre sector.

The industry claims that the value of spinning activities in the EU has halved over the past decade.
Demand mainly from China - is said to have risen significantly over the past 18 months. Cotton yarn production costs in Asia are claimed to be 30-35% lower than in EU (even taking into account yarn quality).

The industry argues that many of the EU's competitors have introduced special incentives in

17 Study on the Application of Value Criteria for Textile Products in Preferential Rules of Origin by Prof Michiel Scheffer, 2006

18 International Trade Manufacturers Federation.

favour of their textile industries as well as imposed export restrictions on raw materials.

In most of the EU cotton spinning companies the profit margins are, in the industry's estimation, relatively low as a consequence of intense international competition. Average operating profit margins are claimed to be in the range 6-8%, while net margins are said to vary between 1 to 2%.

The industry contends that the concentration of production capacities in Asia and the EU's position as a marginal producer of raw cotton places make the EU industry a price-taker. In support of that claim the industry refers to low profit margins and the relatively small size of downstream sectors in the EU using cotton yarn for weaving and knitting (10-15% of global installed capacity).

The industry refers to closures, subcontracting or relocatin by cotton spinning companies in the EU which could not compete with low Asian prices. According Effects along the textiles and clothing value chain were said to have resulted in the halving of employment over 2000-2010.

Significant capacity increases after 2001 at the global level are claimed to have occured. The clear bulk of these investments are said to have taken place in Asia and Oceania. Currently 86% of the installed capacity is said to be located in those regions (compared to only 65% 10 years ago).

Elements of assessment

The indirect CO2 costs amount to 4% of the sector's GVA (ranking as No 9 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 40.5% (ranking as No 91 in terms of trade intensity) (Annex 8).

Cotton type fibres are internationally priced based on a conversion rate between raw cotton and fibres, an indication of the commodity nature of cotton fibres[19]. A long standing cotton/cotton fibre price index (*'Cotlook A Index'*) reflects price offers on the international raw cotton market[20]. Recent reports on the international cotton market points to global price movements[21].

Spot and future trading also indicate that the next step in the value chain - cotton yarn - is also a commodity subject to global pricing[22] While prices of cotton yarns depend on the quality and the characteristics of the yarn, electronic price quotes are increasingly available for specific types of yarn23.

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19 See website of Cotton Outlook on the evolution from 2002 to 2012 of Cotton Index A Liverpool. Cotton Outlook has been publishing CIF prices for the principal growths of raw cotton for close to fifty years. In 1966, the forerunner of what is now the Cotlook A Index was introduced. The initial published value was 31.05 cents per lb

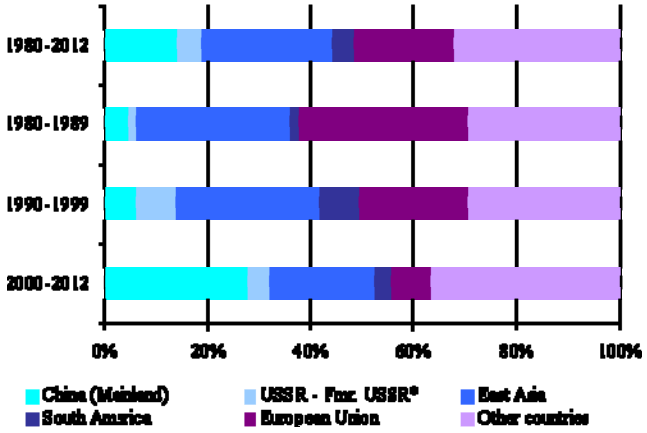
20 See infra. The price is based on an average of the cheapest five quotations from a selection (at present numbering nineteen) of the principal upland cottons traded internationally.

21 See The Economist, 10 March 2012.

22 See e.g. http://www.commodityonline.com/commodities/fibers/cottonyarn.php and http://www.emergingtextiles.com/?q=pre&s=international-spun-yarn-price-sample-table&t=html&u=sam&r=price-database-international-yarn-daily

23 http://www.cottonyarnmarket.net/login2/current_yarn_rate.html

The EU's share of world cotton production has progressively fallen over the past two decades[24]:




The 2011 Benchmarking Decision does not establish fuel and electricity substitutability in respect of products falling within this NACE 4 sector (Annex 9).

**Manufacture of pulp – NACE 2111**

Sector and product description

EU production is split equally between pulp from virgin raw materials (notably wood) or pulp based on recycled paper[25]. Access to wood is a key issue for the pulp industry.

Pulp can be produced mechanically or chemically. Mechanical production is most electro-intensive (Annex 16, table 11)[26]. Some pulp plants produce electricity on site (autogeneration).

Mechanical pulping[27] is often integrated with paper production which is not always the case for chemical pulping.

According to one study chemical pulping accounts for over 30% of European pulp production, mechanical pulping for 6% and thermo-mechanical pulping for 12% (Annex 16, figure 17)[28].

Most pulp mills are integrated with paper and cardboard production. Non-integrated pulp production is called 'market pulp'. In 2008 market pulp production1 was 13.3 million tonnes, of which 12 453 million tonnes was made up of chemical pulp and 869 000 tonnes of mechanical market pulp.

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24 Source: UNCTAD Secretariat (based ICAC statistics)

25 The recycling rate in the EU is 72% (2011 Competitiveness Report) (forthcoming).

26 The Paper and Pulp BREF (draft of April 2010) shows energy consumption of 2350 kWh/t in the pulp part of a integrated thermo-mechanical mill compared to 1800-3600 kWh/t in a non-integrated pulp mill (Tables 5.10 and 5.11). Link: http://eippcb.jrc.es/reference/BREF/PP_D1_0410.pdf

27 Of the 13 subsectors in NACE 2111, two refer to mechanical pulp ("Thermo-mechanical wood" and "Mechanical wood pulp (excluding thermo-mechanical wood pulp").

28 McKinsey (2006), pp. 29-30.

The sector consists of 13 subsectors[29] (Annex 11).

The sector's GVA at factor cost in 2007 was €2.181bn (Annex 14). Employment is estimated to be around 20 000.

Industry and other submissions in support of eligiblity

The industry submissions focus on mechanical pulp mills[30]. It is argued that eligibility should be assessed not at sector or subsector but at installation level. It is argued that installations whose electricity purchases amount to more than 3% of total production costs should be eligible[31].

It is claimed that for mechanical pulp mills electricity makes up, on average, 18% of total production costs in Europe.

In the view of the industry federation indirect CO2 costs/GVA for mechanical pulp mills (i.e. a subsector of NACE 2111) would exceed 10%.

Fuel and electricity substitutability is claimed as a basis for eligibility with reference to the 2010 Carbon Leakage Decision including pulp among sectors receiving competition for direct CO2 costs.

The industry claims that the EU pulp sector is a price-taker given that prices are said to be set globally. To this end, reference is made to findings in a report from 2008[32]. Prices are said to be identical across regions if account is taken of the impact of exchange rates and transaction costs. The industry is of the view that the EU pulp sector cannot set prices without taking into account prices set in US and Asia.

Almost 60% of the pulp investment of the world's top 100 firms in the period 2006-2010 will according to the industry be carried out in Asia during 2006-2010. Investment leakage risks are said to relate to Asia (in particular China), Russia and South America.

While the industry is still dominated by North American and European firms, South American, Asian and African firms are said to be gaining ground.

The industry draws attention to what it calls latent mechanical pulp production capacity.

Elements of assessment

29 Of the 13 subsectors in NACE 2111, two refer to mechanical pulp ("Thermo-mechanical wood" and "Mechanical wood pulp" (excluding "thermo-mechanical wood pulp").

30 A large share of the submissions are based on information from RISI, a consultancy.

31 Relying on the definition of electro-intensive undertakings in the Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity.

32 Pellervo Economic Research Institute Reports 207 ('The Effects of a Revision of the Emission Trading Directive for the period starting 2013 on the European Pulp and Paper Industry') Helsinki 2008. The report refers to the need for some caution on the econometric findings regarding pulp, citing rather short times series and the fact that data was derived from different databases. The report admits that the estimates as regards the price elasticity of demand for pulp are lower in absolute terms than those for paper assessed in the same report. This is said to be explained by the fact that a large part of the pulp trade is made up of intra-firm trade

The indirect costs amount to <5% of GVA (which does not make it feasible to rank the sector in terms of indirect CO2 costs) (Annex 8).

Data indicates that the indirect CO2 costs may make up 2.2% of GVA in the sector[33]. That estimate was based on Best Available Technologies[34] and the assumption that only mechanical mills make purchases of electricity. Those findings were based on the following data and assumptions. Eurostat GVA for 2008 was used. That data only covers so-called market pulp. Value added for pulp production which in integrated with paper production is reported under the NACE code covering paper and cardboard production.

A CO2 price of €30 and an average of regional CO2 factors were assumed (0.67) (i.e. higher than the CO2 factor of 0.465 used in respect of the sectors in the indirect CO2 cost ranking in Annex 8). On the other hand the calculations are based on the Best Available Techniques which implies that all mills have best available technology in place (which is not the case).

The trade intensity amounts to 46.1% (ranking as No 75 in terms of trade intensity) (Annex 8).

Recent analyses by the Commission indicate that prices for pulp are set globally[35] and that the EU pulp industry is a price-taker. This is not contradicted by the Commission's definition of the relevant geographic market in previous merger cases[36].

The international reach of pulp supply chains are increasing, reflected in net trade flows favourable to EU main trade partners[37.]

EU pulp is mainly exported to China, Switzerland and Turkey. Non-EU imports originate mostly from woody areas such as Brazil (33% of imports), USA, Canada, Russia and Indonesia. All tariffs for pulp in European markets have been abolished since 2004[38].

The 2011 Benchmarking Decision does not establish any substitutability between fuel and electricity in respect of pulp (Annex 9).

**Paper and paperboard (NACE 2112)**

Sector and product description

33 CEPI.

34 BREF (2001, tables 2.23 and 4.10).

35 See 2011 Competitiveness report, confirming previous findings in European Commission (SEC (2009) 1111 final), p. 161 ("Since most pulp … grades are effectively commodities, prices are set by the lowest-cost producers on the global market").

36 The pulp market was found to be at least EEA-wide market in Case No COMP/ M.5283 (SAPPI/M-Real ) at paragraph 20; see also Case No COM/M5477 of 20.4.2009 at paragraph 24.

37 Cambridge Econometrics (2011), p. 25; the international and competitive nature of pulp markets are endorsed by De Bruyn et al (2010), pp. 23-24.

38 European Commission (SEC (2009) 1111), p. 163.

Europe represents a quarter of world paper production (close to 1 000 paper mills) and consumption. Nearly all paper mills relying on mechanical pulp (see above) use autogenerated electricity[39]. Biomass is widely used as a fuel.

The NACE Code 2112 is divided into almost 50 subsectors at Prodcom level (Annex 11).

The sector's GVA at factor cost in 2007 was €15.669bn and employment was 196 400 (Annex 14)

Industry and other submissions in support of eligibility[40]

Substitutability between fuel and electricity is cited by the industry as one basis for eligibility. Eligibility should, in the industry federation's view, be confined to products derived from mechanical pulp (whether based on wood or recycled paper) (see above as regards pulp). Eligibility should, according to the federation, be defined at subsector (Prodcom) level.

Industry stakeholders claim that prices are set globally, relying on the same report cited in the section above on the pulp sector. It is alleged that the industry faces increasing competition not only from non-EU competitors (including Asia and South America) but also from other materials such as aluminium, glass and steel. Paper is also said to face increasing competition from the ICT sector.

The risks in the EU are said to involve investment leakage and relocation. The industry maintains that the vast majority of investments made in recent years and planned for the coming years are located in South East Asia and South America. Almost 60% of the pulp investment of the world's top 100 firms in the period 2006-2010 will be carried out in Asia during 2006-2010.

But the industry also claims that in the short term there is scope at the global level for increasing the use of installed capacity to compensate for closure of European plants. It argues that in the medium and long term entry costs are driven down by the presence of significant government subsidies for investment, in particular in the two regions mentioned above.

According to the industry, paper and paperboard being commodities, qualitative differentiation for the same type of product is very limited, although differentiation and branding are significant during later stages of processing, production of finished products and paper use. The industry federation contends that transport costs are low in relation to final product prices.

The industry argues that that mechanical pulp on the one hand and mechanical paper/paperboard production on the other hand are linked to such an extent that the value chain may relocate together in case of carbon leakage affecting pulp production.

Elements of assessment

The indirect costs amount to 4.8% of GVA (ranking as No 6 in terms of indirect CO2 costs) (Annex 8).

[39] So-called 'CHP' (combined heat and power).

[40] A large part of the submissions are based on information from RISI, a consultancy.

The trade intensity amounts to 25.72 % (ranking as No 146 in terms of trade intensity) (Annex 8).

Recent findings by the Commission indicate that prices are set globally[41], a conclusion which is not inconsistent with the Commission's geographic market definition in previous merger cases[42]. The Commission has also found that there are increased imports to China of input materials (wood, pulp and recovered paper). The EU paper industry has also been found to face export restrictions limiting access to such inputs[43]. No tariffs on paper in European markets apply since 2004.

The market for paper has been found to be international, competitive but at the same time highly diversified. There are various base materials, production methods and applications, varying from printing paper to packaging[44].

The 2011 Benchmarking Decision does not establish any substitutability between fuel and electricity in respect of paper and paperboard (Annex 9).

**Manufacture of refined petroleum products (NACE 2320)**

Sector and product description[45]

Refineries are large complex industrial plants converting crude oil into a wide range of products (Annex 16, figure 31) including light distillates (gasoline, naphtha, LPG), middle distillates (gasoil, diesel, kerosene), heavy distillates and specialized products (lubricants, aromatics, bitumen etc.). The refining process varies in complexity but all techniques follow a similar production pattern. The lighter the final products are, the greater the energy intensity and vice versa. Refining by-products are used in petrochemical processes to produce materials such as plastics.

The industry structure has been described as “relatively fragmented”[46]. There are around 100 refineries in the EU. They are often integrated with production of basic chemicals (for example through steam cracking); indeed, 41 of the 53 steam crackers in the EU are integrated refineries/steam crackers. More than three quarters of the feedstocks of those integrated complexes come from refineries.[47] Close to 800 000 jobs in the downstream petrochemicals sector (notably basic chemicals and plastics) are directly linked to refining activity.

41 See p. 169 of the 2011 Competitiveness report, confirming findings in European Commission (SEC (2009) 1111 final), p. 161 ("Since most … paper grades are effectively commodities, prices are set by the lowest-cost producers on the global market").

42 See Case No COMP/M.5950 Munksjö/Arjowiggins of 21 February 2011 at paragraphs 28-31; see also Case No COMP/M.3284 Outokumpu/Boliden finding that in the past the Commission held that the market for fine paper including WFU paper is at least EEA wide.

43 2011 Competitiveness report.

44 De Bruyn et al (2010), pp. 23-24.

45 “De Bruyn et al (2010), pp. 18-19. How an oil refinery works” (Europia website).

46 McKinsey (2006), p. 44.

47 The Commission Staff Working paper on refining and supply of petroleum products in the EU, page 19.

Refineries are characterised by a high degree of auto-generation of electricity[48].

Prodcom does not contain information for the subsectors within NACE 2320.

The sector's GVA at factor cost in 2007 was € 28.29bn and its employment was 124 200 (Annex 14), most of which high-skilled.

Industry and other submissions in support of eligibility

The industry federation's main basis for the eligibility claim is low profit margins[49] and a high degree fuel and electricity substitutability[50]. While electricity is on average said to constitute around 14% of the energy used in EU refineries, the share is said to vary significantly from refinery to refinery. The federation maintains that electricity can represent anything between 7% and 25% of a refinery's energy use.

EU refineries are said to produce over 50% of the electricity they consume, for which they receive no free allowances in the context of direct CO2 costs (2010 Carbon Leakage Decision and the 2011 Benchmarking Decision). In the industry's view internally generated electricity should be added to the imported electricity when assessing the indirect CO2 costs as part of the sector's GVA[51]. On that basis those costs would amount to between 2.5 and 3% of GVA[52].

Refinery products are described as homogenous commodities which are substitutable if EU fuel standards are met. Prices are said to be determined in open and transparent international markets via hubs. Transport costs are claimed to be small in relation to product value. According to the industry federation imports to the EU become competitive at a CO2 price of 15-20€.

While outright relocation is not seen as a risk, reference is made to risks of investment leakage over the longer term, in particular to the Middle East.

As evidence of low profit margins reference is made to recent announcements by two refiners (Petroplus and Total) and the closure of at least nine refineries since mid-2008.

European refiners are said to be in competition with producers located in the Middle East, the Indian subcontinent and Russia. The sector claims that Europe’s high diesel demand due to its large diesel fleet cannot be satisfied by its own refineries and that those non-European refiners do not have similar direct and indirect CO2 costs.

According to the industry, in a situation of low refining margins, many of the previously announced projects may not be implemented and the latest estimate is that only some 14 billion Euros of investments might be spent improving the European refining system by 2020, depending on the economic conditions.

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48 Amounting to 55% according to Barron et al (2008) (at footnote 26).

49 Wood Mackenzie, a consultancy, forcasts that North Western European Urals cracking margins will reach $3.45/bbl in 2010 compared to $2.62/bbl 2009 and $4.62/bbl in 2008. According to the consultancy, margins are set to continue to rise slowly, reaching levels of $5.13/bbl in real (2010) terms by 2015.

50 See reply to questionnaire by France in support of that argument.

51 Claims by EUROPIA.

52 EUROPIA assessment

Elements of assessment:

The indirect CO2 costs amount to 1.2% of the sector's GVA (ranking as No 39 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 16.13% (ranking as No 175 in terms of trade intensity) (Annex 8).

It appears from previous competition cases that the geographic market definition (regional, Western Europe, at least EEA-wide etc.) depends on the particular refinery product in question[53]. They also show that some products in this sector were found to be transportable whereas others were deemed not to be transportable due to physical or chemical characteristics, safety requirements and the consequent substantial transport costs. A previous study finds that the refinery sector is able to pass on costs to customers to a large extent[54].

A further study finds that motor gasoline and fuel oil are supplied almost exclusively from EU refiners and that it is conceivable that the refinery industry is a price-maker which is able to pass on either cash cost or the opportunity cost as in electricity markets[55]

According to one recent study the world refinery industry is characterised by its regional character[56]. Refinery capacity is dominated by the Middle East, North-West Europe and South America, which together account for almost two thirds of global refineries. According to that study, apart from this structural trade (see below), refineries are traded at local and regional markets.

Another study confirms some markets tend to be 'rather local' due to transport costs and logistics (with the exception of so-called structural imports)[57].

The EU structurally is dependent for some products in order to match supply and demand. Demand for middle distillates (gasoil/diesel, jet fuel and kerosene) is growing and the demand for gasoline is falling. The EU imports middle distillates from Russia (diesel) and from the Middle East (kerosene and jet fuel) while it exports gasoline largely to the US[58]. Indeed, one industry trend since 1990 involves a shift from gasoline towards diesel (Annex 16, figure 9) due to tax incentivised dieselisation. Tightening of product specifications (e.g. desulphurization) required significant capacity investments[59].

Profit margins tend to fluctuate, the oil price being a main variable (Annex 16, figure 32). As a result of falling demand while keeping stable capacity, refining margins in 2009 were at their

53 See M.4094M.4094 10.08.2006 INEOS / BP DORMAGEN; Case COMP/M.2345 — Deutsche BP/Erdölchemie, 26 April 2001 and Case COMP/M.4005 — Ineos/Innovene, 9 December 2005.

54 McKinsey (2006), p. 46.

55 Reinaud (2008), p. 62.

56 De Bruyn et al (2010), p. 18.

57 See McKinsey (2006) at p. 45 referring to liquefied petroleum gas; naphta; motor gasoline; kerosene type jet fuel; gas and diesel oil; residual fuel oil; other petroleum products as falling under 'structural imports'.

58 The Commission Staff Working paper of 17 November 2011 on refining and supply of petroleum products in the EU, Evolution of EU net imports in key petroleum products, page 9, 10.

59 According to Reinaud (2008) (at p. 62) the Euro 5 legislation necessitated foreign investment in desulphurization amounting to USD 2-4 per barrel.

lowest level in last 15 years. From the mid-1980s the industry was characterised by overcapacity and low profitability. The IEA predicts that the construction of refineries globally over the past two years and a massive contraction in oil consumption during the recession have led to a glut of capacity at the global level.[60]

According to the IFP[61], a consultancy, complex margins from $3.4/bbl are "perfectly satisfactory from a refiner's perspective". In the table below the North-West European margin (claimed to be representative for Europe) was 1.3 $/bbl in North-West European).

**Average annual margins (in $/bbl)**

| YEAR | NWE BRENT CRACKING | LLS CRACKING USA | DUBAI HYDROCRACKING (SINGAPORE) | DUBAI HYDROCRACKING (CHINA) |
|---|---|---|---|---|
| 2007 | 6.3 | 4.6 | 3.6 | 3.1 |
| 2008 | 5.2 | 1.9 | 3.1 | 2.4 |
| 2009 | 1.3 | -0.2 | -1.5 | -1.8 |

*Source: IEA*

The Commission's 2011 Benchmarking Decision confirms fuel and electricity substitutability in respect of a number of products in the refinery sector (Annex 9)[62].

**Industrial gases (NACE 2411)**

Sector and product description[63]

Industrial gases are produced both by independent operators ("outsourced production") and in-house ("in-sourced production") by manufacturers using industrial gases. At EU level, 47% of oxygen production and 49% of hydrogen production is outsourced.

The metal sector, including steel mills, is by far the largest oxygen consumer among the clients of the European industrial gas federation[64] (58% of all oxygen). Refineries and the petrochemical sector are among the main hydrogen consuming sectors. Oil refining accounts for 48% of the hydrogen produced by federation members (Annex 16, figure 35).

The industrial gases sector comprises ten subsectors (Annex 11), including oxygen and nitrogen which are used in virtually all manufacturing. Industrial gases can be transported in bulk, cylinders and via pipelines.

60 The Commission Staff Working paper of 17 November 2010 on refining and supply of petroleum products in the EU, page 15.

61 Commission Staff Working paper on refining and the supply of petroleum products in the EU, page 39.

62 See also recital 24 of the 2011 Benchmarking Decision which specifically refers to the refinery benchmark.

63 Eiga.org website.

64 EIGA.

The sector's GVA at factor cost in 2007 was € 4.99bn and employment was 39 000 (Annex 14)

Industry and other submissions in support of eligibility

The industry federation's key argument for eligibility is the alleged distortions of competition in favour of in-sourced production (i.e. at steel mills, refineries and chemical plants) at the expense of outsourced production.

If industrial gases companies alone (outsourced production) were to bear higher costs related to indirect CO2 emissions, it is argued that their manufacturing customers (steel mills, chemicals manufacturers and refiners) would face an "incentive" to re-internalise the production of the gases needed in their industrial processes. A study is cited in support of these claims[65].

The ETS Guidelines should, the industry federation argues, create a level playing field between in-sourced and outsourced oxygen and nitrogen plants.

On a NACE 4 basis, industry stakeholders argue that 2% indirect CO2 costs as a share of GVA should suffice for eligibility. Alternatively, given that the risk of carbon leakage does not extend to the whole of the NACE 2411 sector but in particular to three products at Prodcom level (oxygen, hydrogen and nitrogen) eligibility should be assessed at subsector level.

The risk of carbon leakage (to third countries) is said to be bound up with the risk of carbon leakage affecting clients downstream.

Industry stakeholders explain that industrial gases are not transportable due to intrinsic characteristics, safety issues and high costs except for the small proportion channelled via pipelines. Nevertheless, it is submitted that there is a risk of 'internal carbon leakage' even if relocation to third countries is not at issue.

Elements of assessment

The indirect CO2 costs amount to 7.5% of the sector's GVA (ranking as No 2 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 4.17% (ranking as No 221 in terms of trade intensity) (Annex 8).

The 2011 Benchmarking Decision accepts fuel and electricity inter-changeability in respect of two gases (hydrogen and syngas) (Annex 9)[66].

Recital 23 of the ETS Directive, in the context of setting out principles for compensation for direct CO2 costs states such rules should "avoid undue distortions of competition between industrial activities carried out in installations operated by a single operator and production in outsourced installations". It could thus by analogy be envisaged to address those specific concerns through an electricity efficiency benchmark (see ... ) in the client eligible sectors (such as steel) that would create the level playing required by recital 23.

65 Study by Deloitte dated October 2009.

66 The second being 'synthesis gas' (which is not one of the 10 subsectors in the relevant Prodcom list (2007)).

**Basic organic chemicals (NACE 2414)**

Sector and product description

The NACE 2414 sector (basic organic chemicals) comprises close to 200 subsectors (Prodcom level) (Annex 11), compared to the NACE 2413 (basic inorganic chemicals) which comprises 98 subsectors (at Prodcom level). The NACE 2413 sector is not assessed qualitatively as it automatically qualifies under Option A3 (see section 4.9 in the main report).

Strong inter-linkages between several upstream and downstream levels and a large number of production steps characterise the chemical sector.

A very large number of products can be derived from the chemical compounds produced upstream by large installations benefiting from economies of scale. Refinery products (NACE 2320) are often used to produce basic organic chemicals (NACE 2414) such as ethylene and propolyne which in turn often are used to produce further derivatives within the NACE 2414 sector as well as polymers and other plastics in primary forms (NACE 2416). The graph below illustrates the petrochemical chain:

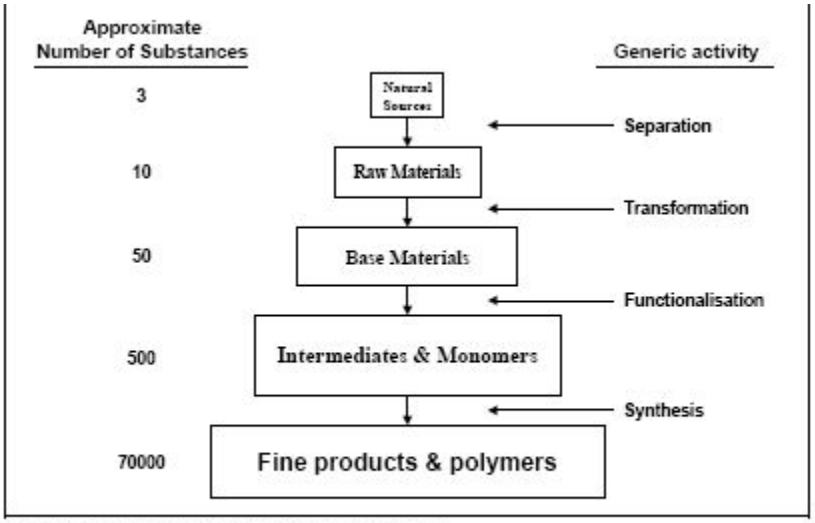



Figure 1.1: Structure of Industrial Organic Chemistry
Based on figure by Griesbaum in [CITEPA, 1997 #47]

The chemical industry was not part of ETS 1 and ETS 2.

The sector's GVA at factor cost in 2007 was €27.56bn and employment was 148 300 (Annex 14)

Industry and other submissions in support of eligibility

In connection with the 2010 Carbon Leakage Decision regarding direct fuel the chemical industry argued in favour of eligibility based on the NACE 3 level (which comprises both NACE 2413

and 2414)[67]. This case is no longer explicitly made. Instead the industry's eligibility argumentation focuses on fuel and electricity inter-changeability[68].

In the view of industry stakeholders even small imported quantities are set the EU price when import prices fall below the lowest domestic price in the internal market. Import duties are claimed to be lower – sometimes much lower – than those of key trading partners (Annex 16, figure 34).

Stakeholders maintain that the EU chemical industry is the most CO2 and electricity efficient in the world and that chemical production contributes towards the transition to a low-carbon economy.

The risks are said to relate to investment leakage rather than relocation. Given the integration of the chemical industry chain effects in the form of co-location could arise as a result of leakage. Certain products[69] within the NACE 2414 sector are said to be at less risk of carbon leakage if chlorine (a subsector within NACE 2413) is eligible.

The linkages between the organic chemical sector (NACE 2414) and the plastics sector (NACE 2416) and especially commodity polymers are emphasised by industry stakeholders. If for example polyethylene production (2414 or 2416) left Europe, stakeholders assert that 55-60% of European ethylene production would lose its target[70].

Reference is also made to price clauses automatically releasing buyers from purchase obligations if prices for e.g. ethylene or propylene (part of NACE 2414) risk to reach uncompetitive levels[71].

The industry accepts that no significant leakage has been observed in the chemical sector during ETS 1 and so far under ETS 2. But it is argued that ETS 3 will impose greater burdens. One industry submission claims that the risk of carbon leakage sets in at a CO2 price of €12.

Elements of assessment

The indirect CO2 costs amount to 2.2% of the sector's GVA (ranking as No 23 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 46.3% (ranking as No 74 in terms of trade intensity) (Annex 8).

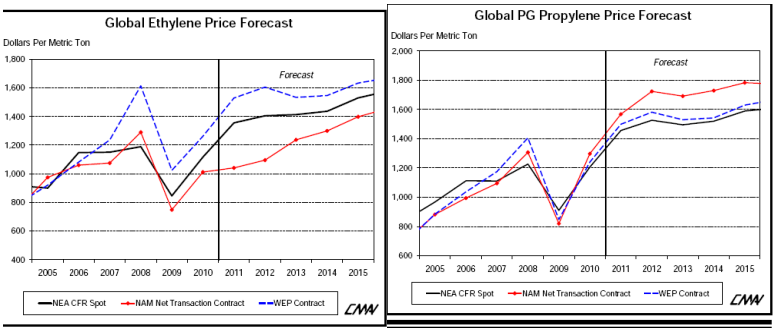
According to one study relatively little is so far known about the ability of the ability of the basic organic chemicals sector to pass on their free EUAs[72]. Given the high degree of product differentiation in the basic organic chemical sector it is also difficult to generalise as to pass on ability and carbon leakage risks due to the expected higher electricity costs[73]. On the other a

67 European Commission (SEC(2009) 1710), p. 7.
68 See reply to questionnaire by France in support of this argument.
69 EDC and VCA.
70 Plastics Europe.
71 Plastics Europe.
72 De Bruyn et al (2010), p. 15.
73 European Commission (SEC (2009) 1111 final), p. 38.

study on major energy-intensive industries found when considering different sectors' ability to set price that pricing in the basic chemical sector (which includes NACE 2414) was competitive[74].

The fact that some products are too hazardous to be transported long distances has been taken into account in previous Commission decisions in merger cases concerning some subsectors within NACE 2414[75]. At the same time, the Commission's decisional practice accepts that the extent of the market may be wider if transport of the chemical in question is not deemed hazardous[76].

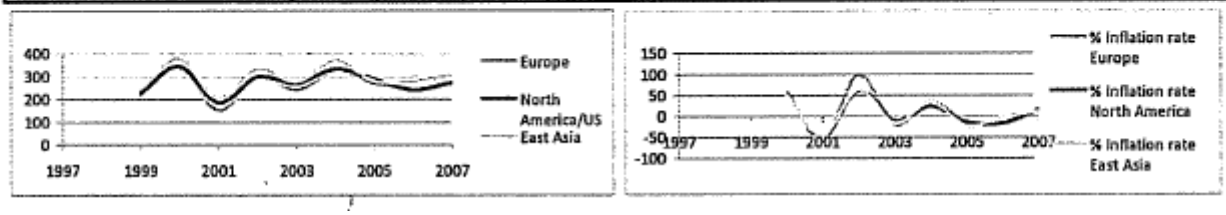
There is evidence of a high degree of correlation (both past and forecast) between EU prices and prices in other regions for key basic organic chemicals such as ethylene and propylene[77].




There is also evidence of a high degree of price correlation between derivatives for ethyelene and prolyene falling with the NACE 2414 sector as well as other NACE 2414 sectors[78].

Euro/metric ton

| Ethylene Dichloride (EDC) | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Europe | | | 215 | 341 | 150 | 298 | 240 | 323 | 270 | 250 | 274 |
| North America/US | | | 229 | 347 | 185 | 299 | 270 | 334 | 288 | 240 | 275 |
| East Asia | | | 249 | 376 | 204 | 332 | 277 | 369 | 281 | 278 | 308 |
| % Inflation rate Europe | | | | 58,28 | -56,12 | 99,06 | -19,42 | 34,44 | -16,46 | -7,10 | 9,49 |
| % Inflation rate North America | | | | 51,53 | -46,55 | 61,29 | -9,80 | 23,96 | -13,81 | -16,91 | 14,63 |
| % Inflation rate East Asia | | | | 50,87 | -45,72 | 62,41 | -16,62 | 33,38 | -23,82 | -1,00 | 10,58 |




74 Ecorys (2009), p. 22. That study (p. 41) also refers to some US studies citing high international electricities of demand for basic organic cheimcals. See sections 2.1.4 and 4.9.2.2 in the main report on the major caveats related to such estimates.

75 See the Commission's decision of 10 August 2005 in Case No COMP/M.4094 - Ineos/BP Dormagen concerning ethylene oxide (considered to be a hazardous product) indicating that the extent of the market did not extent beyond the EEA and Switzerland. The geographic market definition was left open.

76 See the same Commission decision (M.4094) as regards a product not considered hazardous (ethyelene glycol). The decision indicates that the geographic market was at least EEA-wide, although the market definition was left open; see also de Bruyn et al (2010), p. 15.

77 Source: CMAI, Asian Market Report Light Olefins, March 2011, page 7. http://www.cmaiglobal.com/Marketing/Samples/AMRLO_Monthly.pdf

78 Source: Cefic. See also ICIS Chemical Business November 7-13 2011 on the spot bulk price for benezene spot bulk with exhiting a strong price correltion across Asia, Europe and the US.

This is also true of key products such as polymers (within NACE 2416) further down the value chains. The scope for passing through costs from the NACE 2414 sector to the NACE 2416 and beyond is thus much reduced.

International benchmarks prices for key petrochemical products (including subsectors within NACE 2414 and 2416) are quoted on the icispricing.com website[79].

It appears that the basic organic chemical sector (NACE 2414) compared to the basic inorganic chemical sector (NACE 2413) has so far withstood the pressure of international competition well[80]. The basic chemical sector experienced a trade surplus of over €40bn in 2009, while the basic inorganic chemicals sector experienced a deficit. The prices of basic inorganic chemicals also fell by 15.6% between the years 2009-2010 whilst the chemical sector as a whole experienced a rise in price of 1.4%. The Commission has recently described basic organic chemicals as 'one of the EU's most competitive sectors'[81.]

The high level interdependence between production activities in all basic chemical subsectors and exposure to carbon pricing in one chemical subsector could impact on derivatives[82]. But if it were not the case such interdependence could also serve to reduce the carbon leakage risk[83]. Even further upstream the basic chemicals sector is integrated with the petrochemical sectors given that production relies largely on oil and gas among the raw materials. Middle Eastern producers have recently increased their investment in integrated petrochemical production facilities[84]. It appears that investments over the coming years and decade will largely take place outside the EU[85.]

The 2011 Benchmarking Decision establishes substitutability between fuel and electricity in respect of some basic organic chemicals (Annex 9)[86].

**Mineral fertilisers and nitrogen compounds (NACE 2415)**

Sector and product description

The NACE 4 code 2415 comprises 34 subsectors at Prodcom level (Annex 11).

Ammonia is the basic building block of fertilisers. Ammonia is derived from air and natural gas. Adding nitric acid to ammonia results in nitrogen fertiliser. Nitrogen (N) is the main nutrient in

79 ICIS pricing report covers all the major chemical markets including key products within the NACE 2414 sectors such as ethylene, propylene, butadiene, benzene, toluene and xylene.
80 Cambridge Econometrics (2010).
81 2011 Competitiveness report, at p. 155 (forthcoming).
82 Cambridge Econometrics (2010), p. 27.
83 European Commission (SEC (2009) 1111 final), p. 40.
84 2011 Competitiveness report; European Commission (SEC (2009) 1111 final), p. 40.
85 See ICIS Chemicals Business 23-29 January 2012 which lists various planned investments in the ethylene sector in China.
86 Chemicals obtained via steam cracking, aromatics as well as ethylene oxide.

EU fertiliser production (10.1m of out of a total of 14.7m tonnes), the remainder being made up of potassium (P) and calcium (K) based fertilisers[87].

Urea is another form of fertiliser derived from ammonia[88]. Urea accounts for 30% of fertiliser use in the EU.

Fertilisers are produced in powder (granular) or liquid form.

The centrality of natural gas in fertiliser production should be emphasised. Fertiliser producers consume around 5% of global gas production. Natural gas accounts for 90% of the costs of ammonia production. Nitrogen fertilizer use has made nitrous oxide (N2O) the third most important greenhouse gas[89].

This sector only becomes part of the ETS as of 2013.

The sector's GVA at factor cost in 2007 was €3.67bn and employment was 56 400 (Annex 14)

Industry and other submissions in support of eligibility

The acceptance of fuel inter-changeability in respect of ammonia in the Commission's 2011 Benchmarking Decision' relating to direct CO2 costs is adduced by the industry as a ground for eligibility for the NACE 2415 sector.

Nitrogen fertilisers are described as a commodity. The commodity aspect consists, according to the industry, in the nitrogen content (said to account for 80-90% of the price of nitrogen fertilisers). As a result, the price correlation between different types of fertilisers is said to be strong.

The EU fertiliser manufacturing market is said to be fragmented along national lines, a legacy of the divestment by oil and gas companies of their fertiliser divisions.

Relying on a report from 2008[90], the industry federation argues that EU fertiliser manufacturers are price takers and that the price elasticity of export demand is high and that, consequently, EU producers cannot set prices independently of competitors around the world.

The industry claims that that urea, a form of fertilisers, is traded globally via hubs in the Black Sea Region and the Arab Gulf. Trade flows from these hubs allegedly dictate world fertiliser prices. Reference is made to developed spot markets, characterised by price volatility.

While it is claimed that the current external tariffs of 6.5% on non-EU imports do not shield EU producers from competitive, it is accepted the antidumping duties which are currently in place offer some protection.

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87 See efma.org.

88 See Pellervo Economic Research Institute Reports 208 Pellervo (2008)), p. 2; see EFMA Annual Report 2008, p. 19 at http://www.efma.org/docs/Emission_trading.pdf

89 After CO2 and methane.

90 Pellervo Economic Research Institute Reports 208 (2008).

The industry maintains that there is in practice no further scope for reducing electricity consumption given the necessity to use natural gas as feedstock. Other production routes with lower CO2 content would, it is argued, only be competitive in the long term.

The dependence on gas requires that production facilities be located close to pipelines or LNG terminals. Large investments in such facilities are said have taken place in particular in Russia, the Black Sea Region and Algeria.

Elements of assessment

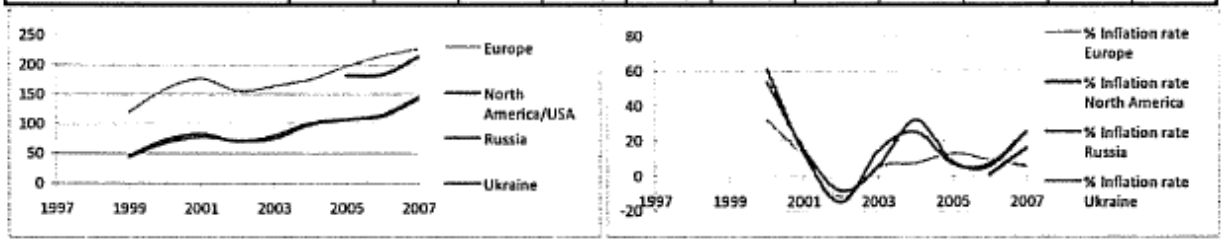
The indirect CO2 costs amount to 3.7% of the sector's GVA (ranking as No 10 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 27.36% (ranking as No 139 in terms of trade intensity) (Annex 8).

The claim that fertiliser prices are set internationally and that EU fertiliser manufacturers are price-takers is supported by the Commission's previous decisions in merger cases[91]. There is also evidence of distinct price correlation across regions[92]:

Euro/mt

| Ammonium Nitrate | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Europe | | | 120 | 158 | 176 | 155 | 163 | 175 | 197 | 215 | 227 |
| North America/USA | | | | | | | | | 181 | 183 | 213 |
| Russia | | | 45 | 73 | 83 | 70 | 80 | 101 | 108 | 115 | 145 |
| Ukraine | | | 44 | 68 | 78 | 71 | 75 | 99 | 107 | 113 | 142 |
| % Inflation rate Europe | | | | 32,14 | 11,25 | -12,05 | 5,44 | 7,12 | 12,70 | 9,03 | 5,50 |
| % Inflation rate North America | | | | | | | | | | 1,05 | 16,16 |
| % Inflation rate Russia | | | | 61,31 | 13,29 | -15,03 | 14,36 | 25,33 | 6,84 | 6,89 | 25,93 |
| % Inflation rate Ukraine | | | | 54,05 | 15,31 | -8,56 | 5,46 | 32,03 | 7,84 | 5,54 | 25,64 |




Some carbon leakage literature also finds that the EU fertiliser sector may have faced problems in passing on the opportunity costs of their free EUAs[93].

The trade position of fertilisers within the chemicals sector broadly defined has been found to be particularly weak[94].

91 See Commission Decision in Case No COMP/M.4730 – YARA/Kermia Growhow at para 30 where the market for urea was deemed to be world-wide in scope (with more than 40% of urea sold to industrial customers being imported, mostly from Russia, Ukraine, Egypt, Libya and the Middle East). See also paragraph 20 where the relevant geographic market for field fertilisers was deemed to be at least EEA-wide and where it was considered that the high level of imports into the EEA (N 10%, P 60% and K40%) suggested that the market may be wider.

92 Source: Cefic.

93 De Bruyn et al (2010), p. 15.

94 European Commission (SEC (2009) 1111 final), p. 37.

Considerable spare capacity appears to exist in surrounding non-EU countries; for example, Russia alone is said to possess spare capacity for nitrogen fertiliser production amounting to 2m tonnes (i.e. around one fifth of EU production of nitrogen fertilisers)[95].

The 2011 Benchmarking Decision accepts that there is substitutability between fuel and electricity in respect of ammonia (Annex 9).

**Manufacture of plastics in primary forms (NACE 2416)**

Sector and product description

The NACE 2416 code consists of 51 subsectors at Prodcom level (Annex 11). It is highly integrated upstream with the inorganic chemical sector (chlorine as input for the polymer PVC) as well as with the organic chemical sectors (eg ethylene and propylene as feedstocks for polymers).

Plastics *in primary forms* are compounds formed by the reaction of simple molecules. They are by definition not compounded with other materials. Polymers constitute the main subsector category within NACE 2416.

Of around 20 groups of plastics in primary forms there are five high volume groups: polyethylene; polypropylene; polyvinylchloride (PVC); polystyrene and polyethylene terephthalate (PET) which account for around 75% of plastics production in primary forms in Europe. Those products are often referred to as 'commodity polymers' or 'thermoplastics'. They are used in high volume and wide range of applications, such as packaging.

Plastics in primary forms come in different forms (liquids, pastes, lumps, powders, granules, flakes and similar bulk forms).

The sector's GVA at factor cost in 2007 was €21.88bn and employment was 187 500 (Annex 14)

Europe currently produces about 25% of the estimated worldwide plastics production. High integration along the value chain is a key characteristic of the European plastics industry.

Industry and other submissions in support of eligibility

The sector adduces fuel substitutability as one of the grounds for eligibility.

It claims that at least 60% of the sector is made up of commodities. Polymers are said to be a key commodity category. The sector federation maintains that the price elasticity of such commodities is determined by global supply and demand; more specifically, if the price of imports fall below the lowest domestic EU price it is claimed that the import price will determine the overall price level (ie the same submission as made by industry in respect of basic organic chemicals (NACE 2414 above).

[95] See efma.org.

In other words, it is claimed – in line with economic theory – that EU the price is set by the marginal producer. In practice, industry stakeholders assert that prices in North America are price-setting. Transport costs are said to account to 4-10% of the product value.

Industry stakeholders take the view that polymer inter-changeability and large trade imply that for the commodity polymer grades there is a global pricing regime. They claim that prices are generally agreed on a monthly basis.

The great majority of commodity products are said to face carbon leakage risks even in the short term; whereas the risk for highly specialised products is more long term. While, demand for commodity polymers mainly consists of applications where technical properties and customer service are not critical it is argued that specialised (or "engineering") polymers – which normally command a price premium – are becoming increasingly commoditised.

The Middle East and Asia as are cited as the areas where the large majority of the new investments are concentrated and where demand grows more rapidly.

The greatest competitive pressure on the polyethylene and polypropylene market is emanating from the Middle East.

The industry federation maintains that the “ethylene chain” probably includes activities for which Europe is most threatened in terms of cost competitiveness (see above on the NACE 2414 sector).

Three main major factors are said to determine competitiveness: feedstock costs, processing costs and market price. In recent years, the emerging countries of Asia are said to have enjoyed an advantage on all these factors compared to the EU.

For the 14 most important polymers, the net balance is claimed to have been positive for around 2.5 ml tons in 2005, but is said to have fallen to around 1.8 ml tons in 2010.

The industry federation invokes “inter-material competition” between plastics and other materials (paper, metals and wood).

The importance of upstream integration with the petrochemical sector – as a provider of essential raw materials - is stressed. Physical proximity to customer and markets are also considered important.

It is maintained that abatement (e.g. through transition to less carbon intensive polymers) cannot be achieved in the short term.

It is stressed that the plastics and polymer industry in a wider sense consists of polymer manufacturers, converters and machine manufacturers, the overall turnover of which in the EU and the EEA in 2007 was in excess of 300 billion Euro[96], with the total industry employing more

[96] Plastics Europe 2007.

than 1.6 million people including all related industries. Integration is said to be strong between NACE 2414 (organic base chemicals) and 2416 (polymers).

Elements of assessment

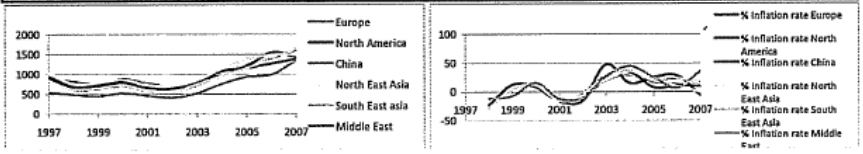
The indirect CO2 costs amount to 1.7% of the sector's GVA (ranking as No 30 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 27.14% (ranking as No 140 in terms of trade intensity) (Annex 8).

The plastics sector provided a study based on data for the period 2005-2010 indicating that at least the following six subsectors have trade intensities of 25% and indirect CO2 costs of 2.9%/GVA for the respective subsectors: Low Density Polyethylene (LDPE) (Prodcom: 24161039; Linear Low Density Polyethylene (LLDPE) (Prodcom: 24161035); High Density Polyethylene (HDPE) (Prodcom: 24161050); Polypropylene (PP) (Prodcom: 24165130); Polyvinyl Chloride (PVC) (Prodcom: 24163010) and Polycarbonate (PC) (Prodcom: 24164040).The calculations were based on a CO2 price of €30 and a CO2 factor of 0.465 CO2t/MWh[97]. Strong price correlations across major producing regions indicate that bulk polymers are globally priced[98].

Dollar/metric ton

| LDPE | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Europe | 923 | 813 | 756 | 874 | 769 | 688 | 826 | 1064 | 1233 | 1390 | 1596 |
| North America | 871 | 669 | 750 | 811 | 676 | 573 | 844 | 966 | 1203 | 1538 | 1435 |
| China | 938 | 675 | 703 | 780 | 649 | 633 | 800 | 1071 | 1149 | 1264 | 1380 |
| North East Asia | 1034 | 744 | 775 | 859 | 715 | 699 | 844 | 1144 | 1369 | 1484 | 1478 |
| South East asia | 838 | 601 | 628 | 696 | 580 | 565 | 709 | 963 | 1146 | 1406 | 1630 |
| Middle East | 549 | 484 | 449 | 519 | 456 | 408 | 518 | 748 | 930 | 985 | 1335 |
| % Inflation rate Europe | | -11,92 | -7,01 | 15,61 | -12,01 | -10,53 | 20,06 | 28,81 | 15,88 | 12,73 | 14,82 |
| % Inflation rate North America | | -23,19 | 12,11 | 8,13 | -16,65 | -15,24 | 47,29 | 14,45 | 24,53 | 27,85 | -6,70 |
| % Inflation rate China | | -28,04 | 4,15 | 10,95 | -16,79 | -2,47 | 26,38 | 33,88 | 7,28 | 10,01 | 9,18 |
| % Inflation rate North East Asia | | -28,05 | 4,17 | 10,84 | -16,76 | -2,24 | 20,74 | 35,55 | 19,67 | 8,40 | -0,40 |
| % Inflation rate South East Asia | | -28,28 | 4,49 | 10,83 | -16,67 | -2,59 | 25,49 | 35,83 | 19,00 | 22,69 | 15,93 |
| % Inflation rate Middle East | | -11,84 | -7,23 | 15,59 | -12,14 | -10,53 | 26,96 | 44,40 | 24,33 | 5,91 | 35,53 |




The GGC countries[99] are extending their exports beyond the major dry bulk polymers[100] as reported in a trade journal ("*the GCC governments are initiating multiple strategies to help GCC countries to grow from being exporters of polyolefins to exporters of finished polyolefin products*").[101] Another trade publication reports that Saudi Arabia is studying a development of local products that could be exported to Europe, including automotive-grade plastics.[102]

There are indications that different installations compete on price, partly because of the low degree of product differentiation of the sector. Transport costs are relatively low in relation to the product value[103]. By 2015, it is expected that 90% of imports into the EU will come from the

97 Consumption data was obtained from ICIS's proprietary databases, converted into € based on exchange rates published by Eurostat.

98 See extensive list of prices on icispricing.com.

99 *Gulf Cooperation Council (GCC) nations, which include Qatar, Saudi Arabia and the United Arab Emirates.*

100 Polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET) and PVC

101 Chemical Week, June 1, 2009.

102 ICIS Chemical Business, May 30 – June 5, 2011, Saudi clusters, Plastics in the driving seat, page 30-31.

103 Ibidem.

Middle East[104]. There are indications that the EU's trading position has deteriorated sharply (Annex 16, figure 36).

The production of plastics in primary forms is linked with other sectors and subsectors both upstream and downstream. According to one recent study on carbon leakage, to the extent these other sectors do not relocate and downsize the risk of carbon leakage is reduced also in relation to the plastics sector (and vice versa)[105].

It appears that investments over the coming years and decade will largely take place outside the EU[106].

There is evidence of low profit margins, at least in some subsectors[107].

Plastics in primary forms was one of five sectors deemed eligible under a qualitative assessment in the 2010 Carbon Leakage Decision[108]. This conclusion was based on additional research finding that the CO2 costs (direct and indirect) were closer to 5% than in the Commission's initial findings (3%)[109].

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of plastics in primary forms (Annex 9).

**Manufacture of synthetic rubber in primary forms (NACE 2417)**

Sector and product description

Building of synthetic rubber plants in Europe, North America and Japan begin in earnest after 1945. Synthetic rubber overtook natural rubber in production and consumption volume in the 1960s.

Synthetic rubber is synthesised in steam crackers from petroleum and other minerals.

Synthetic rubber is thus one of the numerous outputs of steam crackers (which also produce polymers (NACE 2416)). Synthetic rubber uses butadiene and/or benzene (NACE 2414) as feedstocks.

Emulsion styrene butadiene rubber (ESBR) is the largest volume synthetic rubber. ESBR accounts for about 30% synthetic rubber production. Styrene butadiene rubber (SBR) is another major product (12%)110. There are ten ESBR and 15 SBR plants in Europe (excluding Russia).

The sector's GVA at factor cost in 2007 was € 577m and employment was 5 900 (Annex 14).

104 Ibidem.
105 See Cambridge Economics (2011).
106 See ICIS Chemicals Business 23-29 January 2012.
107 See recital 66 of Council Implementing Regulation No 1030/2010 imposing a definitive anti-dumping dutyon imports of certain PETs originating in China.
108 See recital 19 of the 2010 Carbon Leakage Decision.
109 Cambridge Econometrics (2010), p. 30.
110 Polymer BREF, Table 8.1.

Production of synthetic rubber in primary forms (NACE 2417) is built into the petrochemicals value-chain. For example, as ESBR production relies on monomers (such as styrene and butadiene in NACE 2414) the plants are located as part of integrated refineries or chemical complexes, or as adjuncts to such complexes.111

Tyre sales account for nearly three quarters of SBR demand. Its other end uses include food packaging, automotive industry and engine lubricants.

Industry and other submissions in support of eligibility

In respect of EPDM (another synthetic rubber mainly used by the automotive sector (sealing, air ducts, and hoses) it is argued that market prices are established in fierce global competition and that, therefore, any additional costs of the EU ETS cannot be passed on to downstream customers.

Asymmetric cost impacts on EU producers may, it is argued, increase due to higher trade intensities in the future. It is contended that the impact will continue to vary from one year to another, as in the past, in response to supply and demand shifts, changes in market demand and increasing international competition. Reference is made to announced capacity expansions of producers in the Middle East, China and in South Korea.

Between 2007 and 2010 several plants in France, Romania, and Bulgaria reportedly shut down.

Elements of assessment

The indirect CO2 costs amount to <5% (which does not allow for a ranking in terms of the sector's GVA) (Annex 8).

The trade intensity amounts to 32.08% (ranking as No 103 in terms of trade intensity) (Annex 8).

Synthetic rubbers are traded on international exchanges along with natural rubbers.112

From 2009 to 2014, demand for SBR is forecast to grow at an average annual growth rate of 6.3% in Europe. 113 There are indications of risks of increased import from Asia, particularly China114 and India, due to a build-up capacity which is outstripping demand in that region.115. China is scaling up capacity with new plants that are planned to start operating before 2014116.

The 2011 Benchmarking Decision does not establish fuel and electricity substitutability in respect of products falling within this NACE 4 sector (Annex 9).

**Manufacture of man-made fibres (NACE 2470)**

111 Polymers BREF, Chapter 7, page 119, August 2007.
112 They are traded on commercial exchanges in Tokyo, Singapore, London and on NYMEX.
113 Chemicals Economic Handbook, Styrene butadiene elastomers, p. 38, 42, 47, 50 etc.
114 Chemicals Economic Handbook, Styrene butadiene elastomers.
115 ICIS, March 17-23, 2008, page 38.
116 Chemicals Economic Handbook, Styrene butadiene elastomers.

Sector and product description

Polyester accounts for around 75% of man-made fibre production, followed by polyamide (nylon) and other fibres (such acrylic and cellulosic)[117]. The man-made fibres sector provides raw materials for a wide variety of uses, including textiles, transport (e.g. tyres and airbags), construction, housing, aerospace, hygienic/medical applications, environmental protection as well energy savings applications (e.g. wind mills).

The man-made fibre sector is capital intensive. The lifetime of investments typically exceeds 20 years. There are production facilities in almost every EU Member State.

The sector's GVA at factor cost in 2007 was € 2.754 bn and employment was 41 200 (Annex 14).

The man-made fibres industry forms part of the European textile supply chain with a value-added of €65 billion, 128 000 companies and a two-million strong workforce118.

Industry and other submissions in support of eligibility

Industry submissions119 focus not only on polyester and polyamide (nylon) but also cover aramid, acrylic, polypropylene and polyethylene. Industry stakeholders emphasise that the sector is closely linked with the production of polymers (included in NACE 2416) and that electricity represents an important share of total production costs. Energy costs are said to be of the same order of magnitude as labour costs. The industry argues that EU production unit costs are high compared with China. Transport costs are said to be relatively low and supply chains are described as global.

The industry federation argues that global competition is intense and that increased costs cannot be passed through to consumers. Production of the sector is said to be mainly of the commodity type with globally set prices. Overcapacity in Asia, notably in China, is cited. A decline in EU output over 2000-2010 is said to have taken place.

The industry federation claims that uncertainty about the level of the CO2 price and its compensation is holding back new investment into Europe.

Industry profit margins are said to range from 3% (10 year average for polyester) to negative.

The industry states that global prices are under pressure due to weak demand (not only in Europe but also in Asia), increased cost of inputs and China’s expansion of production capacity.

Non-EU imports are said to originate mostly from China, India and South Korea. China is said to account for 60% of world polyester fibres.

Import duties on man-made fibres into European markets are to be the lowest in the world.

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117 Total world production of all types of man-made fibres, in 2010, was 53 million tones (Industry data – CIRFS).

118 Source Eurostat

119 Response by CIRFS to Commission Consultation of March-May 2011.

Physical proximity of man-made fibres is said to be critical to the competitiveness of downstream users because it claimed to reduce input costs, facilitate the development of new products and increase the flexibility of the supply chain.

Elements of assessment

The indirect CO2 costs amount to 2.8% of the sector's GVA (ranking as No 16 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 32.78% (ranking as No 119 in terms of trade intensity) (Annex 8).

There are indications that the man-made fibres sector is a price-taker. Key man-made fibres appear to be of a commodity type with global reference prices120.

In previous merger decisions the Commission found that, depending on the products, the market has been to be at least EEA or EU wide or no more than EEA wide[121]. In some cases the geographic scope of the market was left open[122].

Over the past decade Chinese and Indian production capacity of polyester increased by a factor 4.5 and 2.8 times respectively[123]. Non-EU producers, in particular China, were the main beneficiaries of the consumption increase of 20% during the years 2005-2007. Over the past year capacity has expanded in Turkey as well as in South America, notably Brazil124. In the Chinese man-made fibres sector there is currently an estimated overcapacity of 25-30%125. Anti-dumping duties have been imposed on imports of polyester industrial filament yarn from China126.

EU production fell by 24% since its pre-crisis peak in early 2008[127]. Over the past year, it appears that production facilities from Germany have relocated to Israel and US firms have divested in Spain128.

Provisional anti-dumping duties imposed in 2010 are referred to as evidence of pressure on polyester fibre prices129. It appears from that investigation that sector's profit margin in 2005 was 3.0% turning to a loss of 1.1% in 2007130.

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120 See prices for nylon and polyester fibres and yarns available on icispricing.com.

121 See Cases M.214 - DuPont/ICI; M.206; No IV/M.1182 - AKZO NOBEL /COURTAULDS110; Rhone Poulenc/SNIA; M.1337 - Koch/Saba/Hoechst; No COMP/M.3341 and Case No COMP/M.2187 and CVC/Lenzing. (in particular paragraphs 132-133).

122 See e.g. Case COMP/M.3341, paragraph 16.

123 PCI World Synthetic Fibres Supply/Demand Report 2010.

124 PCI Fibres Report N° 280 of December 2011

125 Commission Regulation N° 478/2010 of 1 June 2010 imposing a provisional anti-dumping duty on imports of high tenacity yarn of polyesters originating in the People's Republic of China

126 Commission Regulation N° 478/2010 of 1 June 2010 imposing a provisional anti-dumping duty on imports of high tenacity yarn of polyesters originating in the People's Republic of China

127 Eurostat.

128 PCI Fibres Report N° 280 of December 2011

129 Profitability has steadily decreased from 2006 onwards due to dumped imports (Commission Regulation N° 478/2010 of 1 June 2010 imposing a provisional anti-dumping duty on imports of high tenacity yarn of polyesters originating in the People's Republic of China)

The 2011 Benchmarking Decision does not establish fuel and electricity substitutability in respect of products falling within this NACE 4 sector (Annex 9).

**Manufacture of cement (NACE 2651)**

Sector and product description

The sector contains eight subsectors (Prodcom level) (Annex 11). The European standard for common cement[131] covers 27 products. It is has been estimated that so-called Portland cement makes up 85% of EU cement production[132].

Clinker is a key input in cement production. Clinker production is the most energy and electricity intensive part of cement production. Cement is produced in grinding plants.

The degree of auto-generated electricity is relatively low[133]. The sector's GVA at factor cost in 2007 was €9.96bn and employment was 64 100 (Annex 14)

Industry and other submissions in support of eligibility

Eligibility is advocated on the basis of the sector's inclusion under the 2010 Carbon Leakage Decision as regards direct costs. While industry stakeholders accept that there is as yet no hard evidence of relocation, they claim that the sector as a whole will be at risk of carbon leakage at CO2 price of 35€ [134].

At a CO2 price of €25, the industry claims that more than 80% of EU clinker production will be at risk of offshoring by 2020 as follows: 100% of Italian, Greek, Polish and UK production; virtually all of Spanish production; 75% of German production; 65% of French production and 70% of the production of the smaller EU producers.

While the sector acknowledges that land transport of clinker is not economically viable beyond a radius of 300 km, it contends that transport by sea is viable over much longer distances (as evidenced by large imports from China in recent years). The industry accepts that cement is more expensive to transport than clinker. Unlike cement, clinker does not require special equipment.

While there are many variants of cement, the industry claims that there is substitutability between EU and non-EU cement.

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130 Data from European Commission Regulation 478/2010

131 EN 197-1: 2000

132 Ecorys (2009).

133 6% according to McKinsey 2006, p. 41.

134 Reference is made to a study prepared in 2008, Boston Consulting Group ("Assessment of the Impact of the 2013-2020 ETS Proposal on the European Cement Industry" November 2008) and 2012, Boston Consulting Group, Key arguments justifying the European cement industry's application for state aid to balance off-shoring risk caused by the increase of electricity prices due to EU-ETS, January 2012.

The abovementioned report from 2008 submitted by the industry argues that the carbon leakage risks relate in particular to clinker. It singles out zones in the EU deemed to be at particular risk of carbon leakage in relating to clinker (Annex 16, figure 39).

Eligibility is also advocated on the basis of the significant new capacity (mainly for clinker) said to have been installed in Northern Africa, Turkey and the Middle East. The sector also refers to recent announcements of new capacity (100m tonnes) coming on stream in Turkey by 2020.

The industry maintains that regional trade intensity in both the Mediterranean basin and in areas which are close to port facilities in fact exceeds 10%.

In addition to risks of investment leakage to China and India, the 2008 report submitted by the industry considers that risks of carbon leakage (and ultimately relocation) concern the EU's neighbouring regions (including North Africa, the Middle East, Turkey and Ukraine). The EU's global share of cement production is said to be 8%. It is expected to fall to 6-7% in 2020.

In respect of what is described as the most competitive offshore regions (ie the Mediterranean basin), reference is made to announcements to build nine plants in Saudi Arabia, three in Egypt and seven in the UAE. An additional capacity increase of 1.4 plants per year and per country would, the sector argues, suffice to induce the EU's entire clinker production to be offshored to North Africa, the Middle East and Turkey.

Elements of assessment:

The indirect costs amount to 4.4% of GVA (ranking as No 8 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 6.75% (ranking as No 209 in terms of trade intensity) (Annex 8). Trade intensities between Europe and non-EU regions are thus among the lowest of all manufacturing sectors (about 7%).

Cement prices appear to differ considerably across regions (Annex 16, figures 21-22).

According to the Commission's practice in merger cases the geographic extent of the cement market takes the form of a set of markets, centred around the various factories, overlapping with each other and covering the whole of Europe[135]. The size of each market and the extent of the overlaps are determined by the distance from the factory. The EU cement industry is highly concentrated[136].

As study on electricity intensive industries finds that a cement plant usually serves customers within a 150 km radius[137].

135 Case COMP/F-2/38.401 EN 197-1 Standard – EMC/European Cement Producers dated 28 September 2005 (Commission decision rejected a complaint in antitrust proceedings).

136 European Commission (SEC (2009) 1111 final), p. 25.

137 See p. 13 in Ecorys (2009) ("Estimating Sectoral Price Elasticities for the Enegy-Intensive Sectorss").

A study cited by another sector (steel) estimating the price of elasticity of demand for certain sectors finds that the elasticity is lower for cement compared to the other sectors estimated (pulp, paper, steel and aluminium)[138].

It appears that transport cost by land[139] reduces the risk of carbon leakage in particular in relation to cement but also in relation to its key intermediary, clinker[140].

Clinker imports to the EU exceed cement imports by a factor of four[141]. China is the main player on the world clinker market, accounting for 67% of production. It is also the largest importer to the EU, covering over 40% of non-EU imports (Annex 16, figure 12).

Based on current environmental performance it has been found that the industry is unlikely to be able to make major further improvements in the short term[142].

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of cement (Annex 9).

**Other non-metallic mineral products (NACE 2682)**

Sector and product description

The main application of carbon and graphite are carbon and graphite electrodes for the steel, aluminium or silicon-metal industries. Other industrial applications include fuel cells or semiconductors. Carbon allows for less conductivity than graphite and is used in among other things aluminium production[143].

Graphite is a naturally occurring form of carbon which is mined. Production of artificial graphite (Prodcom: 26821400) is one of 15 sectors within the NACE 2682 code which is heterogenous. (Annex 11). Depending on the subsector there are significant variations in terms of energy (including electricity) intensity.

The sector's GVA at factor cost in 2007 was € 4.62bn and employment was 68 100 (Annex 14).

Industry and other submissions in support of eligibility

The eligibility claim is made by the industry at Prodcom level in favour of two subsectors within NACE 2682. First, Artificial graphite, colloidal, semi-colloidal graphite, and preparations (Prodcom: 26821400) and, second, Exfoliated vermiculite, expanded clays, foamed slag and similar expanded mineral materials and mixtures thereof (Prodcom: 26821620). Later industry submissions focused in particular on artificial graphite (Prodcom: 26821400).

138 See reply to questionnaire by Eurofer which refers to the following price elasticities of demand estimated by the International Energy Agency: EAF steel: - 1.56; BOF steel -1.56; aluminium: -0.86 and cement: -0.27.

139 Cement is not transported by long over more than +/- 200 km (European Commission (SEC (2009) 1111 final), p. 29).

140 Bergmann et al (2007), p. 78; de Bruyn et al (2010) pp. 21-22.

141 European Commission (SEC (2009) 1111 final), p. 27.

142 European Commission (SEC(2009) 1111 final), pp. 23-24.

143 Carbongraphite.org web site.

The industry claims that all sectors and subsectors qualified under the 2010 Carbon Leakage Decision for direct CO2 costs should qualify under the ETS Guidelines. In any case, with reference to the inclusion in the 2010 Carbon Leakage Decision for direct CO2 costs (direct fuels). Exchangeability between direct fuel and electricity is cited as an argument in favour eligibility in respect of the two subsectors mentioned above. Equal treatment is said to be required for those plants that rely to a greater extent on electricity compared to direct fuels.

The industry federation claims that energy makes up more than 4% of the GVA of these two subsectors.

In respect of artificial graphite (26821400) it is specified that the indirect CO2 costs amount to 5.2% of EU GVA.

It effectively claims that the two subsectors are price-takers given that the market is said to be global.

Reference is also made to ongoing and expected anti-dumping cases in relation to the carbon and graphite sector in the EU.

The industry asserts that production of artificial graphite is highly electricity intensive. In support it cites reference document on best available techniques (BREF on non-ferrous metals), which shows that electricity accounts for around 80% of energy input.

The industry argues that the producers of graphite electrodes are facing tough international competition. Reference is made to the imposition by the EU in December 2010 of a definitive anti-dumping duty on imports of graphite electrodes originating from India and initiated an anti-dumping proceeding against China.

Elements of assessment

The indirect CO2 costs amount to 1.2% of the sector's GVA (ranking as No 40 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 17.91% (ranking as No 169 in terms of trade intensity) (Annex 8).

Although the claims are not made for the sector as a whole, no evidence has been provided suggesting that any of the two subsectors would have indirect CO2 costs amounting to mroe than 4% of the EU GVA for those subsectors.

In terms of pricing, there are some indications that artificial graphite is sold in a competitive global market[144.] For graphite electrodes there appears to be a high degree of correlation between export prices for graphite electrodes from Japan, Europe and North America[145.]

The 2011 Benchmarking Decision does not establish fuel and electricity substitutability in respect of products falling within this NACE 4 sector (Annex 9).

144 http://www.indmin.com/MarketTracker/197195/Graphite.html?id=GT-C

145 PCI Carbon Databank report: January 2012

**Manufacture of basic iron, steel and ferro-alloys (NACE 2710)**

Sector and product description

Primary steel production relies on virgin raw materials (iron ore, coal and limestone) (Annex 16, figure 30). In addition to direct fuels, primary steel production use electricity generated from waste gases derived from the raw materials. This production route is also called "BOF"(blast oxygen furnace). Typically, BOF steel does not contain alloy elements. It is mostly used to product so-called flat products (e.g. for the automotive industry).

Secondary steel production rely on old steel (scrap) which is melted in "electric arc furnaces" at mills which tend to be smaller than the large integrated BOF installations[146] (accounting for lower market concentration among EAF producers). Electric arc production uses significantly more electricity than primary steelmaking. It accounts for close to 40% of EU steelmaking. After processing (rolling) mostly 'long' products are used e.g. in the construction industry.

Steel from both production routes – so called semi-finished or crude steel - are either processed at the same site (integrated steel mills) or transported for processing elsewhere.

While semi-finished (or "crude" steel), irrespective of production route, is a largely homogenous production, the number variants of processed (or "rolled") steel (i.e. the end-product) can be counted in thousands of products.

It has been estimated that 14% of electricity used in the BOF route is auto-generated[147]. No auto-generation is involved in the EAF route.

The NACE code 2710 is divided into 64 subsectors at Prodcom level (Annex 11).

These subsectors include ferroalloy and silicon, ferro-manganese, ferro-silico-manganese, ferro-chromium, ferro-molybdenum, ferro-silicon and silicon metal.

The sector's GVA at factor cost in 2007 was € 42.83bn and employment was 401 700 (Annex 14)

Industry and other submissions in support of eligibility

The industry submissions are focussed on electric arc steel production. Carbon leakage is said to exist in particular at the level of semi-finished steel, not the wide variety of final processed (or "rolled") products.

Eligibility should be based on subsector level, by relying on the product boundaries defined in the Commission's 2011 Benchmarking Decision which defines the basis for compensation for direct fuel use and which accepts substitutability between fuel and electricity. The Decision is said to accept the importance of electric arc production by including electricity within the production definition.

146 De Bruyn et al (2010), p 20.

147 McKinsey (2006), see figures 2-8.

Steel is said to be increasingly traded. A number of antidumping procedures are cited as one example of increasing trade in steel. Non-EU competitors are spread across the world (including Brazil, Ukraine, Turkey, Iran, Russia, India, China and the US) (Annex 16, figures 10-11). A considerable excess capacity for steel production is said to exist outside the EU. This spare capacity is said to be twice the size of overall EU production[148].

Non-EU producers are increasingly said to be certifying their products according to international standards. The industry federation claims that relocation and/or production shifts are most likely in favour of North Africa, Turkey and CIS.

The industry is of the view that no further electricity efficiency gains are possible in electric arc production until 2020.

According to the industry steel prices are de facto set globally. Moreover, even if only a very small share of steel production is traded in the form of futures contracts at exchanges such as the London Metal Exchange[149], the steel products traded on that exchange increasingly serve as international benchmarks. Previous findings on the price elasticity of steel compared to other sectors are cited[150]. Transport costs are said to be low compared to the price of semi-finished steel.

In terms of trade the EU is the largest steel importer in the world (Annex 16, figure 10). Japan, China, the EU, Russia and Ukraine (in that order) are the largest exporter. Trade in steel is said to have consistently risen over the recent two decades. Certain submissions deal specifically with ferro-alloys (which make up some of the subsectors in NACE 2710).

Arguments relating to ferro-silicon (a ferro-alloy) similar to those relating to semi-finished steel are adduced. For example, ferro-alloys are said to be commodities; prices are claimed to be set according to international benchmarks; transport costs are said to make up an insignificant part product value; a number of antidumping procedures are said to testify to trade exposure**.**

Elements of assessment

The indirect CO2 costs amount to 3.6% of the sector's GVA (ranking as No 11 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 32.31% (ranking as No 122 in terms of trade intensity) (Annex 8).

Recent findings by the Commission indicate that prices are set internationally[151]. This is not inconsistent with previous Commission decisions in merger cases[152]. The relatively homogenous nature of the products, the fact that they are traded on a large scale internationally as well as the

148 See OECD questionnaire dsti(su)/sc(2011)4 dated April 2011.

149 0.8% of total steel output The product traded on the exchange are in 'billet' form (which tend to produced by the EAF route..

150 Reference is made to the following price elasticities of demand estimated by the International Energy Agency: EAF steel: - 1.56; BOF steel -1.56; aluminium: -0.86 and cement: -0.27.

151 2011 Competitiveness report (forthcoming).

152 See paragraph 65 of the Commission Decision in Case No COMP/M.4137 (Arcelor-Mittal) in which the Commission defined the geographic market for semi-finished steel as at least EEA wide.

correlation between domestic EU and import prices support these conclusions[153]. One study considers that EAF steel is more of a commodity than BOF steel[154].

The EU accounted for 12% of world steel production in 2010. Iron ore accounts for 40% of total costs of steel production. Any increases in the iron ore prices are automatically transferred to steel producers. Steel prices have been found to be directly linked to iron ore prices[155]. There are indications that the EU electric arc sector suffers from lack of availability of the vital input, i.e. scrap steel, partly due to export restrictions. Similar restrictions apply to iron ore[156].

Steel is indeed a heavily traded good; about 40% of worldwide production is being traded. The largest import flows into the EU originate from China and Russia (Annex 16, figure 10)[157]. Imports into the EU have risen over the past decade (Annex 16, figure 11).

One report[158] found that significant abatement of CO2 emissions in the BOF production route would require long-term efforts (at least five years to deliver a concept and five years to confirm technical and economical viability).

The 2011 Benchmarking Decision accepts that there is substitutability between fuel and electricity in respect of steel (Annex 9).

**Copper production (NACE 2744)**

Sector and product description

The NACE 2744 code is divided into 14 subsectors (Annex 11).

Copper ore is extracted from mines. At smelters the ore or copper concentrates (copper content of around 30%) is transformed (refined) via electrolysis (an electro-intensive process) into so-called copper cathodes (primary production route). Copper cathodes contain more than 99% copper. A dozen refineries are operated by six owners in the EU (of which two own copper mines).

Scrap copper may also be used as raw material (secondary production route).

It is in particular cathodes (an intermediate commodity product) which are internationally traded.

All in all around 40 installations producing copper form part of the ETS.

The sector's GVA at factor cost in 2007 was € 3.82bn and employment was 46 300 (Annex 14)

Industry and other submissions in support of eligibility

153 Cambridge Econometrics (2010).

154 According to McKinsey (2006) (p. 25) long products are mostly commodities (competing with concrete) whereas flat products are more often specialties (competing with aluminium).

155 See pp. 146, 167 of the 2011 Competitiveness report.

156 Ibidem, p.169.

157 De Bruyn et al (2010), p 20.

158 McKinsey (2006), p. 23.

Industry submissions argue that EU copper producers are unable to pass on the CO2 component in electricity prices due to the fact that world copper prices are set via trading at commodity exchanges and in particular the London Metal Exchange (LME).

The LME's daily references prices (based on the most liquid trading session) are said to be used as global reference prices. The issue of transport costs do not arise as most copper (and other metal) deliveries are made to LME warehouses. In any case transport costs are low in relation the product value.

The industry claims that no primary copper smelter set up in the last year. Nor has any major refurbishment taken place during this period.

Elements of assessment

The indirect CO2 costs amount to 3.4% of the sector's GVA (ranking as No 13 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 34.59 % (ranking as No 114 in terms of trade intensity) (Annex 8).

Previous Commission decisions in merger cases confirm that the relevant geographic market is global on account of reference prices being set by commodity exchanges, in particular the LME. One decision describes describing the price for copper cathodes set at that exchange as the "world copper price"[159]. Other more recent assessments confirm the findings that EU producers cannot influence prices due to price-setting at the LME. There appears to be strong convergence between LME prices and those of other exchanges (Annex 16, table 24). This is the case even if the price elasticity of demand for copper is considered to be low in the long run (given that copper only has a few substitutes, principally aluminium)[160]. As aluminium is the most electricity intensive sector and is highly traded good it may face similar impacts or stronger cost impacts from the CO2 cost component in electricity prices[161]. Transport costs appear to be less important in this sector given that a significant part of deliveries are made to LME warehouses (Annex 16, figure 37)

Europe – accounting for 14% of world production - is a net importer of copper. Copper metal (cathodes) and concentrates are mainly imported from Chile, accounting for nearly 50% of non-EU imports[162].

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of copper (Annex 9).

**Hollow glass (NACE 2613)**

Sector and product description

159 See the Commission's Decision in Case M4781 of 23 January 2008, paragraphs 15, 25, 27-28.
160 Cambridge Econometrics (2010), p. 21.
161 Cambridge Econometrics (2010), p. 21..
162 De Bruyn et al (2010), p. 26

The terms ”hollow glass” and ”container glass” will be used interchangeably below to denote the NACE 2613 sector.

A fundamental distinction must be made within the NACE 2613 sector between bottles and jars (i.e. beer bottles, wine bottles and containers for food packaging) on the one hand and tableware (i.e. drinking glasses) and flaconnage (i.e. bottles used for perfumes and pharmaceutical products) on the other hand. These products have different physical and market characteristics[163].

In 2007 close to 3 000 container glass companies, employing about 119 400 staff, generated a GVA of €5.4bn.

Industry and other submissions in support of eligibility

According to the industry transport costs vary significantly across different parts of the sector. In a number of the sub-sectors transport costs form an insignificant proportion of the cost/value of the product.

This is particularly true, the industry argues, in relation to flaconnage production. It is acknowledged that the picture is more complex as regards the transport of bottles. For transport by truck, reference is made to survey suggesting that the maximum distance between furnace and final customers was likely to be between 600 and 1 000 km. According to the industry trucking transport costs from Ukraine into the EU were typically in the region of €50-70/tonne and from Russia costs were estimated to be around €100/tonne. This compared with European production costs of around €300/tonne.

Reference is also made to the scope for seaborne transport allowing products to be transported over significantly greater distances.

The container glass industry claims to be in competition with other packaging materials in particular with plastics, aluminium and paper. A level playing field between directly substitutable materials is considered essential to ensure fair competition and prevent market distortions.

Competition with PET, a commodity polymer within NACE 2614, is emphasised by the industry in particular. The industry federation explains that PET bottle manufacturing involves the cracking of ethylene and the production of monoethylene glycol (MEG), the chemical precursor to PET bottle resin. It is claimed that most MEG production takes place outside of the EU in globally competitive markets and therefore is unlikely to see its price rise as a result of phase III of the EU ETS.

The container glass sector claims to use a variety of different technologies. It explains that electricity is used for glass melting through resistive electrical heating and for appliances. Depending on the installation, the share of electricity in energy consumed is said to range from 10% (boosting as an aid to oil/gas burners) to 100% (full electric melting). For that reason it is

[163] As reflected by their different treatment in the 2011 Benchmarking Decision (one benchmark for coloured bottles, one benchmark for colourless bottles and fall-back benchmarks for tableware, flaconnage and extra-white flint).

submitted that more detailed assessments of carbon leakage risks should be carried out at installation level.

The production of container glass is claimed to have increasingly moved out of the EU over recent years. Investments in significant new capacity in India, China, United Arab Emirates are already said to serve the EU market. Import volumes are said to have risen by more than 50% between 2005 and 2009 and the net trade balance between the EU27 and the rest of the world is claimed to have fallen by over 25% over the last five years.

The industry refers to several plant closures over past years. Ten plants with more than 10 000 job losses between 2004 and 2008 have been indentified by the industry federation[164].

Elements of assessment

The indirect CO2 costs amount to 2.6% of the sector's GVA (ranking as No 17 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 24.32% (ranking as No 150 in terms of trade intensity) (Annex 8).

One study finds that transport costs limits export ability for the glass sectors, in particular for hollow glass[165].

A 2009 study submitted by a consultancy acting on behalf of the European trade body[166] suggested that the price elasticity of demand in the sector as a whole was -0.54. That study makes a comparison with another study[167] which found the following elasticities: -0.27 in the cement sector, -0.5 in the newsprint sector, -0.62 in the steel sector and -0.8 in the aluminium sector. Reference is made to section 4.9.2.2 in the main report; see also Annex 16, tables 20 and 25 on so-called Armington elasticities.

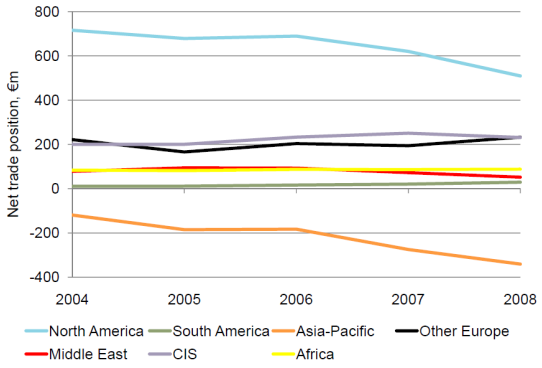
For bottle and jars, there are indications that new production capacity is being added in partiuclar outside the EU's south eastern and eastern borders[168.]

Eurostat figures show a net decline the EU trade position of the container glass industry (NACE 2613) (i.e. bottles, jars, tableware and flaconnage)[169].

164 FEVE.
165 Ecofys (2009), p. 28.
166 Most of the elements derive from a study by Vivid Economics from 2009 commissined by the European trade body FEVE.
167 Smale et al (2006).
168 2009 study by Vivid Economics.
169 Eurostat (Comext).

For the sector as whole, the deterioration in the trade balance is largely a result of changes in trade patterns between Europe and North America and the Asia-Pacific

Figure 4 **Despite falls, the EU27 has a positive trade balance with every region apart from Asia-Pacific**




Source: Vivid Economics and Comext data

17

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of hollow glass (Annex 9).

**Manufacture of stainless steel pipes (NACE 2722)**

Industry and other submissions in support of eligibility

The industry submits that the historical separation between the basic steel products and steel pipe is unique (and is not replicated in the aluminium and copper sectors).

The industry submission is focused on seamless pipe mills, a subsector within NACE 2722 said to be particularly electro-intensive. Another large segment is said to be the small welded pipes market.

While the small welded tubes industry is still said to be mainly oriented towards the local market, the seamless and large-welded pipes industry is globally oriented.

Industry stakeholders contend that steel pipe capacity is increasing in China and elsewhere.

The steel pipe industry reiterates that not integrating the steel pipe sector into the steel basic sector eligible for indirect compensation would cause several serious distortions of competition in particularly towards:

Steel pipes are claimed to be in competition with other steel products for the same applications like beams and open profiles in the construction, and like bars and flat products in automotive and engineering sectors. All these steel products said to be in direct competition are downstream products of the steel industry made out from the same intermediate materials (steel billet or coils) but, unlike steel pipes, they are all included in the basic steel sector (NACE 2710). This would, it is argued, damage steel pipes which would lose market share dramatically.

The industry claims that pipes made out of aluminium are competing with steel pipes in sectors such as furniture. Copper pipes are said to be an alternative to steel pipes for water distribution

lines in buildings and in general for fluids conveyance. Severe distortions of competition for the steel pipe manufacturing would allegedly arise.

In support of the claim that indirect CO2 cost increases cannot be passed on, reference is made to the evolution of the EU manufacturing market share for exports to third countries. This is said to show a decrease from around 23% in 2005 to around 15% in 2011 to the benefit of China (which is claimed to produce more than one steel pipe out of two in the world compared with one out of three in 2006). Japan, CIS and North and Latin America are, besides the EU, said to be the other main producers of steel pipes.

The industry asserts that the basic material to produce seamless pipes is a steel billet which represents more than 50% of the cost. Steel billets are produced by electric arc furnace (EAF) plants which are high electricity intensive (see section on NACE 2710 above).

The Prodcom codes of billets for pipes are covered by the numbers 27102121, 27102221 and 27102321; however, only part of those product are said to come from EAF plants.

The steel pipe sector considers it imperative, as far as the criteria of eligibility for compensation are concerned, not to rely on code numbers but on a specific industry definition. It is claimed that the two specific fuel and electricity benchmarks for EAF plants (see section on NACE 2710 above) will ease the definition and collection of data in view of the possible inclusion of that sub sector in the scheme.

Elements of assessment

The indirect CO2 costs amount to 0.7% of the sector's GVA (not allowing for a ranking in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 45.17% (ranking as No 77 in terms of trade intensity) (Annex 8).

It appears that the NACE 2722 was not included in the basic steel code (NACE 2710) due to the coverage of the (now expired) European Coal and Steel Treaty (which excluded steel pipes)[170].

The specific segment of the NACE 2722 concerned by the eligibility claims comprises the following subsectors at Prodcom level: 27221010, 27221021, 27221023, 27221041, 27221043, 27221045 and 27221050.

The 2011 Benchmarking Decision does establish substitutability between fuel and electricity in respect electric arc steel out of which (at least in part) steel pipes are produced (Annex 10).

**Other non-ferrous metals (NACE 2745)**

Sector and product description

[170] See Treaty establishing the European Coal and Steel Community (1951), Annex 1, footnote (observation) 5.

The nickel industry is the largest sub-sector in NACE 2745 (other non-ferrous metals), which also include chromium and manganese. Figures for 2010 show that nickel and so-called nickel semi-products represented around half of the entire NACE code (54 % by volume and 50% by value).

Raw nickel-containing ore is not normally transported. Processed ore ("primary nickel") is transported, as "secondary nickel" (produced from scrap). The main application of secondary nickel is stainless steel (around 60-65%).

The sector's employment in 2007 was 18 000 (Annex 14).

The nickel-related value chain is estimated to be in excess of €80-100bn in value-added terms representing 1.2 million jobs, of which around €50 billion (0.7 million jobs) is estimated to be dependent on nickel[171.]

In the EU and EEA, nickel metal production is carried out in Finland, the UK, France (including in New Caledonia), Greece and Norway. Their main competitors are Norilsk Nickel (Russia), Jinchuan (China) and Vale (Canada).

Industry and other submissions in support of eligibility

Nickel production is said to be the most energy-intensity metal within NACE 2745. It is claimed to be more energy-intensive than aluminium production.[172]

While the nickel industry is small both in the EU and globally, it is claimed that it forms a significant link in the value chain due to the critical importance of – inter alia - nickel-containing alloys, nickel in plating and nickel containing products used in transport (autos, trains, aerospace and jet engines), engineering, electronics, construction and medical devices. The nickel value chain is said to significantly contribute to the attractiveness of the EU as a location for complex, high value-added manufacturing, because of the local presence of clusters of suppliers of specialist nickel products, including extensive feedback loops with EU-based nickel refiners.

The industry argues that increased Chinese production is squeezing EU suppliers both through increased input prices and through increased product market competition.

It claims that while the nickel subsector is small is critical importance for sectors producing nickel-containing alloys.

Elements of assessment

The indirect CO2 costs amount to 2% of the sector's GVA (ranking as No 25 in terms of indirect CO2 costs) (Annex 8).

The trade intensity amounts to 73.81% (ranking as No 22 in terms of trade intensity) (Annex 8).

171 Weinberg Report on the Socio-Economic Assessment of the EU Nickel Value Chain, published 2009. Available upon request at the Nickel Institute.

172 On average 237 gigajoules are needed per tonne of nickel metal output compared with 100 gj/t for aluminium. 2000 Nickel Life Cycle Data (published on www.nickelinstitute.org)

Global nickel prices are set and referenced through the London Metals Exchange (LME), the Shanghai Metals Exchange and the Chicago Exchange[173].

According to a decision by the Commission in the merger area transport costs make up less than 0.5% of the average nickel price quoted on the London Metal Exchange (LME)[174]. That decision found that most nickel is a commodity traded on a global basis.
While the share of EU in world primary nickel production in recent years has been around 7-9% and its share of world production in the 22%-31% range[175], Chinese nickel capacity is planned to rise from an estimated 455 kt in 2011 to some 750-1100 kt by 2015[176].

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of the NACE 2745 sector (Annex 9).

**Casting of iron, steel and light metals (NACE 2751, NACE 2752 and NACE 2753)**

Sector and production description

Foundries melt ferrous and non-ferrous metals and alloys and reshape them into products or at least near their finished shape through pouring and solidication of the moltenmetal or alloy into a mold. The essence of the process of making iron and steel castings consists of pouring motlen iron, steel or steel alloys into a mould.

Casting products are used by in particular the automotive sector but also for power station constructions.

The three casting subsectors comprise around 5 000 enterprises and employ around 240 000 staff in the EU. Their combined value added in 2007 was €11bn. 80% of these foundries are SMEs. Around of Europe's foundries have electrical melting devices. According to figures for 2007 the GVA was €11bn.

The EU is the second largest producers of castings after China.

Industry and other submissions in support of eligibility

The eligibility claim is essentially based on the fact that casting was deemed eligible (as one of five sectors) under the qualitative assessment in the 2010 Carbon Leakage Decision.

Given the lack of EU level data, trade intensity data and other sources for a number of Member States were relied upon. For example, for Germany a trade intensity (based on 2007 figures) of no less than 10% is considered plausible. Data for Italy for 2005-2007 provides a range of 14.3%-17.4%[177].

Elements of assessment

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173 Ecorys/ Cambridge Econometrics, "Competitiveness of the EU Non-ferrous Metals Industries" 2011

174 Paragraphs 27-28 of The Commission Decision of 6 February 2007 in Case No COMP/M.4476 - NORILSK NICKEL / OMG NICKEL.

175 2006-2011 estimate INSG figures- a drop occurred in 2009 as a consequence of economic crisis. Recovery is slowly ongoing.

176 Presentation Xu Aidong, Beijing Antaike Information Development Co. Ltd 2011.

177 http://www.coeweb.istat.it/default2.htm

The indirect CO2 cost of casting of iron amount to 3.6% of the sector's GVA . The indirect CO2 costs of casting of steel amount to 1.4% of the sector's GVA . The indirect CO2 costs of casting of light metals amount to 1.1% of the sector's GVA.

Trade intensity of the casting sector can not be specified at EU level (due to the fact that Eurostat does not report any trade data for NACE 27.5X category, no statistical data on trade for the European foundry industry are available for recent years). The industry provided national data on trade intensity (see section on industry submissions above). Nevertheless, one study[178] finds that the trade intensity for casting of steel to be around 10%. The national data submitted does not show that the trade intensity for any of the three casting sectors would exceed 25%.

In view of lack of quantitative data (in particular trade intensity data), casting was one of the five sectors deemed eligible under the qualitative assessment of the 2010 Carbon Leakage Decision.

One study[179] notes that steel casting is a distinct production process from the manufacture of steel characterised by a high degree of vertical integration. As a result, it finds it difficult to isolate the CO2 cost impact on the casting sector. It finds that the CO2 abatement potential limited that the production process mainly involves pouring molten steel into casts.

It also finds that the capacity increase in the EU is exceeded greatly by capacity increases in China. Between the years 1993-2004, ferrous foundries in Europe increased production by around 25% from 11 million to 13.5 million tonnes. During this same time period China increased its capacity by 73% from 12 to 30 million tonnes; maintaining its dominant market position.

The 2011 Benchmarking Decision does not establish substitutability between fuel and electricity in respect of the three casting sectors (Annex 9).

178 Cambridge econometrics (2010).

179 Cambridge econometrics (2010).

# ANNEX 11

## List of subsectors

| PRODCOM | Description |
|---|---|
| **NACE 13.10 : Mining of iron ores**<br>Number of subsectors: 2 | |
| | |
| 13101030 | Non-agglomerated iron ores and concentrates (excluding roasted iron pyrites) |
| 13101050 | Agglomerated iron ores and concentrates (excluding roasted iron pyrites) |
| **NACE 14.40 : Production of salt**<br>Number of subsectors: 6 | |
| | |
| 14401000 | Salt (sodium chloride); rock salt; sea salt; salt from brine; salt in brine (including table salt and denatured salt) |
| 14401001 | Rock salt (dry mined) |
| 14401003 | Sea salt (by solar evaporation) |
| 14401005 | Vacuum salt (solution mined) |
| 14401007 | Salt in brine (solution mined) |
| 14401009 | Others |
| **NACE 15.62 : Manufacture of starches and starch products**<br>Number of subsectors: 17 | |
| | |
| 15621030 | Crude maize (corn) oil and its fractions (excluding chemically modified) |
| 15621050 | Refined maize (corn) oil and its fractions (excluding chemically modified) |
| 15622110 | Glucose and glucose syrup (excluding with added flavouring or colouring matter) |
| 15622120 | Chemically pure fructose in solid form; fructose and fructose syrup, containing in the dry state > 50 % of fructose; isoglucose excluding with added flavouring or colouring matter |
| 15622130 | Maltodextrine and maltodextine syrup (excluding with added flavouring or colouring matter) |
| 15622140 | Caramel, on a sugar base |
| 15622150 | Caramel, on a starch base |
| 15622190 | Chemically pure maltose; artificial honey |
| 15622211 | Wheat starch |
| 15622213 | Maize (corn) starch |
| 15622215 | Potato starch |
| 15622219 | Starches (including rice, manioc, arrowroot and sago palm pith) (excluding wheat, maize (corn) and potato) |
| 15622230 | Inulin |
| 15622250 | Wheat gluten (excluding wheat gluten prepared for use as a glue or as a glazing or dressing for the textile industry) |
| 15622270 | Dextrins and other modified starches (including ester/etherified, |

| | |
|---|---|
| | soluble starch, pregelatinised/swelling starch, dialdehyde starch, starch treated with formaldehyde/epichlorohydrin) |
| 15622300 | Tapioca and substitutes therefor prepared from starch; in the form of flakes; grains; pearls; siftings or similar forms |
| 15623000 | Residues of starch manufacture and similar residues |

| **NACE 21.11 : Manufacture of pulp** | |
|---|---|
| Number of subsectors: 16 | |
| | |
| 21111100 | Chemical wood pulp, dissolving grades |
| 21111213 | Unbleached coniferous chemical wood pulp, soda or sulphate (excluding dissolving grades) |
| 21111215 | Semi-bleached or bleached coniferous chemical wood pulp, soda or sulphate (excluding dissolving grades) |
| 21111253 | Unbleached non-coniferous chemical wood pulp, soda or sulphate (excluding dissolving grades) |
| 21111255 | Semi-bleached or bleached non-coniferous chemical wood pulp, soda or sulphate (excluding dissolving grades) |
| 21111313 | Unbleached coniferous chemical wood pulp, sulphite (excluding dissolving grades) |
| 21111315 | Semi-bleached or bleached coniferous chemical wood pulp, sulphite (excluding dissolving grades) |
| 21111353 | Unbleached non-coniferous chemical wood pulp, sulphite (excluding dissolving grades) |
| 21111355 | Semi-bleached or bleached non-coniferous chemical wood pulp, sulphite (excluding dissolving grades) |
| 21111415 | Thermo-mechanical wood pulp |
| 21111419 | Mechanical wood pulp (excluding thermo-mechanical wood pulp) |
| 21111430 | Semi-chemical wood pulp |
| 21111433 | Chemi-thermo mechanical wood pulp (CTMP) |
| 21111435 | Other chemi-mechanical wood pulp (TCMP, CRMP) |
| 21111439 | Other semi-chemical wood pulp |
| 21111450 | Pulp of other fibrous cellulosic material |

| **NACE 21.12 : Manufacture of paper and paperboard** | |
|---|---|
| Number of subsectors: 59 | |
| | |
| 21121150 | Newsprint in rolls or sheets |
| 21121200 | Hand-made paper and paperboard in rolls or sheets (excluding newsprint) |
| 21121310 | Uncoated paper and paperboard in rolls or sheets; used as a base for photo-sensitive; heat-sensitive or electro-sensitive paper or paperboard |
| 21121355 | Uncoated wallpaper base; in rolls or sheets containing <= 10% by weight of fibres obtained by a mechanical process |
| 21121359 | Uncoated wallpaper base; in rolls or sheets containing > 10% by weight of fibres obtained by a mechanical process |
| 21121410 | Graphic paper, paperboard : mechanical fibres <= 10%, weight < 40 g/m2 |
| 21121435 | Graphic paper, paperboard : mechanical fibres <= 10%, weight >= 40 g/m2 but <= 150 g/m2, in rolls |
| 21121439 | Graphic paper, paperboard : mechanical fibres <= 10%, weight >= 40 g/m2 but <= 150 g/m2, sheets |
| 21121450 | Graphic paper, paperboard : mechanical fibres <= 10%, weight > 150 g/m2 |
| 21121470 | Graphic paper, paperboard : mechanical fibres > 10% |
| 21122130 | Cellulose wadding for household or sanitary purposes, in rolls of a width > 36 cm or in rectangular (including square sheets) with at least one side > 36 cm in an unfolded state |
| 21122155 | Creped paper and webs of cellulose fibres for household/ sanitary purposes, in rolls, width > 36 cm, rectangular sheets min. one side > 36cm in unfolded state, weight <= 25 g/m2/ply |
| | |

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|---|---|
| 21122157 | Creped paper and webs of cellulose fibres for household/sanitary purposes, in rolls, width > 36 cm, rectangular sheets min. one side > 36 cm in unfolded state, weight > 25 g/m2/ply |
| 21122190 | Paper stock for household : others |
| 21122250 | Uncoated, unbleached kraftliner in rolls or sheets (excluding for writing, printing or other graphic purposes, punch card stock and punch card tape paper) |
| 21122290 | Uncoated kraftliner in rolls or sheets (excluding unbleached, for writing; printing or other graphic purposes, punch card stock and punch card tape paper |
| 21122315 | Uncoated, unbleached sack kraft paper (excluding for writing, printing or other graphic purposes, punch card stock and punch card tape paper) |
| 21122319 | Uncoated sack kraft paper (excluding unbleached, for writing, printing or other graphic purposes, punch card stock and punch card tape paper) |
| 21122333 | Uncoated kraft paper and paperboard weighing <= 150 g/m2 (excluding kraftliner, sack kraft paper, for writing, printing and other graphic purposes, etc) |
| 21122335 | Uncoated kraft paper/paperboard weighing between 150-225g/m2 (excluding kraftliner, sack kraft paper, for writing, printing or other graphic purposes, punch card stock and tape paper |
| 21122337 | Uncoated kraft paper and paperboard weighing > 225 g/m2 excluding kraftliner, sack kraft paper - for writing, printing and other graphic purposes, punch card stock, punch card tape paper |
| 21122350 | Creped or crinkled sack kraft paper; creped or crinkled; in rolls or sheets |
| 21122400 | Uncoated fluting paper; in rolls or sheets |
| 21122520 | Uncoated testliner (recycled liner board), weight <= 150 g/m2, in rolls or sheets |
| 21122540 | Uncoated testliner (recycled liner board), weight > 150 g/m2, in rolls or sheets |
| 21123010 | Sulphite wrapping paper in rolls or sheets |
| 21123020 | Cigarette paper (excluding in the form of booklets or tubes), in rolls > 5 cm wide |
| 21123030 | Uncoated filter paper and paperboard in rolls or sheets |
| 21123040 | Uncoated felt paper and paperboard in rolls or sheets |
| 21123061 | Other uncoated paper and paperboard, in rolls or sheets, weight <= 150 g/m2 (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard) |
| 21123065 | Other uncoated paper and paperboard, in rolls or sheets, weight > 150 g/m2 and < 225 g/m2 (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard) |
| 21123069 | Other uncoated paper and paperboard, in rolls or sheets, weight >= 225 g/m2 (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard) |
| 21124010 | Vegetable parchment in rolls or sheets |
| 21124030 | Greaseproof papers in rolls or sheets |
| 21124050 | Tracing papers in rolls or sheets |
| 21124070 | Glassine and other glazed transparent or translucent papers in rolls or sheets |
| 21125100 | Composite paper and paperboard in rolls or sheets (including strawpaper and paperboard) (excluding surface coated or impregnated) |
| 21125230 | Creped or crinkled kraft paper in rolls or sheets (excluding sack kraft paper) |
| 21125250 | Embossed or perforated paper and paperboard in rolls or sheets (excluding perforated paper and paperboard cards for Jacquard or similar machines; paper lace; music cards; etc) |
| 21125335 | Coated base for paper..., for photo-, heat-, electro-sensitive paper, weight <= 150 g/m2, m.f. <= 10% |
| 21125337 | Coated paper, for writing, printing, graphic purposes (excluding coated base, weight <= 150 g/m2) |
| | |

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|---|---|
| 21125360 | Light-weight coated paper for writing, printing, graphic purposes, m.f. > 10% |

| | |
|---|---|
| 21125375 | Other coated mech. graphic paper for writing, printing, graphic purposes, m.f. > 10%, rolls |
| 21125379 | Other coated mech. graphic paper for writing, printing, graphic purposes, m.f. > 10%, sheets |
| 21125430 | Other coated kraft paper, other than for writing, printing or graphic purposes |
| 21125453 | Multi-ply paper and paperboard, coated, of which each layer in bleached |
| 21125455 | Multi-ply paper and paperboard, coated, with 1 bleached outer layer |
| 21125459 | Multi-ply paper and paperboard, coated, others |
| 21125470 | Paper/paperboard in rolls or sheets, coated on one/both sides with kaolin or other inorganic substances excluding of a kind used for any graphic purposes, multi-ply paper/paperboard |
| 21125530 | Carbon or similar copying paper in rolls of a width > 36 cm or in rectangular ((including square) sheets with at least one side > 36 cm in an unfolded state) |
| 21125550 | Self-copy paper in rolls of a width > 36 cm or in rectangular (including square) sheets with one side > 36 cm and the other > 15 cm in the unfolded state |
| 21125590 | Copying or transfer paper in rolls of a width>36cm or in rectangular sheets with min. one side>36cm in unfolded state excluding carbon or similar copying paper, self-copy paper |
| 21125610 | Tarred, bituminized or asphalted paper and paperboard in rolls or sheets |
| 21125633 | Self-adhesive paper and paperboard in rolls or sheets |
| 21125635 | Gummed paper and paperboard in rolls or sheets (excluding self-adhesives) |
| 21125655 | Bleached paper and paperboard in rolls or sheets, coated, impregnated or covered with plastics weighing > 150 g/m2 (excluding adhesives) |
| 21125659 | Paper and paperboard in rolls or sheets, coated, impregnated or covered with plastics (excluding adhesives, bleached and weighing > 150 g/m2) |
| 21125670 | Paper and paperboard in rolls or sheets, coated, impregnated or covered with wax, paraffin wax, stearin, oil or glycerol |
| 21125700 | Other paper, paperboard, coated..., n.e.c. |

| **NACE 24.11 : Manufacture of industrial gases**<br>Number of subsectors: 10 | |
|---|---|
| | |
| 24111120 | Argon |
| 24111130 | Rare gases (excluding argon) |
| 24111150 | Hydrogen |
| 24111160 | Nitrogen |
| 24111170 | Oxygen |
| 24111230 | Carbon dioxide |
| 24111250 | Sulphur trioxide (sulphuric anhydride); diarsenic trioxide |
| 24111270 | Nitrogen oxides |
| 24111290 | Inorganic oxygen compounds of non metals (excluding sulphur trioxide (sulphuric anhydride); diarsenic trioxide, nitrogen oxides, silicon dioxide, sulphur dioxide, carbon dioxide) |
| 24111300 | Liquid air; compressed air |

| **NACE 24.14 : Manufacture of other organic basic chemicals**<br>Number of subsectors: 196 | |
|---|---|
| | |
| 24141120 | Saturated acyclic hydrocarbons |
| 24141130 | Unsaturated acyclic hydrocarbons; ethylene |
| 24141140 | Unsaturated acyclic hydrocarbons; propene (propylene) |
| 24141150 | Unsaturated acyclic hydrocarbons; butene (butylene) and isomers thereof |
| 24141165 | Unsaturated acyclic hydrocarbons; buta-1.3-diene |
| 24141167 | Unsaturated acyclic hydrocarbons; Isoprene |
| 24141190 | Unsaturated acyclic hydrocarbons (excluding ethylene, propene, butene, buta-1.3-diene and isoprene) |
| 24141213 | Cyclohexane |
| 24141215 | Cyclanes; cyclenes and cycloterpenes (excluding cyclohexane) |

| | |
|---|---|
| 24141223 | Benzene |
| 24141225 | Toluene |
| 24141243 | o-Xylene |
| 24141245 | p-Xylene |
| 24141247 | m-Xylene and mixed xylene isomers |
| 24141250 | Styrene |
| 24141260 | Ethylbenzene |
| 24141270 | Cumene |
| 24141280 | Naphthalene and anthracene |
| 24141290 | Biphenyl, terphenyls, vinyltoluenes, cyclic hydrocarbons excluding cyclanes, cyclenes, cycloterpenes, benzene, toluene, xylenes, styrene, ethylbenzene, cumene, naphthalene, anthracene |
| 24141313 | Chloromethane (methyl chloride) and chloroethane (ethyl chloride) |
| 24141315 | Dichloromethane (methylene chloride) |
| 24141323 | Chloroform (trichloromethane) |
| 24141325 | Carbon tetrachloride |
| 24141353 | 1.2-Dichloroethane (ethylene dichloride) |
| 24141357 | Saturated chlorinated derivatives of acyclic hydrocarbons, n.e.c. |
| 24141371 | Vinyl chloride (chloroethylene) |
| 24141373 | Trichloroethylene |
| 24141375 | Tetrachloroethylene (perchloroethylene) |
| 24141379 | Unsaturated chlorinated derivatives of acyclic hydrocarbons (excluding vinyl chloride, trichloroethylene, tetrachloroethylene) |
| 24141450 | Derivatives of hydrocarbon containing only sulpho groups; their salts and ethyl esters |
| 24141470 | Derivatives of hydrocarbon containing only nitro or only nitroso groups |
| 24141490 | Derivatives of hydrocarbon (excluding those containing only sulpho groups; their salts and ethyl esters, those containing only nitro or only nitroso groups) |
| 24141510 | Fluorinated; brominated or iodinated derivatives of acyclic hydrocarbons |
| 24141530 | Halogenated derivatives of acyclic hydrocarbons containing >= 2 different halogens |
| 24141553 | 1, 2, 3, 4, 5, 6-Hexachlorocyclohexane |
| 24141559 | Halogenated derivatives of cyclanic; cyclenic or cycloterpenic hydrocarbons (excluding 1, 2, 3, 4, 5, 6-Hexachlorocyclohexane) |
| 24141573 | Chlorobenzene; o-dichlorobenzene and p-dichlorobenzene |
| 24141575 | Hexachlorobenzene and DDT (1,1,1-trichloro-2; 2-bis(p-chlorophenyl)ethane) |
| 24141579 | Halogenated derivatives of aromatic hydrocarbons excluding chloro-, o-dichloro-, p-dichloro-, hexachlorobenzene, DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) |
| 24142100 | Industrial fatty alcohols |
| 24142210 | Methanol (methyl alcohol) |
| 24142220 | Propan-1-ol (propyl alcohol) and propan-2-ol (isopropyl alcohol) |
| 24142230 | Butan-1-ol (n-butyl alcohol) |
| 24142240 | Butanols (excluding butan-1-ol (n-butyl alcohol)) |
| 24142263 | Octanol (octyl alcohol) and isomers thereof |
| 24142265 | Lauryl alcohol; cetyl alcohol; stearyl alcohol and other saturated monohydric alcohols (excluding methyl, propyl and isopropyl, n-butyl, other butanols, octyl) |
| 24142273 | Acyclic terpene alcohols |
| 24142275 | Allyl alcohol and other unsaturated monohydric alcohols (excluding acyclic terpene alcohols) |
| 24142310 | Ethylene glycol (ethanediol) |
| 24142320 | Propylene glycol (propane-1.2-diol) |
| 24142333 | D-glucitol (sorbitol) |
| 24142339 | Diols and polyhydric alcohols (excluding ethylene glycol and propylene glycol, D-glucitol) |
| 24142350 | Halogenated, sulphonated, nitrated or nitrosated derivatives of acyclic alcohols |
| 24142373 | Cyclanic, cyclenic or cycloterpenic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives |
| 24142375 | Aromatic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives |
| 24142415 | Phenol (hydroxybenzene) and its salts |

| | |
|---|---|
| 24142417 | Cresols and their salts |
| 24142419 | Monophenols and their salts (excluding phenol and its salts, cresols and its salts) |
| 24142433 | 4,4-Isopropylidenediphenol (bisphenol A; diphenylolpropane) and its salts |
| 24142439 | Polyphenols (including salts; excluding 4,4 isopropylidenediphenol) and phenol-alcohols |
| 24142453 | Phenol or phenol-alcohol derivatives containing only halogen substituents and their salts |
| 24142455 | Phenol or phenol-alcohol derivatives containing only sulpho groups; their salts and esters |
| 24142459 | Phenols or phenol-alcohol derivatives (excluding those containing only halogen substituents and their salts, those containing sulpho groups their salts and esters) |
| 24143120 | Industrial stearic acid |
| 24143130 | Industrial oleic acid |
| 24143150 | Industrial tall oil fatty acids |
| 24143195 | Industrial monocarboxylic fatty acids distilled (excluding stearic, oleic tall oil) |
| 24143197 | Industrial monocarboxylic fatty acids (excluding stearic, oleic, tall oil, distilled) |
| 24143215 | Ethyl acetate |
| 24143217 | Vinyl acetate |
| 24143219 | Esters of acetic acid (excluding ethyl acetate, vinyl acetate) |
| 24143220 | Mono-, di- or tri-chloroacetic acids; propionic, butanoic and pentanoic acids; their salts and esters |
| 24143235 | Palmitic acid |
| 24143237 | Salts and esters of palmitic acid |
| 24143243 | Salts of stearic acid |
| 24143245 | Stearic acid |
| 24143247 | Esters of stearic acid |
| 24143253 | Formic acid |
| 24143255 | Salts and esters of formic acid |
| 24143271 | Acetic acid |
| 24143277 | Acetic anhydride |
| 24143278 | Salts of acetic acid |
| 24143280 | Lauric acid and others; salts and esters |
| 24143310 | Acrylic acid and its salts and other monocarboxylic acid |
| 24143320 | Esters of acrylic acid |
| 24143330 | Methacrylic acid and its salts |
| 24143340 | Esters of methacrylic acid |
| 24143350 | Oleic, linoleic or linolenic acids; their salts and esters |
| 24143363 | Benzoic acid; its salts and esters |
| 24143365 | Benzoyl peroxide and benzoyl chloride |
| 24143367 | Phenylacetic acid; its salts and esters |
| 24143370 | Aromatic monocarboxylic acids, (anhydrides), halides, peroxides, peroxyacids, derivatives excluding benzoic acid, phenylacetic acids their salts/esters, benzoyl peroxide, benzoyl chloride |
| 24143383 | Oxalic, azelaic, maleic, other, cyclanic, cylenic acids, salts |
| 24143385 | Adipic acid; its salts and esters |
| 24143387 | Maleic anhydride |
| 24143413 | Dibutyl orthophthalates |
| 24143415 | Dioctyl orthophthalates |
| 24143423 | Dinonyl or didecyl orthophthalates |
| 24143425 | Esters of orthophthalic acid (excluding dibutyl orthophthalates, dioctyl orthophthalates, dinonyl and didecyl orthophthalates) |
| 24143433 | Phthalic anhydride |
| 24143435 | Terephthalic acid and its salts |
| 24143443 | Dimethyl terephthalate |
| 24143445 | Aromatic polycarboxylic acids, their anhydrids, their derivatives, n.e.c. |
| 24143473 | Citric acid and its salts and esters |
| 24143475 | Carboxilic acid with alcohol, phenol, aldehyde or ketone functions |

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| 24144113 | Methylamine; di- or trimethylamine and their salts |
| 24144115 | Diethylamine and its salts |
| 24144117 | Acylic monoamines and their derivatives; and salts thereof (excluding methylamine; di- or trimethylamine, diethylamine) |
| 24144123 | Ethylenediamine and its salts |
| 24144125 | Hexamethylenediamine and its salts |
| 24144127 | Acyclic polyamines their derivatives; and salts thereof (excluding ethylenediamine and its salts, hexamethylenediamine and its salts) |
| 24144130 | Cyclanic, cyclenic or cycloterpenic mono- or polyamines, and their derivatives; salts thereof |
| 24144151 | Aniline and its salts (excluding derivatives) |
| 24144153 | Aniline derivatives and their salts |
| 24144155 | Toluidines and their derivatives; and salts thereof |
| 24144157 | Aromatic monoamines and their derivatives and salts (excluding aniline, toluidines) |
| 24144170 | Aromatic polyamines and their derivatives; salts thereof |
| 24144233 | Monoethanolamine and its salts |
| 24144235 | Diethanolamine and its salts |
| 24144237 | Triethanolamine and its salts |
| 24144239 | Amino-alcohols, their ethers and esters with only 1 oxygen function and their salts excluding monoethanolamine and its salts, diethanolamine and its salts, triethanolamine and its salts |
| 24144290 | Oxygen-function amino-compounds (excluding amino-alcohols, their esters and ethers and salts thereof, lysine and its salts and esters, glutamic acid its salts and esters) |
| 24144310 | Ureines and their derivatives; salts thereof |
| 24144320 | Saccharin and its salts |
| 24144330 | Imides and their derivatives, and salts thereof (excluding saccharin and its salts) |
| 24144340 | Imines and their derivatives; and salts thereof |
| 24144350 | Acrylonitrile |
| 24144360 | 1-Cyanoguanidine (dicyandiamide) |
| 24144370 | Nitrile-function compounds (excluding acrylonitrile, 1-cyanoguanidine (dicyandiamide)) |
| 24144420 | Diazo-, azo- or azoxy-compounds |
| 24144430 | Organic derivatives of hydrazine or of hydroxylamine |
| 24144450 | Isocyanates |
| 24144490 | Compounds with other nitrogen function (excluding isocyanates) |
| 24145135 | Thiocarbamates; dithiocarbamates; thiuram mono-, di- or tetrasulphides |
| 24145137 | Methionine |
| 24145139 | Organo-sulphur compounds (excluding thiocarbamates, dithiocarbamates, thiuram mono-, di- or tetrasulphides, methionine) |
| 24145150 | Organo-inorganic compounds (excluding organo-sulphur compounds) |
| 24145210 | Heterocyclic compounds with oxygen only hetero-atom(s) (including coumarin; methylcoumarins and ethylcoumarins) (excluding other lactones) |
| 24145230 | Heterocyclic compounds with nitrogen only hetero-atom(s); containing an unfused imidazole ring (excluding hydantoin and its derivatives) |
| 24145250 | Compounds with pyridine, (iso)quinoline cycle,... other heterocyclic compounds only with N |
| 24145260 | Melamine |
| 24145270 | 6-Hexanelactam (epsilon-caprolactam) |
| 24145290 | Nucleic acids and other heterocyclic compounds - thiazole, benzothiazole, other cycles |
| 24145350 | Phosphoric esters; and their salts (including lactophosphates; their halogenated; sulphonated; nitrated or nitrosated derivatives) |
| 24145375 | Thiophosphoric esters (phosphorothioates) their salts and halogenated; sulphonated; nitrated or nitrosated derivatives |
| 24145379 | Esters of other inorganic acids of non-metals (excluding of hydrogen halides), etc, n.e.c. |
| 24146111 | Methanal (formaldehyde) |
| 24146113 | Ethanal (acetaldehyde) |
| 24146115 | Butanal (butyraldehyde; normal isomer) |

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| 24146119 | Acyclic aldehydes, without other oxygen function (excluding methanal (formaldehyde), ethanal (acetaldehyde), butanal (butyraldehyde; normal isomer)) |
| 24146120 | Cyclic aldehydes; without other oxygen function |
| 24146130 | Aldehyde-alcohols |
| 24146143 | Vanillin (4-hydroxy-3-methoxybenzaldehyde) |
| 24146145 | Ethylvanillin (3-ethoxy-4-hydroxybenzaldehyde) |
| 24146147 | Aldehyde-ethers,aldehyde-phenols,aldehydes (other oxygen function) excluding vanillin (4-hydroxy-3-methoxybenzaldehyde), ethylvanillin (3-ethoxy-4-hydroxybenzaldehyde) |
| 24146150 | Cyclic polymers of aldehydes |
| 24146160 | Paraformaldehyde |
| 24146170 | Halogenated; sulphonated; nitrated or nitrosated derivatives of aldehydes; (including with other oxygen function, cyclic polymers of aldehydes, paraformaldehyde) |
| 24146211 | Acetone |
| 24146213 | Butanone (methyl ethyl ketone) |
| 24146215 | 4-Methylpentan-2-one (methyl isobutyl ketone) |
| 24146219 | Acyclic ketones; without other oxygen function (excluding acetone, butanone (methyl ethyl ketone), 4-methylpentan-2-one (methyl isobutyl ketone)) |
| 24146231 | Camphor; aromatic ketones without other oxygen function; ketone-alcohols; ketone-aldehydes; ketone-phenols and ketones with other oxygen function |
| 24146233 | Cyclohexanone and methylcyclohexanones |
| 24146235 | Ionones and methylionones |
| 24146239 | Cyclanic, cyclenic or cycloterpenic ketones without oxygen function (excluding camphor, cyclohexanone and methylcyclohexanones, ionones and methylionones) |
| 24146260 | Quinones |
| 24146270 | Halogenated; sulphonated; nitrated or nitrosated derivatives of ketones and quinones |
| 24146313 | Diethyl ether |
| 24146319 | Acyclic ethers and their halogenated, sulphonated, nitrated or nitrosated derivatives (excluding diethyl ether) |
| 24146323 | Cyclanic, cyclenic or cycloterpenic ethers and their halogenated, sulphonated, nitrated or nitrosated derivatives |
| 24146325 | Aromatic ethers and their halogenated, sulphonated, nitrated or nitrosated derivatives |
| 24146333 | 2,2-Oxydiethanol (diethylene glycol; digol) |
| 24146339 | Ether-alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives (excluding 2,2-Oxydiethanol) |
| 24146350 | Ether-phenols; ether-alcohol-phenols and their halogenated, sulphonated, nitrated or nitrosated derivatives |
| 24146360 | Alcohol; ether and ketone peroxides and their halogenated, sulphonated, nitrated or nitrosated derivatives |
| 24146373 | Oxirane (ethylene oxide) |
| 24146375 | Methyloxirane (propylene oxide) |
| 24146379 | Epoxides, epoxyalcohols, -phenols, epoxyethers, with a 3-membered ring and their halogenated, sulphonated, nitrated/nitrosated derivatives excluding oxirane, methyloxirane (propylene oxide) |
| 24146380 | Acetals and hemiacetals and their halogenated; sulphonated; nitrated or nitrosated derivatives |
| 24146430 | Other organic compounds, n.e.c. |
| 24146450 | Rennet and concentrates thereof |
| 24146470 | Enzymes; prepared enzymes (not elsewhere specified or included) (excluding rennet and concentrates) |
| 24147120 | Activated natural mineral products; animal black |
| 24147130 | Tall oil; whether or not refined |
| 24147140 | Gum, wood or sulphate turpentine oils, pine oil and other alike |
| 24147150 | Rosin and resin acids; and derivatives; rosin spirit and oils; run gums |
| 24147170 | Wood tar; wood tar oils; wood creosote; wood naphtha; vegetable pitch; brewers' pitch and similar preparations based on rosin, resin acids or on vegetable pitch |
| 24147200 | Wood charcoal whether or not agglomerated (including shell or nut charcoal) |
| 24147320 | Benzol (benzene) |

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| 24147330 | Toluol (toluene) and xylol (xylenes) |
| 24147340 | Naphthalene and other aromatic hydrocarbon mixtures (excluding benzole, toluole, xylole) |
| 24147350 | Phenols |
| 24147365 | Creosote oils |
| 24147367 | Other oils and oil products, n.e.c. |
| 24147370 | Pitch and pitch coke; obtained from coal tar or from other mineral tars |

| **NACE 24.15 : Manufacture of fertilizers and nitrogen compounds**<br>Number of subsectors: 34 | |
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| | |
| 24151050 | Nitric acid; sulphonitric acids |
| 24151075 | Anhydrous ammonia |
| 24151077 | Ammonia in aqueous solution |
| 24152020 | Ammonium chloride |
| 24152030 | Nitrites |
| 24152050 | Nitrates of potassium |
| 24153013 | Urea containing > 45% by weight of nitrogen on the dry anhydrous product (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153019 | Urea containing <= 45% by weight of nitrogen on the dry anhydrous product (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153023 | Ammonium sulphate (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153029 | Double salts and mixtures of ammonium sulphate and ammonium nitrate (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153030 | Ammonium nitrate (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153043 | Mixtures of ammonium nitrate with calcium carbonate, <= 28% nitrogen by weight |
| 24153045 | Mixtures of ammonium nitrate with calcium carbonate, > 28% nitrogen by weight |
| 24153060 | Double salts and mixtures of calcium nitrate and ammonium nitrate (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153080 | Mixtures of urea and ammonium nitrate in aqueous or ammoniacal solution (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24153095 | Mineral or chemical fertilizers, nitrogenous, n.e.c. |
| 24154035 | Superphosphates (excluding potassic, in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24154090 | Mineral or chemical fertilizers, phosphatic n.e.c. |
| 24155030 | Potassium chloride (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24155050 | Potassium sulphate (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24155090 | Mineral or chemical fertilizers, potassic, n.e.c. |
| 24156000 | Animal or vegetable fertilizers |
| 24157050 | Natural sodium nitrate (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24157070 | Sodium nitrate (excluding natural, in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24158010 | Fertilizers in tablets or similar forms or in packages of a gross weight of <= 10 kg) |
| 24158023 | Fertilizers containing nitrogen, phosphorus and potassium, > 10% nitrogen |
| 24158025 | Fertilizers containing nitrogen, phosphorus and potassium, <= 10% nitrogen |
| 24158030 | Diammonium hydrogenorthophosphate (diammonium phosphate) (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24158040 | Ammonium dihydrogenorthophosphate (monoammonium phosphate) |
| 24158053 | Mineral or chemical fertilizers containing nitrates and phosphates, n.e.c. |
| 24158059 | Mineral or chemical fertilizers with nitrogen and phosphorus, n.e.c. |
| 24158063 | Potassic superphosphates (excluding in tablets or similar forms or in packages of a weight of <= 10 kg) |
| 24158069 | Mineral/chemical fertilizers with both phosphorus and potassium excluding potassic superphosphates (in tablets/similar forms/in packages: weight <=10kg, those with nitrogen |

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| 24158090 | Other fertilizers, n.e.c. |

| **NACE 24.16 : Manufacture of plastics in primary forms**<br>Number of subsectors: 51 | |
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| 24161035 | Linear polyethylene having a specific gravity < 0.94, in primary forms |
| 24161039 | Polyethylene having a specific gravity < 0.94, in primary forms (excluding linear) |
| 24161050 | Polyethylene having a specific gravity of >= 0.94, in primary forms |
| 24161070 | Ethylene-vinyl acetate copolymers, in primary forms |
| 24161090 | Polymers of ethylene, in primary forms (excluding polyethylene, ethylene-vinyl acetate copolymers) |
| 24162035 | Expansible polystyrene, in primary forms |
| 24162039 | Polystyrene, in primary forms (excluding expansible polystyrene) |
| 24162050 | Styrene-acrylonitrile (SAN) copolymers, in primary forms |
| 24162070 | Acrylonitrile-butadiene-styrene (ABS) copolymers, in primary forms |
| 24162090 | Polymers of styrene, in primary forms (excluding polystyrene, styrene-acrylonitrile (SAN) copolymers, acrylonitrile-butadiene-styrene (ABS) copolymers) |
| 24163010 | Polyvinyl chloride, not mixed with any other substances, in primary forms |
| 24163023 | Non-plasticised polyvinyl chloride mixed with any other substance, in primary forms |
| 24163025 | Plasticised polyvinyl chloride mixed with any other substance, in primary forms |
| 24163040 | Vinyl chloride-vinyl acetate copolymers and other vinyl chloride copolymers, in primary forms |
| 24163050 | Vinylidene chloride polymers, in primary forms |
| 24163060 | Polytetrafluoroethylene, in primary forms |
| 24163070 | Fluoro-polymers, in primary forms (excluding polytetrafluoroethylene) |
| 24163090 | Polymers of halogenated olefins, in primary forms, n.e.c. |
| 24164013 | Polyacetals, in primary forms |
| 24164015 | Polyethylene glycols and other polyether alcohols, in primary forms |
| 24164020 | Polyethers, in primary forms (excluding polyacetals, polyether alcohols) |
| 24164030 | Epoxide resins, in primary forms |
| 24164040 | Polycarbonates, in primary forms |
| 24164050 | Alkyd resins, in primary forms |
| 24164062 | Polyethylene terephthalate having a viscosity number of >= 78 ml/g |
| 24164064 | Other polyethylene terephthalate |
| 24164070 | Unsaturated liquid polyesters, in primary forms (excluding polyacetals, polyethers, epoxide resins, polycarbonates, alkyd resins, polyethylene terephthalate) |
| 24164080 | Unsaturated polyesters, in primary forms (excluding liquid polyesters, polyacetals, polyethers, epoxide resins, polycarbonates, alkyd resins, polyethylene terephthalate) |
| 24164090 | Polyesters, in primary forms (excluding polyacetals, polyethers, epoxide resins, polycarbonates, alkyd resins, polyethylene terephthalate, other unsaturated polyesters) |
| 24165130 | Polypropylene, in primary forms |
| 24165150 | Polymers of propylene or of other olefins, in primary forms (excluding polypropylene) |
| 24165230 | Polymers of vinyl acetate, in aqueous dispersion, in primary forms |
| 24165250 | Polymers of vinyl acetate, in primary forms (excluding in aqueous dispersion) |
| 24165270 | Polymers of vinyl esters or other vinyl polymers, in primary forms (excluding vinyl acetate) |
| 24165350 | Polymethyl methacrylate, in primary forms |
| 24165390 | Acrylic polymers, in primary forms (excluding polymethyl methacrylate) |
| 24165450 | Polyamide -6, -11, -12, -6.6, -6.9, -6.10 or -6.12, in primary forms |
| 24165490 | Polyamides, in primary forms (excluding polyamide -6, -11, -12, -6.6, -6.9, -6.10 or -6.12) |
| 24165550 | Urea resins and thiourea resins, in primary forms |
| 24165570 | Melamine resins, in primary forms |
| 24165630 | Amino resins, in primary forms (excluding urea and thiourea resins, melamine resins) |
| 24165650 | Phenolic resins, in primary forms |
| 24165670 | Polyurethanes, in primary forms |
| 24165700 | Silicones, in primary forms |

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| 24165810 | Petroleum resins, coumarone, indene or coumarone-indene resins and polyterpenes, in primary forms |
| 24165820 | Polysulphides, polysulphones polyxylene resins, poly (1.4 diisopropylbenzene), polyvinyl ketones, polyethyleneimines and polyimides, in primary forms |
| 24165830 | Cellulose acetates, in primary forms |
| 24165840 | Cellulose nitrates, in primary forms (including collodions) |
| 24165850 | Cellulose ethers and cellulose and its related derivatives, in primary forms (excluding cellulose acetates, cellulose nitrates) |
| 24165860 | Natural and modified polymers, in primary forms (including alginic acid, hardened proteins, chemical derivatives of natural rubber) |
| 24165870 | Ion-exchangers based on synthetic or natural polymers |

| **NACE 24.17 : Manufacture of synthetic rubber in primary forms** | |
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| Number of subsectors: 2 | |
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| 24701050 | Synthetic latex rubber |
| 24701090 | Synthetic rubber (excluding latex) |

| **NACE 24.70 : Manufacture of man-made fibres** | |
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| Number of subsectors: 18 | |
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| 24701195 | Polypropylene synthetic tow and staple not carded, combed or otherwise processed for spinning |
| 24701197 | Other synthetic tow and staple not carded, combed or otherwise processed for spinning |
| 24701240 | High tenacity synthetic filament yarn |
| 24701313 | Textured yarn of nylon or other polyamides n.p.r.s. (excluding sewing thread) |
| 24701315 | Textured yarn of polyesters n.p.r.s. (excluding sewing thread) |
| 24701323 | Textured yarn of polypropylene n.p.r.s. (excluding sewing thread) |
| 24701325 | Textured yarn n.p.r.s. (excluding sewing thread, of nylon and other polyamides, of polyesters, of polypropylene) |
| 24701330 | Nylon or other polyamides and polyesters not textured filament yarn, n.p.r.s. (excluding sewing thread) |
| 24701350 | Single yarn of polyester, n.p.r.s. (excluding sewing thread, high tenacity, textured, multiple or cabled yarns) |
| 24701370 | Polypropylene not textured filament yarn, n.p.r.s. (excluding sewing thread) |
| 24701390 | Other synthetic not textured filament yarn, n.p.r.s. (excluding sewing thread) |
| 24701400 | Synthetic monofilament >= 67 decitex and of which the cross-sectional dimension <= 1 mm; strip and the like of synthetic textile materials of an apparent width <= 5 mm |
| 24702100 | Artificial tow and staple, not carded, combed or otherwise processed for spinning |
| 24702200 | High tenacity filament yarn of viscose rayon, n.p.r.s. (excluding sewing thread) |
| 24702390 | Artificial filament yarn < 67 decitex, n.p.r.s. (excluding sewing thread) |
| 24702400 | Artificial monofilament of >= 67 decitex and of which the cross-sectional dimension <= 1 mm; strip and the like of artificial textile materials of an apparent width <= 5 mm |
| 24703050 | Waste of synthetic fibres (including noils, yarn waste, garnetted stock) |
| 24703070 | Waste of artificial fibres (including noils, yarn waste, garnetted stock) |

| **NACE 26.13 : Manufacture of hollow glass** |
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| Number of subsectors: 18 |

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| 26131110 | Glass preserving jars, stoppers, lids and other closures (including stoppers and closures of any material presented with the containers for which they are intended) |
| 26131116 | Containers made from tubing of glass (excluding preserving jars) |
| 26131122 | Glass containers of a nominal capacity ≥ 2,5 litres (excluding preserving jars) |
| 26131128 | Bottles of colourless glass of a nominal capacity < 2,5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather, infant's feeding bottles) |
| 26131134 | Bottles of coloured glass of a nominal capacity < 2,5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather, infant's feeding bottles) |
| 26131140 | Glass containers for beverages and foodstuffs of a nominal capacity < 2,5 litres (excluding bottles, flasks |

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| | covered with leather or composition leather, domestic glassware, vacuum flasks and vessels) |
| 26131146 | Glass containers for pharmaceutical products of a nominal capacity < 2,5 litres |
| 26131152 | Glass containers of a nominal capacity < 2,5 litres for the conveyance or packing of goods (excluding for beverages and foodstuffs, for pharmaceutical products, containers made from glass tubing) |
| 26131220 | Drinking glasses (including stemware drinking glasses), other than of glass ceramics, of lead crystal, gathered by hand |
| 26131240 | Drinking glasses (including stemware drinking glasses), other than of glass ceramics, of lead crystal, gathered mechanically |
| 26131260 | Drinking glasses (excluding stemware drinking glasses and products of glass ceramics or lead crystal), of toughened glass |
| 26131280 | Other drinking glasses |
| 26131310 | Table or kitchen glassware of lead crystal gathered by hand (excluding of glass-ceramics, of toughened glass, drinking glasses) |
| 26131330 | Table or kitchen glassware of lead crystal gathered mechanically (excluding of glass ceramics, of toughened glass, drinking glasses) |
| 26131350 | Table/kitchen glassware with linear coefficient of expansion ≤ 5 × 10 - 6/K, temperature range of 0 °C to 300 °C excluding of glass ceramics, lead crystal/toughened glass, drinking glasses |
| 26131360 | Glass-ceramic table, kitchen, toilet, office, indoor decoration or similar purpose glassware |
| 26131390 | Table/kitchen glassware (excluding drinking), toughened glass |
| 26131400 | Glass inners for vacuum flasks or for other vacuum vessels (including unfinished and finished) |

| **NACE 26.51 : Manufacture of cement**<br>Number of subsectors: 8 | |
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| 26511100 | Cement clinker |
| 26511210 | White Portland cement |
| 26511230 | Grey Portland cement (including blended cement) |
| 26511250 | Alumina cement |
| 26511290 | Other hydraulic cements |
| 26521033 | Quicklime |
| 26521035 | Slaked lime |
| 26521050 | Hydraulic lime |

| **NACE 26.82 : Manufacture of other non-metallic mineral products n.e.c.**<br>Number of subsectors: 15 | |
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| 26821150 | Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate; articles of such mixtures or of asbestos (for example, thread, woven fabric, clothing, headgear, footwear, gaskets), whether or not reinforced (excluding Articles of asbestos-cement, of cellulose fibre-cement or the like as well as Friction material and articles thereof) |
| 26821190 | Friction material and articles thereof (for example, sheets, rolls, strips, segments, discs, washers, pads), not mounted, for brakes, for clutches or the like, with a basis of asbestos, of other mineral substances or of cellulose, whether or not combined with textile or other materials |
| 26821253 | Roofing or water-proofing felts based on bitumen (in rolls) |
| 26821259 | Other products based on bitumen (in rolls) |
| 26821290 | Products based on bitumen (excluding in rolls) |
| 26821300 | Bituminous mixtures based on natural and artificial aggregate and bitumen or natural asphalt as a binder |
| 26821400 | Artificial graphite, colloidal, semi-colloidal graphite, and preparations |
| 26821500 | Artificial corundum (excluding mechanical mixtures) |
| 26821610 | Slag wool, rock wool and similar mineral wools and mixtures thereof, in bulk, sheets or rolls |
| 26821620 | Exfoliated vermiculite, expanded clays, foamed slag and similar expanded mineral materials and mixtures thereof |
| 26821630 | Mixtures and articles of heat/sound-insulating materials n.e.c. |

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| 26821650 | Worked mica and articles of mica |
| 26821670 | Non-electrical articles of graphite or other carbon |
| 26821680 | Articles of peat (including sheets, cylinder shells and plant pots) (excluding textile articles of peat fibre) |
| 26821690 | Articles of stone or other mineral substances, n.e.c. |

| **NACE 27.10 : Manufacture of basic iron and steel and of ferro-alloys**<br>Number of subsectors: 64 | |
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| | |
| 27101100 | Pig iron and spiegeleisen in pigs, blocks or other primary forms. Ferrous products obtained by direct reduction of iron ore and other spongy ferrous products |
| 27101250 | Granules and powders, of pig iron, spiegeleisen, iron or steel |
| 27101310 | Slag and dross |
| 27101320 | Ferrous scrap |
| 27102010 | Ferro-manganese |
| 27102020 | Ferro-silicon |
| 27102030 | Ferro-silico-manganese |
| 27102040 | Ferro-chromium |
| 27102050 | Ferro-molybdenum |
| 27102090 | Other ferro alloys n.e.c. |
| 27103110 | Flat semi-finished products (of non-alloy steel) |
| 27103121 | Ingots, other primary forms and long semi-finished products for seamless tubes (of non-alloy steel) |
| 27103122 | Other ingots, primary forms and long semi-finished products including blanks (of non-alloy steel) |
| 271031Z0 | Ingots, other primary forms and long semi-finished products, of non-alloy steel |
| 27103210 | Flat semi-finished products (slabs) (of stainless steel) |
| 27103221 | Ingots, other primary forms and long semi-finished products for seamless tubes (of stainless steel) |
| 27103222 | Other ingots, primary forms and long semi-finished products (of stainless steel) |
| 271032Z0 | Ingots, other primary forms and long semi-finished products, of stainless steel |
| 27103310 | Flat semi-finished products (of alloy steel other than of stainless steel) |
| 27103321 | Ingots, other primary forms and long semi-finished products for seamless tubes (of alloy steel other than of stainless steel) |
| 27103322 | Other ingots, primary forms and long semi-finished products (of alloy steel other than of stainless steel) |
| 271033Z0 | Ingots, other primary forms and long semi-finished products, of alloy steel other than stainless steel |
| 27104111 | Hot rolled flat products in coil for rerolling of a width of 600 mm or more (of stainless steel) |
| 27104112 | Other hot rolled flat products in coil of a width of 600 mm or more (of stainless steel) |
| 27104121 | Hot rolled flat products in coil for rerolling of a width of less than 600 mm (of stainless steel) |
| 27104122 | Other hot rolled flat products in coil of a width of less than 600 mm (of stainless steel) |
| 27104130 | Plates and sheets produced by cutting from hot rolled wide strip of a width of 600 mm or more (of stainless steel) |
| 27104140 | Plates and sheets produced on a reversing mill (quarto) of a width of 600 mm or more and wide flats (of stainless steel) |
| 27104150 | Cold rolled sheet, plate and wide strip of a width of 600 mm or more (of stainless steel) |
| 271041Z5 | Hot rolled flat products in coil of a width >= 600 mm, of stainless steel |
| 271041Z6 | Hot rolled flat products in coil of a width < 600 mm, of stainless steel |
| 27104200 | Hot rolled wire rod in coil (of stainless steel) |
| 27104310 | Hot rolled round bars (of stainless steel) |
| 27104320 | Hot rolled bars other than round bars and sections (of stainless steel) |
| 27104330 | Forged bars (of stainless steel) |
| 27105000 | Hot rolled flat and long products of high speed steel |
| 27106020 | Hot rolled flat products in coil (wide strip) of a width of 600 mm or more (of steel other than of stainless steel or of high speed steel) |
| 27106030 | Hot rolled flat products in coil (narrow or slit strip) of a width of less than 600 mm (of steel other than of stainless steel or of high speed steel) |

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| 27106040 | Plates and sheets produced by cutting from hot rolled wide strip of a width of 600 mm or more, and wide flats (of steel other than of stainless steel or of high speed steel) |
| 27106050 | Plates and sheets produced on a reversing mill (quarto) of a width of 600 mm or more and wide flats (of steel other than of stainless steel or of high speed steel) |
| 27107111 | Uncoated cold rolled sheet, plate and strip of a width of 600 mm or more (of steel other than of stainless steel) |
| 27107112 | Electrical sheet and strip not finally annealed of a width of 600 mm or more |
| 27107120 | Electrical sheet and strip, grain non-oriented of a width of 600 mm or more |
| 27107130 | Electrical sheet and strip, grain oriented of a width of 600 mm or more |
| 271071Z0 | Uncoated cold rolled sheet, plate and strip (including electrical sheet and strip not finally annealed), of a width >= 600 mm, of steel other than stainless steel |
| 27107210 | Tinplate, other tinned sheet and strip, including electrolytically chromium coated steel (ECCS) |
| 27107220 | Hot dipped metal coated sheet and strip of a width of 600 mm or more |
| 27107230 | Electrolytically metal coated sheet and strip of a width of 600 mm or more |
| 27107240 | Organic coated sheet of a width of 600 mm or more |
| 27108110 | Ribbed or other deformed wire rod (of non-alloy steel) |
| 27108120 | Wire rod of free-cutting steel |
| 27108130 | Wire rod used for concrete reinforcing (mesh/cold ribbed bars) |
| 27108140 | Wire rod for tyre cord |
| 27108190 | Other wire rod (of non-alloy steel) |
| 27108210 | Hot rolled wire rod (of bearing steel) |
| 27108290 | Hot rolled wire rod (of alloy steel wire rod other than of bearing steel, high speed steel and stainless steel) |
| 27108310 | Hot rolled concrete reinforcing bars |
| 27108320 | Hot rolled bars in free-cutting steels |
| 27108330 | Hot rolled bars in bearing steels |
| 27108340 | Hot rolled bars in tool steels |
| 27108350 | Hot rolled and forged light sections of a web height of less than 80 mm and angles |
| 27108361 | Hollow drill bars and rods |
| 27108364 | Hot rolled bars (excluding hollow drill bars and rods) of non-alloy steel (of other than of free-cutting steel) |
| 27108367 | Hot rolled bars (excluding hollow drill bars and rods) of alloy steel (other than of stainless, tool, bearing and high speed steel) |
| 27109110 | U-sections of a web height of 80 mm or more (of non-alloy steel) |
| 27109120 | I-sections of a web height of 80 mm or more (of non-alloy steel) |
| 27109130 | H-sections of a web height of 80 mm or more (of non-alloy steel) |
| 27109210 | Sheet piling (of steel) |
| 27109220 | Welded and cold formed sections (of steel) |
| 27109230 | Railway material (of steel) |
| 2710T110 | Pig iron |
| 2710T121 | Crude steel: non-alloy steel produced in electric furnaces |
| 2710T122 | Crude steel: non-alloy steel produced by other processes than in electric furnaces |
| 2710T131 | Crude steel: alloy steel other than stainless steel produced in electric furnaces |
| 2710T132 | Crude steel: alloy steel other than stainless steel produced by other processes than in electric furnaces |
| 2710T141 | Crude steel: stainless and heat resisting steel produced in electric furnaces |
| 2710T142 | Crude steel: stainless and heat resisting steel produced by other processes than in electric furnaces |
| 2710T211 | Hot rolled flat products in coil (wide strip) of a width of 600 mm or more |
| 2710T212 | Hot rolled flat products in coil of a width less than 600 mm |
| 2710T221 | Plate and sheet rolled in lengths in wide strip mills |
| 2710T222 | Plate, sheet and wide flat, hot rolled in mills other than wide strip mills |
| 2710T231 | Hot rolled wire rod |
| 2710T241 | Concrete reinforcing bars |
| 2710T242 | Other hot rolled bars |
| 2710T243 | Hot rolled and forged light sections of a web height of less than 80 mm and angles |
| 2710T244 | Heavy sections |
| 2710T251 | Sheet piling |

| | |
|---|---|
| 2710T252 | Railway material |
| 2710T260 | Welded sections |
| 2710T310 | Cold rolled sheet, plate and strip and blackplate, >= 600 wide |
| 2710T320 | Electrical sheet and strip |
| 2710T330 | Tinplate, other tinned sheet and electrically chromium coated steel (ECCS) |
| 2710T340 | Hot dipped metal coated sheet |
| 2710T350 | Electrolytically metal coated sheet |
| 2710T360 | Organic coated sheet |

| **NACE 27.22 : Manufacture of steel tubes** | |
|---|---|
| Number of subsectors: 29 | |
| | |
| 27221010 | Seamless tubes, pipes and hollow profiles, of stainless steel |
| 27221021 | Seamless tubes, pipes and hollow profiles, cold drawn or cold rolled for precise application, not of stainless steel |
| 27221023 | Seamless tubes, pipes and hallow profiles, cold finished not cold drawn or cold rolled for precision application, not of stainless steel |
| 27221030 | Iron or steel tubes; pipes and hollow profiles; seamless (excl. cast iron) |
| 27221041 | Seamless tubes, pipes and hallow profiles, not of stainless steel, not cold finished, external diameter <= 168.3 mm |
| 27221043 | Seamless tubes, pipes and hallow profiles, not of stainless steel, not cold finished, external diameter > 168.3 mm, <= 406.4 mm |
| 27221045 | Seamless tubes, pipes and hallow profiles, not of stainless steel, not cold finished, external diameter > 406.4 mm |
| 27221050 | Seamless hollow profiles and seamless tubes and pipes, of non circular cross-section, hot or cold finished, of steel |
| 27221053 | Iron or steel welded; riveted or similarly closed tubes and pipes with internal and external circular cross-sections; external diameter > 406.4 mm |
| 27221055 | Iron or steel open seam or welded; riveted or similarly closed tubes; pipes and hollow profiles the external diameter of which is > 406.4 mm |
| 27221060 | Tubes and pipes, having circular cross-sections and an external diameter of > 406,4 mm, of flat rolled products of iron or steel e.g., welded, riveted or similarly closed |
| 27221061 | Longitudinally welded tubes and pipes of iron (excl. cast iron) or steel with internal and external circular cross-sections; external diameter > 406.4 mm |
| 27221065 | Spirally welded, riveted or similarly closed tubes and pipes of iron (excl. cast iron) or steel with internal and external circular cross-sections; external diameter > 406.4 mm |
| 27221070 | Open seam or welded, riveted or similarly closed tubes; pipes and hollow profiles of stainless steel, external diameter <= 406.4 mm |
| 27221081 | Open seam or welded, riveted or similarly closed tubes, pipes and hollow profiles, not stainless steel, exter. diam. <= 406.4 mm, circular cross-section, wall thick. <=2 mm, cold drawn or otherwise cold finished for precise application |
| 27221083 | Open seam or welded, riveted or similarly closed tubes; pipes and hollow profiles, not of stainless steel, exter. diam. <= 406.4 mm, circular cross-section, wall thick. >2 mm, cold drawn or otherwise cold finished, for precision application |
| 27221085 | Open seam or welded, riveted or similarly closed tubes; pipes and hollow profiles, not of circular cross-section, not cold drawn or otherwise cold finished, for precision application |
| 27221086 | Precision tubes and pipes, of circular cross-section, of non-alloy steel, cold formed and welded or cold formed and cold drawn or cold rolled after welding, of an external diameter =< 406,4 mm and a wall thickness > 2 mm |
| 27221091 | Open seam or welded, riveted or similarly closed tubes; pipes and hollow profiles, not of stainless steel, external diameter <= 406.4 mm, of circular cross-section, not cold drawn or otherwise cold finished, not for precision application |
| 27221092 | Tubes and pipes, of circular cross-section, of steel other than stainless steel, hot or cold formed and welded, riveted or similarly closed, of an external diameter =< 406,4 mm |
| 27221093 | Open seam or welded, riveted or similarly closed tubes; pipes and hollow profiles, not of circular cross-section, not cold drawn or otherwise cold finished, not for precision application |
| 27221094 | Tubes and pipes, of square or rectangular cross-section, of steel, hot or cold formed and welded, of a wall thickness =< 2 mm |

| | |
|---|---|
| 27221096 | Tubes and pipes, of square or rectangular cross-section, of steel, hot or cold formed and welded, of a wall thickness > 2 mm |
| 27221098 | Tubes and pipes, of other cross-section than circular, square or rectangular, and hollow profiles, of steel hot or cold formed and welded |
| 27222010 | Steel flanges (including stainless steel) (excluding cast fittings) |
| 27222030 | Steel threaded tube or pipe fittings (including stainless steel, elbows; bends and sleeves) (excluding cast fittings) |
| 27222050 | Steel tube or pipe fittings (including stainless steel) (excluding butt welding fittings, threaded fittings, cast fittings, flanges) |
| 27222073 | Steel butt welding elbows and bends for tubes or pipes (including stainless steel) (excluding cast fittings) |
| 27222075 | Steel butt welding fittings for tubes or pipes (including stainless steel) (excluding cast fittings, elbows and bends) |

| **NACE 27.44 : Copper production**<br>Number of subsectors: 14 | |
|---|---|
| | |
| 27441100 | Copper mattes; cement copper (precipitated copper) (excluding copper powder) |
| 27441200 | Unrefined copper, copper anodes for electrolytic refining (including blister copper) (excluding electrocopper-plating, electroplating anodes) |
| 27441330 | Unwrought unalloyed refined copper (excluding rolled, extruded or forged sintered products) |
| 27441350 | Unwrought copper alloys (excluding rolled, extruded or forged sintered products) |
| 27441370 | Master alloys of copper (including alloys which are not usefully malleable) (excluding copper phosphide (phosphor copper) containing > 15% by weight of phosphorous) |
| 27442100 | Copper powders and flakes excluding cement copper, powders/flake powders used in the preparation of paints such as bronzes/golds, (chemical compounds), refined copper shot |
| 27442200 | Copper and copper alloy bars, rods, profiles and hollow profiles (excluding bars and rods obtained by casting or sintering, copper wire rod in coils) |
| 27442330 | Copper wire, refined (transv. section > 6 mm), of copper alloy |
| 27442350 | Copper wire with cross-sectional dimension > 0.5 mm, < 6 mm (excluding twine or cord reinforced with wire, stranded wire and cables) |
| 27442370 | Copper wire with cross-sectional dimension <= 0.5 mm (excluding twine or cord reinforced with wire, stranded wire and cables) |
| 27442400 | Copper and copper alloy plates, sheets and strip of a thickness > 0.15 mm (excluding expanded copper metal, insulated electric strip) |
| 27442500 | Copper foil, of a thickness (excluding any backing) <= 0.15 mm |
| 27442630 | Copper tubes and pipes |
| 27442650 | Copper and copper alloy tube/pipe fittings including couplings, elbows, sleeves, tees and joints excluding bolts and nuts used for assembling/fixing pipes/tubes, fittings with taps, cocks, valves |

| **NACE 27.45 : Other non-ferrous metal production**<br>Number of subsectors: 23 |
|---|

| | |
|---|---|
| 27451100 | Nickel mattes, nickel oxide sinters and other intermediate products of nickel metallurgy (including impure nickel oxides, nickel speiss, impure ferro-nickel) |
| 27451230 | Non-alloy unwrought nickel (excluding nickel powders and flakes) |
| 27451250 | Unwrought nickel alloy (excluding nickel powders and flakes) |
| 27452100 | Nickel powders and flakes (excluding nickel oxide sinters) |
| 27452200 | Nickel and nickel alloy bars, rods, profiles and wires (excluding prepared bars, rods or profiles for use in structures, insulated electric bars and wire, enamelled wire) |
| 27452300 | Nickel and nickel alloy plate, sheet, strip and foil (excluding expanded metal) |
| 27452430 | Nickel tubes, pipes |
| 27452450 | Nickel tube or pipe fittings (couplings, elbows, sleeves) |
| 27453013 | Unwrought tungsten (wolfram) bars and rods obtained by sintering, tungsten powders, waste and scrap (excluding carbide) |
| 27453015 | Wrought tungsten (wolfram) bars, rods, plate, sheet, strip, foil and wire (excluding bars and rods obtained by sintering, carbide) |
| 27453017 | Molybdenum, articles thereof, powders, waste and scrap (excluding alloy molybdenum without a predominance of molybdenum, carbide) |

| | |
|---|---|
| 27453023 | Tantalum, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453025 | Magnesium, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453027 | Cobalt mattes and other intermediate products of cobalt metallurgy, cobalt, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453033 | Bismuth, articles thereof, powders, waste and scrap (including bismuth-lead-tin alloys, bismuth-indium-lead-tin-cadmium alloys (excluding carbide) |
| 27453035 | Unwrought cadmium, powders, waste and scrap (including cadmium zinc alloys) (excluding carbide) |
| 27453037 | Wrought cadmium and articles thereof (including cadmium zinc alloys) (excluding carbide) |
| 27453043 | Titanium, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453045 | Zirconium, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453047 | Antimony, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453053 | Manganese, articles thereof, powders, waste and scrap (excluding carbide) |
| 27453055 | Beryllium, chromium, germanium, vanadium, gallium, hafnium, indium, niobium (columbium), rhenium, thallium, articles of these metals, powders, waste and scrap (excluding carbide) |
| 27453057 | Cermets, articles thereof, waste and scrap (excluding cermets containing fissile or radioactive substances, carbide) |

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Part 4

**COMMISSION STAFF WORKING DOCUMENT**

**Impact Assessment Report**

***Accompanying the document***

**Communication of the Commission**

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

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# ANNEXES

## ANNEX 12

## The CO2 price and electricity efficiency benchmarks: two of the five variables used to determine the maximum aid amount

*The CO2 price*

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 4.6 Section of the main report).

The CO2 price which forms part of the formula determining the maximum aid amount should be fixed in relation to the period in respect of which the State aid is granted.

The future CO2 price can be assumed to reflect companies' planning horizon better than the spot price. One possibility would therefore be to use – in respect of the period in which the aid will be granted - the average of the future prices observed over a reference period (e.g. a number of months or a year).

Such an approach could have two benefits. First, future prices would already be known *ex ante* for the aid amount calculation (i.e. the average of observed prices over a period in respect of the period during which the aid will granted). 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).

The higher the value of this variable (the CO2 price in the period for which aid is paid), the higher the maximum aid amount.

*The product-specific electricity efficiency benchmarks*

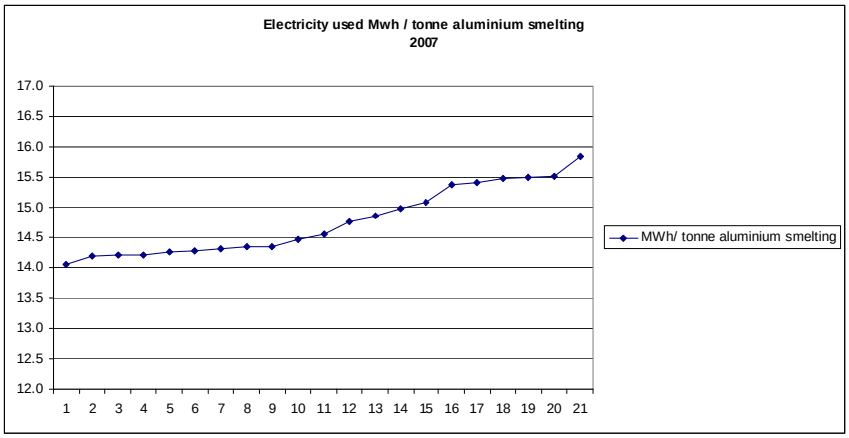
Article 10a(6) of the ETS Directive requires that product benchmarks corresponding to the most electricity efficient methods of production be established. If a particular installation's efficiency in terms of use of electricity (MWh/tonne of the product concerned) meets the benchmark there will be no reduction of the aid. Conversely, **if the actual efficiency is below the benchmark the aid level will fall by a corresponding amount.**

At the time of writing the work on the product benchmarks (in terms of MWh/tonne of each product in question) is still ongoing. It is therefore premature to set out outright options in relation to what is likely to be a proposal of a very technical nature. The legal requirement in Article 10a(6) is that the benchmarks should correspond to the most electricity efficient techniques. It may be presumed that that there will be two categories of benchmarks: **primary** and **fallback benchmarks**.

Such primary electricity benchmarks could in the first place be developed for products manufactured through particularly electro-intensive processes with a sufficient number of installations to derive an average from a benchmark curves (see example in figure below). Primary benchmarks could also rely on reference documents on "Best Available Techniques"

('BREFs')[1] (e.g. if the number of installations in the sector is insufficient to draw up a benchmark curve).

Figure**: Electricity benchmarking curve for primary aluminum (2007) (primary smelting process – electrolysis) (he average electricity consumption of the 10 % most efficient plants)**




*Source: EEA, 2009*

As regards compensation for direct CO2 costs 52 primary product benchmarks were established in the 2011 Benchmarking Decision, accounting for around 75% of direct emissions of all products entitled to compensation under the 2010 Carbon Leakage Decision. The benchmarks are expressed in terms of EUAs (i.e. free allocation of permits) per tonne of production.

These 52 benchmarks relate to 'products' (not necessarily corresponding to Prodcom product definitions).[2] The boundaries of the production processes are precisely defined[3]. For 14 of the 52 primary benchmarks the boundaries include not only use of fuel but also electricity (fuel and electricity substitutability). But as mentioned compensation is only given for fuel use.

Second, as in the case of the 2011 Benchmarking Decision, the ETS Guidelines would have to establish so-called **fallback benchmarks** applicable to all other products which fall within eligible sectors or subsectors to be defined by the ETS Guidelines. The secondary benchmarks may involve dividing the installation's electricity consumption over a period time by its production in tonnes over the same period (MWh/tonnes of the product) A correction factor (0.X) could also be envisaged to ensure that products subject to fall-back benchmarks are neither favoured nor disadvantaged compared to products subject to the primary benchmarks. Some stakeholders have recommended a correction factor which is as low as 0.5 (i.e. 50%). Others recommend a factor of 100% or close to 100%.

1 BREFs are established in accordance with Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control has been used to derive benchmark values. Some 30 BREFs have been adopted (Bergmann et al (2007)).

2 See recital 4 of the 2011 Benchmarking Decision.

3 See recital 4 of the 2011 Benchmarking Decision ("*In principle, for each product one benchmark should be defined. Where a product is a direct substitute of another product, both should be covered by the same product benchmark and the related product definition*").

## ANNEX 13

## The CO2 factor, the merit curve and modelling to determine pass-on of CO2

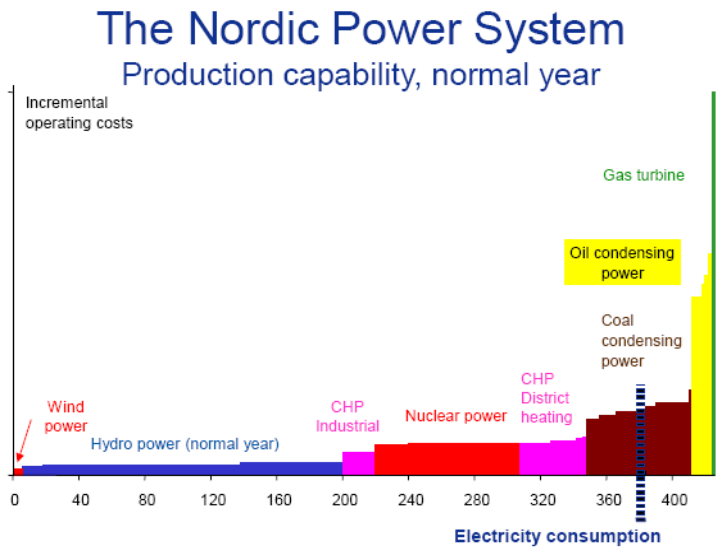
*4.5.1 The impact of the CO2 on the "merit curve"*

As mentioned in section 4.5 **it is the "marginal production" which sets the wholesale price** for all consumers (such as manufacturing industry) which buy electricity at the wholesale level (i.e. directly from the electricity grid).

The "marginal production" at any given hour of the day in the relevant geographic area ("price-setting area") is the most expensive production which is in operation at that hour. Some hours of the day are "peak" hours when demand is particularly high. In many cases (although this will vary across areas) the marginal production consists of gas-fired electricity production. This means that the marginal electricity produced during the day is often gas (which can be used more flexibly even if it is more expensive than coal). During night-time (so-called constant "base-load" demand) it may not be necessary to resort to gas production and the marginal production is often made up of coal.

Thus at any point in time there is a range of electricity generating installations (e.g. hydropower, nuclear power, gas and coal) in operation which are ordered accordance to their relative variable production costs, starting with the cheapest production and ending with the most expensive – i.e. "marginal" - production. Accordingly, in any given geographic area, for any particular hour during a particular day a so-called "merit curve" can be established (see example in figure below).

**Figure: Merit curve in the Nordic countries**



*Source: Reply to questionnaire by the Confederation of Swedish Enterprise*

The marginal production de facto sets the price for all buyers in the price-setting area.

In practice the merit curve for each hour results from a daily round of bids to sell (by electricity generators) and offers to buy (by large electricity consumers or traders) at the electricity exchanges. Matching the bids and offers, the electricity exchanges will establish the price each hour the next day ("day ahead" or "spot" prices).[4] The bid corresponding to the marginal production thus becomes price-setting.[5]

**The introduction of the ETS in 2005 had a significant impact on the "merit order" in EU electricity markets.**[6] Whereas in the pre-ETS era, gas would often have constituted the price-setting marginal production during peak hours (daytime) due to the cost of producing electricity from gas being more expensive than other forms of electricity production. But as coal is roughly twice as CO2 intensive compared to gas the introduction of a CO2 price via the ETS would often lead to a reversal of the merit order resulting coal-fired production shifting to the right along the merit order (see figures below), thereby de facto setting the price for the whole area.[7]

The price increase borne by e.g. industrial installations in that area would thus not correspond to **the price difference between coal production before and after the introduction of the ETS but to the difference between the gas-based price before ETS and the coal-based price following the introduction of the ETS**. The figures below illustrate a shift along the merit curve from coal to gas production using CCGT.[8]

4 Electricity futures are also traded on the EU exchanges (as in the case of the CO2 trading exchanges).

5 See e.g. reply to questionnaire by Germany (defining the marginal production as the "Grenzgebot".

6 Pype (2011).

7 See e.g. reply to questionnaire by the European Aluminium Association.

8 CCGT stands for "Combined Cycle Gas Technology" and is one of the more CO2 efficient forms of gas-fired gas production.

**Figure: Expected reversals of the merit order at different CO2 prices**

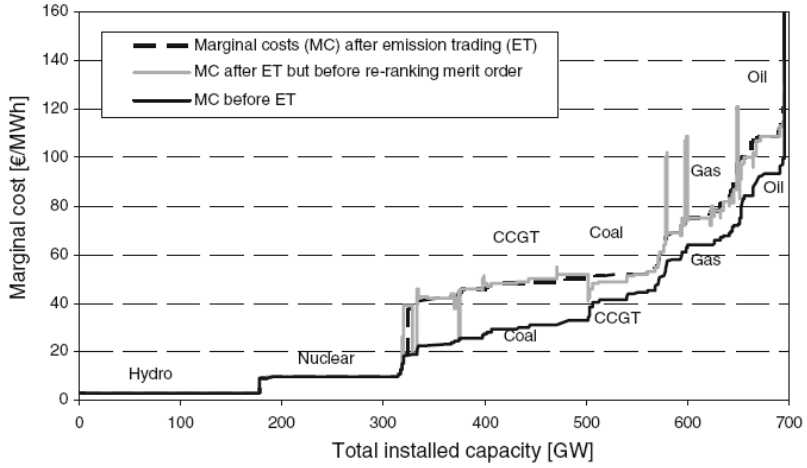



**Fig. 7** ETS-induced changes in the EU-20 merit order at 20 €/t and 2006 fuel prices

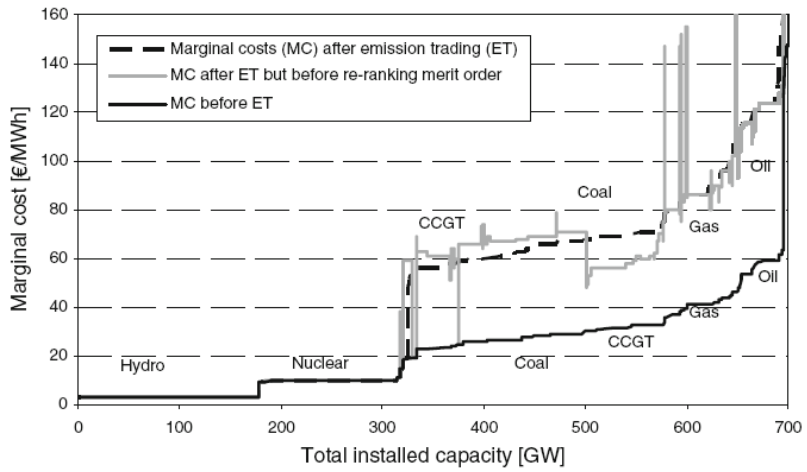



**Fig. 8** ETS-induced changes in the EU-20 merit order at 40 €/t and 2006 fuel prices

*Source: IFIEC (2008)*

An additional challenge in attempting to determine the precise impact of CO2 pricing on electricity prices is that the impact would moreover have to be assessed at EU level Indeed, Article 10a(6) requires that the CO2 factor correspond to "the CO2 emissions of the relevant *European* electricity mix"[9].

As mentioned in section 4.5.2 the type of EU-wide modelling that would be required to determine the difference between an ETS scenario and a non-ETS scenario at EU level has not been carried out. Indeed, for the same reason it is not possible to state whether the compensation of direct CO2 costs (via the 2010 Carbon Leakage Decision and the 2011 Benchmarking

[9] While the Finnish and French versions uses the term "average" the clearly majority of the language versions use the term relevant" (Slavic, Baltic, Greek languages to be verified).

Decision) overcompensates or under-compensates the installations receiving free allowances for their direct CO2 emissions.

Calculating the cost impact of the ETS on electricity prices would be relatively straightforward if there were no reversals in the merit order and if it were assumed that electricity markets were perfectly competitive (resulting in a 100% pass on of cost increases). Given these two (heroic) assumptions it would be possible to add the CO2 cost component to the marginal production cost of the marginal production (typically gas without the ETS) which would remain the same before and after any cost increase.

But as mentioned it is likely that that the introduction of the ETS has led to reversals in the merit order: typically (from gas in a non-ETS world to coal in an ETS world) given that the CO2 cost affects coal significantly more than gas. The likelihood, precise nature and extent of such reversals of the merit order across the different price-setting areas in the EU over time may vary considerably, further complicating the task of estimating the effect of the reversals at an EU level.

*4.5.2 Modelling to assess the impact of the CO2 price on electricity prices*

The cost impact of ETS has been estimated in respect of certain parts of the EU. A study using one particular model ("BID") finds that have found that the impact in Norway has been around 0.6 (i.e. for each rise in the CO2 price by 1€ the electricity was found to have risen by 0.6€).[10] The estimated transfer factors for other Member States are all found to be in the within the interval between 0.4 and 0.8-0.9; for example, the factor for Germany is around 0.7.[11]

As the ETS Guidelines must define a CO2 factor in respect of all Member States it does not appear feasible, based on the available information, to develop one single model that would capture the entirety of the current state of EU electricity markets.[12] The model referred to above in fact only captures the two most integrated regional entities in Europe: the **Central Western area** and the **Nordic area**. **Elsewhere in Europe markets are mostly national in scope** which would require that the same or similar model is developed in respect of more than a dozen Member States[13]. **Recourse to the 'transfer factor' as the CO2 factor as described above is not considered feasible given time and resource constraints.**

But it is still possible to set out meaningful options regarding the CO2 factor. A higher rather a lower CO2 factor will mean a higher maximum aid ceiling. Thus a factor based on the marginal production will tend to be higher than the average CO2 emissions of electricity in the EU. Different alternatives may also have bearing on incentives to use particular electricity generating technologies. This is confirmed by the abovementioned recent modelling regarding Norway and other Member States which found that the transfer factor can be expected to fall within a range defined by the CO2 factors of the two most common forms of marginal production (gas and coal) (i.e. between around 0.4 to around 0.9 CO2t/MWh) (see figure below).[14]

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10 Pöyry (2011).

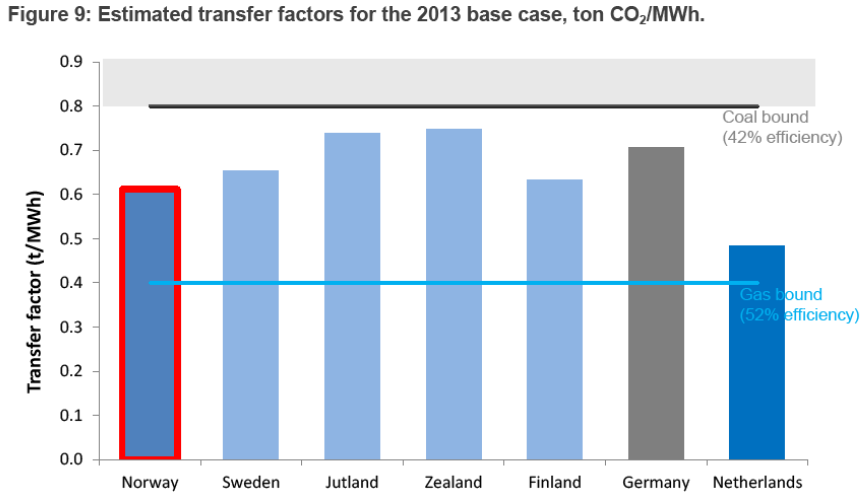
11 Pöyry (2011).

12 See non-paper by the European Commission entitled "The Internal Energy Market – Time to Switch into Higher Gear".

13 Pype (2011).

14 Pöyry (2011).

**Figure: Estimated CO2 transfer factors for six Member States in 2013 in range between CO2 factors for gas and coal**




*Source: Pöyry (2011)*

Indeed, gas-fired plants tend – depending on their efficiency – to have a CO2 factor roughly in the region of 0.4 CO2t/MWh. The most efficient gas-fired plans do not consume more than around 0.35 CO2t/MWh. Black (or “hard”) coal (hereafter "coal") has a CO2 factor of around 0.8-0.9. The CO2 factor of oil fired electricity generation plants is somewhere in-between the coal and gas CO2 emission factors. This type of electricity is sometimes described as “grey” as opposed (CO2-free) “green” electricity (see Article 10a(6)).

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Part 5

**COMMISSION STAFF WORKING DOCUMENT**

**Impact Assessment Report**

***Accompanying the document***

**Communication of the Commission**

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

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# ANNEXES

## ANNEX 14

## Value added at factor cost and number of persons of employment at NACE 4 level (2007)

| NACE | Description | Value added at factor costs (Mio €) | Number of persons employed per enterprise (hundreds) |
|---|---|---|---|
| 1010 | Mining and agglomeration of hard coal | n.a. | 646.11 |
| 1020 | Mining and agglomeration of lignite | 2,774.1 | 774.93 |
| 1030 | Extraction and agglomeration of peat | 517.4 | 11.42 |
| 1110 | Extraction of crude petroleum and natural gas | 56,795 | 201.27 |
| 1120 | Service activities incidental to oil and gas extraction, excluding surveying | 5,609.8 | 68.18 |
| 1200 | Mining of uranium and thorium ores | n.a. | n.a. |
| 1310 | Mining of iron ores | n.a. | n.a. |
| 1320 | Mining of non-ferrous metal ores, except uranium and thorium ores | 4,244.7 | 135.93 |
| 1411 | Quarrying of ornamental and building stone | 2,305.8 | 9.81 |
| 1412 | Quarrying of limestone, gypsum and chalk | 992.6 | 14.39 |
| 1413 | Quarrying of slate | 147.9 | 13.13 |
| 1421 | Operation of gravel and sand pits | 8,921.7 | n.a. |
| 1422 | Mining of clays and kaolin | 713 | 30 |
| 1430 | Mining of chemical and fertilizer minerals | 251.7 | 26.59 |
| 1440 | Production of salt | 549.5 | 17.92 |
| 1450 | Other mining and quarrying n.e.c. | 796.4 | 11.48 |
| 1511 | Production and preserving of meat | 10,181.3 | 3,159 |
| 1512 | Production and preserving of poultrymeat | 4,000 | n.a. |
| 1513 | Production of meat and poultrymeat products | 18,812 | 5,413 |
| 1520 | Processing and preserving of fish and fish products | 4,329.6 | 1,259 |
| 1531 | Processing and preserving of potatoes | 2,786 | 428 |
| 1532 | Manufacture of fruit and vegetable juice | 1,897.5 | 365 |
| 1533 | Processing and preserving of fruit and vegetables n.e.c. | 8,071.7 | 2,030 |
| 1541 | Manufacture of crude oils and fats | n.a. | 301 |
| 1542 | Manufacture of refined oils and fats | 1,545.7 | 234 |

| | | | |
|---|---|---|---|
| 1543 | Manufacture of margarine and similar edible fats | n.a. | 124 |
| 1551 | Operation of dairies and cheese making | 17,582.8 | 3,342 |
| 1552 | Manufacture of ice cream | 1,900 | n.a. |
| 1561 | Manufacture of grain mill products | 5,273.4 | 1,017 |
| 1562 | Manufacture of starches and starch products | 1,962 | 184 |
| 1571 | Manufacture of prepared feeds for farm animals | 5,400.8 | 983 |
| 1572 | Manufacture of prepared pet foods | 2,587 | 294 |
| 1581 | Manufacture of bread; manufacture of fresh pastry goods and cakes | 30,722.2 | 13,548 |
| 1582 | Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes | 6,796.6 | 1,582 |
| 1583 | Manufacture of sugar | 3,482.7 | 411 |
| 1584 | Manufacture of cocoa; chocolate and sugar confectionery | 12,066.5 | 1,919 |
| 1585 | Manufacture of macaroni, noodles, couscous and similar farinaceous products | 2,120.8 | 574 |
| 1586 | Processing of tea and coffee | 4,672.6 | 589 |
| 1587 | Manufacture of condiments and seasonings | 2,600 | 510 |
| 1588 | Manufacture of homogenized food preparations and dietetic food | 2,369.4 | 261 |
| 1589 | Manufacture of other food products n.e.c. | n.a. | 1,400 |
| 1591 | Manufacture of distilled potable alcoholic beverages | 6,707.4 | 592 |
| 1592 | Production of ethyl alcohol from fermented materials | 327.6 | 87 |
| 1593 | Manufacture of wines | 5,300 | 908 |
| 1594 | Manufacture of cider and other fruit wines | 653.1 | 63 |
| 1595 | Manufacture of other non-distilled fermented beverages | 96.7 | 14 |
| 1596 | Manufacture of beer | 11,681 | 1,350 |
| 1597 | Manufacture of malt | 405.1 | n.a. |
| 1598 | Production of mineral waters and soft drinks | 9,514.9 | 1,559 |
| 1600 | Manufacture of tobacco products | 8,526.4 | 550 |
| 1711 | Preparation and spinning of cotton-type fibres | 680.3 | 299 |
| 1712 | Preparation and spinning of woollen-type fibres | 507.2 | 160 |
| 1713 | Preparation and spinning of worsted-type fibres | 465.5 | 171 |
| 1714 | Preparation and spinning of flax-type fibres | 140.3 | 51 |

| | | | |
|---|---|---|---|
| 1715 | Throwing and preparation of silk, including from noils, and throwing and texturing of synthetic or artificial filament yarns | 500.6 | 152 |
| 1716 | Manufacture of sewing threads | 287.9 | 93 |
| 1717 | Preparation and spinning of other textile fibres | 320.8 | 97 |
| 1721 | Cotton-type weaving | 2,221.5 | 818 |
| 1722 | Woollen-type weaving | 451.7 | 147 |
| 1723 | Worsted-type weaving | 777.3 | 199 |
| 1724 | Silk-type weaving | 1,009.6 | 246 |
| 1725 | Other textile weaving | 1,006.6 | 272 |
| 1730 | Finishing of textiles | 3,382.1 | 1,059 |
| 1740 | Manufacture of made-up textile articles, except apparel | n.a. | n.a. |
| 1751 | Manufacture of carpets and rugs | 2,070 | 438 |
| 1752 | Manufacture of cordage, rope, twine and netting | 456.6 | 167 |
| 1753 | Manufacture of non-wovens and articles made from non-wovens, except apparel | 1,367.6 | 243 |
| 1754 | Manufacture of other textiles n.e.c. | 4,937.6 | 1,340 |
| 1760 | Manufacture of knitted and crocheted fabrics | 1,224 | 400 |
| 1771 | Manufacture of knitted and crocheted hosiery | n.a. | n.a. |
| 1772 | Manufacture of knitted and crocheted pullovers, cardigans and similar articles | 1,754.6 | 952 |
| 1810 | Manufacture of leather clothes | n.a. | n.a. |
| 1821 | Manufacture of workwear | 1,185.6 | 736 |
| 1822 | Manufacture of other outerwear | 14,807.6 | 8,212 |
| 1823 | Manufacture of underwear | 3,134.5 | 1,993 |
| 1824 | Manufacture of other wearing apparel and accessories n.e.c. | 3,913.8 | 1,693 |
| 1830 | Dressing and dyeing of fur; manufacture of articles of fur | 375 | 202 |
| 1910 | Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear | 13,070.8 | 5,278 |
| 1920 | Manufacture of luggage, handbags and the like, saddler | 3,465 | 1,085 |
| 1930 | Manufacture of footwear | 7,630.5 | 3,686 |
| 2010 | Sawmilling and planing of wood; impregnation of wood | 9,894.2 | 3,078 |
| 2020 | Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards | 6,640.7 | 1,222 |

| | | | |
|---|---|---|---|
| 2030 | Manufacture of builders' carpentry and joinery | 17,200 | 5,750 |
| 2040 | Manufacture of wooden containers | 3,271.4 | 1,013 |
| 2051 | Manufacture of other products of wood | 3,265 | 1,364 |
| 2052 | Manufacture of articles of cork, straw and plaiting materials | 700 | 240 |
| 2111 | Manufacture of pulp | 2,181.9 | n.a. |
| 2112 | Manufacture of paper and paperboard | 15,669 | 1,964 |
| 2121 | Manufacture of corrugated paper and paperboard and of containers of paper and paperboard | 12,794.8 | 2,707 |
| 2122 | Manufacture of household and sanitary goods and of toilet requisites | 4,995.4 | 782 |
| 2123 | Manufacture of paper stationery | 2,193.7 | 514 |
| 2124 | Manufacture of wallpaper | n.a. | 58 |
| 2125 | Manufacture of other articles of paper and paperboard n.e.c. | 3,839.7 | 755 |
| 2211 | Publishing of books | 12,755.1 | 2,011 |
| 2212 | Publishing of newspapers | 18,573.5 | 3,023 |
| 2213 | Publishing of journals and periodicals | 15,935.2 | 2,693 |
| 2214 | Publishing of sound recordings | 1,100 | 210 |
| 2215 | Other publishing | 2,089.7 | 514 |
| 2221 | Printing of newspapers | 2,200 | 390 |
| 2222 | Printing n.e.c. | 31,237.7 | 7,150 |
| 2223 | Bookbinding | 2,176.9 | 605 |
| 2224 | Pre-press activities | 3,362.5 | 796 |
| 2225 | Ancillary activities related to printing | 2,600 | 670 |
| 2231 | Reproduction of sound recording | 855 | 154 |
| 2232 | Reproduction of video recording | 521.1 | 101 |
| 2233 | Reproduction of computer media | n.a. | 95 |
| 2310 | Manufacture of coke oven products | 666.5 | 102 |
| 2320 | Manufacture of refined petroleum products | 28,289.3 | 1,242 |
| 2330 | Processing of nuclear fuel | 856.4 | 308 |
| 2411 | Manufacture of industrial gases | 4,994.8 | 390 |
| 2412 | Manufacture of dyes and pigments | 2,549.3 | 358 |
| 2413 | Manufacture of other inorganic basic chemicals | 6,278.1 | 788 |
| 2414 | Manufacture of other organic basic chemicals | 27,561.6 | 1,483 |
| 2415 | Manufacture of fertilizers and nitrogen compounds | 3,672.4 | 564 |
| 2416 | Manufacture of plastics in primary forms | 21,881.6 | 1,875 |

| | | | |
|---|---|---|---|
| 2417 | Manufacture of synthetic rubber in primary forms | 577.1 | 59 |
| 2420 | Manufacture of pesticides and other agro-chemical products | 2,934.8 | 271 |
| 2430 | Manufacture of paints, varnishes and similar coatings, printing ink and mastics | 12,555.3 | 1,741 |
| 2441 | Manufacture of basic pharmaceutical products | 6,827.9 | 565 |
| 2442 | Manufacture of pharmaceutical preparations | 66,853.2 | 5,546 |
| 2451 | Manufacture of soap and detergents, cleaning and polishing preparations | 7,965.8 | 1,145 |
| 2452 | Manufacture of perfumes and toilet preparations | 9,681.8 | 1,449 |
| 2461 | Manufacture of explosives | 1,178.9 | 203 |
| 2462 | Manufacture of glues and gelatines | 1,775.2 | 231 |
| 2463 | Manufacture of essential oils | 1,667.5 | 187 |
| 2464 | Manufacture of photographic chemical material | 1,177.3 | 112 |
| 2465 | Manufacture of prepared unrecorded media | 89.7 | 24 |
| 2466 | Manufacture of other chemical products n.e.c. | 10,872.6 | 1,205 |
| 2470 | Manufacture of man-made fibres | 2,754.3 | 412 |
| 2511 | Manufacture of rubber tyres and tubes | 8,582.5 | 1,294 |
| 2512 | Retreading and rebuilding of rubber tyres | n.a. | n.a. |
| 2513 | Manufacture of other rubber products | 9,747 | 2,263 |
| 2521 | Manufacture of plastic plates, sheets, tubes and profiles | 16,000 | 2,900 |
| 2522 | Manufacture of plastic packing goods | 11,690.8 | 2,565 |
| 2523 | Manufacture of builders' ware of plastic | 10,780.4 | 2,640 |
| 2524 | Manufacture of other plastic products | 25,392.5 | 5,931 |
| 2611 | Manufacture of flat glass | 2,688.3 | 294 |
| 2612 | Shaping and processing of flat glass | 5,391.2 | 1,256 |
| 2613 | Manufacture of hollow glass | 5,406.5 | 1,196 |
| 2614 | Manufacture of glass fibres | 1,905.6 | 249 |
| 2615 | Manufacture and processing of other glass, including technical glassware | 2,856.9 | 664 |
| 2621 | Manufacture of ceramic household and ornamental articles | 1,738.4 | 349 |
| 2622 | Manufacture of ceramic sanitary fixtures | 1,703.4 | 346 |
| 2623 | Manufacture of ceramic insulators and insulating fittings | 441.9 | 95 |
| 2624 | Manufacture of other technical ceramic products | n.a. | n.a. |
| 2625 | Manufacture of other ceramic products | n.a. | n.a. |
| 2626 | Manufacture of refractory ceramic products | 1,891 | 388 |
| 2630 | Manufacture of bricks, tiles and construction products, in baked clay | 4,063 | 916 |
| 2631 | Manufacture of cement | 9,959.2 | 641 |
| 2632 | Manufacture of lime | 1,062.9 | 219 |
| 2653 | Manufacture of plaster | 299.3 | 42 |
| 2661 | Manufacture of concrete products for construction purposes | 14,026.5 | 2,867 |
| 2662 | Manufacture of plaster products for construction purposes | 2,294.6 | 208 |
| 2663 | Manufacture of ready-mixed concrete | 6,947.8 | 1,168 |

| | | | |
|---|---|---|---|
| 2664 | Manufacture of mortars | 1,758.9 | 241 |
| 2665 | Manufacture of fibre cement | 652.6 | 107 |
| 2666 | Manufacture of other articles of concrete, plaster and cement | 1,283.1 | 332 |
| 2670 | Cutting, shaping and finishing of ornamental and building stone | n.a. | 2,000 |
| 2681 | Production of abrasive products | 1,602.3 | 303 |
| 2682 | Manufacture of other non-metallic mineral products n.e.c. | 4,621.4 | 681 |
| 2710 | Manufacture of basic iron and steel and of ferro-alloys | 42,831.1 | 4,017 |
| 2721 | Manufacture of cast iron tubes | n.a. | n.a. |
| 2722 | Manufacture of steel tubes | n.a. | 1,193 |
| 2731 | Cold drawing | 496.6 | 75 |
| 2732 | Cold rolling of narrow strip | 1,367.4 | 185 |
| 2733 | Cold forming or folding | 1,354 | 208 |
| 2734 | Wire drawing | 1,789 | 310 |
| 2741 | Precious metals production | 900 | 105 |
| 2742 | Aluminium production | 8,971.1 | 1,208 |
| 2743 | Lead, zinc and tin production | 2,638.1 | 231 |
| 2744 | Copper production | 3,816.7 | 463 |
| 2745 | Other non-ferrous metal production | n.a. | 180 |
| 2751 | Casting of iron | 4,769.9 | 1,122 |
| 2752 | Casting of steel | 1,977.8 | 384 |
| 2753 | Casting of light metals | 4,271.1 | 920 |
| 2754 | Casting of other non-ferrous metals | 1,447.9 | 333 |
| 2811 | Manufacture of metal structures and parts of structures | 31,984.1 | 7,809 |
| 2812 | Manufacture of builders' carpentry and joinery of metal | 12,258.9 | 3,773 |
| 2821 | Manufacture of tanks, reservoirs and containers of metal | 3,753.7 | 915 |
| 2822 | Manufacture of central heating radiators and boilers | 3,800 | 800 |
| 2830 | Manufacture of steam generators, except central heating hot water boilers | 7,219 | 1,525 |
| 2840 | Forging, pressing, stamping and roll forming of metal; powder metallurgy | 17,354.9 | 3,266 |
| 2851 | Treatment and coating of metals | 12,945.7 | 2,906 |
| 2852 | General mechanical engineering | 37,213.2 | 8,785 |
| 2861 | Manufacture of cutlery | 1,021.7 | 215 |
| 2862 | Manufacture of tools | 9,971.2 | 2,037 |
| 2863 | Manufacture of locks and hinges | 7,362.5 | 1,737 |
| 2871 | Manufacture of steel drums and similar containers | 937 | 200 |
| 2872 | Manufacture of light metal packaging | 3,990 | 683 |
| 2873 | Manufacture of wire products | 3,600 | 722 |

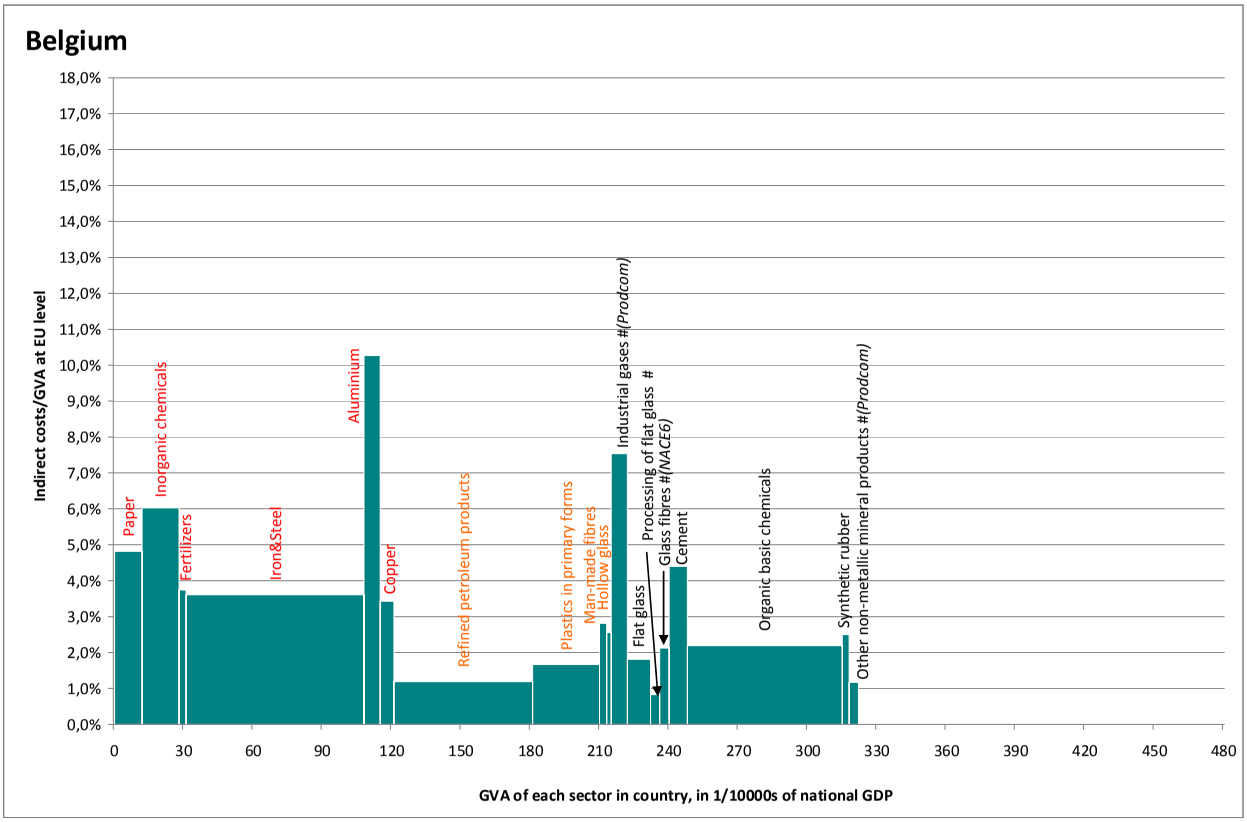
| | | | |
|---|---|---|---|
| 2874 | Manufacture of fasteners, screw machine products, chain and springs | 6,152 | 1,175 |
| 2875 | Manufacture of other fabricated metal products n.e.c. | 17,260.6 | 4,242 |
| 2911 | Manufacture of engines and turbines, except aircraft, vehicle and cycle engines | 8,392 | 1,129 |
| 2912 | Manufacture of pumps and compressors | 15,359.2 | 2,364 |
| 2913 | Manufacture of taps and valves | 11,336 | n.a. |
| 2914 | Manufacture of bearings, gears, gearing and driving elements | 13,000 | 2,236 |
| 2921 | Manufacture of furnaces and furnace burners | 2,335.4 | 434 |
| 2922 | Manufacture of lifting and handling equipment | 22,039.8 | 3,773 |
| 2923 | Manufacture of non-domestic cooling and ventilation equipment | 16,000 | 3,000 |
| 2924 | Manufacture of other general purpose machinery n.e.c. | 22,717.8 | 4,012 |
| 2931 | Manufacture of agricultural tractors | 1,900 | 300 |
| 2932 | Manufacture of other agricultural and forestry machinery | 8,363 | 1,869 |
| 2941 | Manufacture of portable hand held power tools | 2,000 | 331 |
| 2942 | Manufacture of other metalworking machine tools | 9,942.2 | 1,742 |
| 2943 | Manufacture of other machine tools n.e.c. | 6,700 | 1,213 |
| 2951 | Manufacture of machinery for metallurgy | 2,860 | 578 |
| 2952 | Manufacture of machinery for mining, quarrying and construction | 11,858.1 | 2,029 |
| 2953 | Manufacture of machinery for food, beverage and tobacco processing | 6,696.4 | 1,302 |
| 2954 | Manufacture of machinery for textile, apparel and leather production | 3,749.9 | 788 |
| 2955 | Manufacture of machinery for paper and paperboard production | 2,800 | n.a. |
| 2956 | Manufacture of other special purpose machinery n.e.c. | 23,789.4 | 4,457 |
| 2960 | Manufacture of weapons and ammunition | 5,347.6 | 962 |
| 2971 | Manufacture of electric domestic appliances | 11,337.4 | 2,463 |
| 2972 | Manufacture of non-electric domestic appliances | 1,723.5 | 418 |
| 3001 | Manufacture of office machinery | n.a. | 317 |
| 3002 | Manufacture of computers and other information processing equipment | 8,234 | 1,269 |
| 3110 | Manufacture of electric motors, generators and transformers | 17,000 | 3,171 |

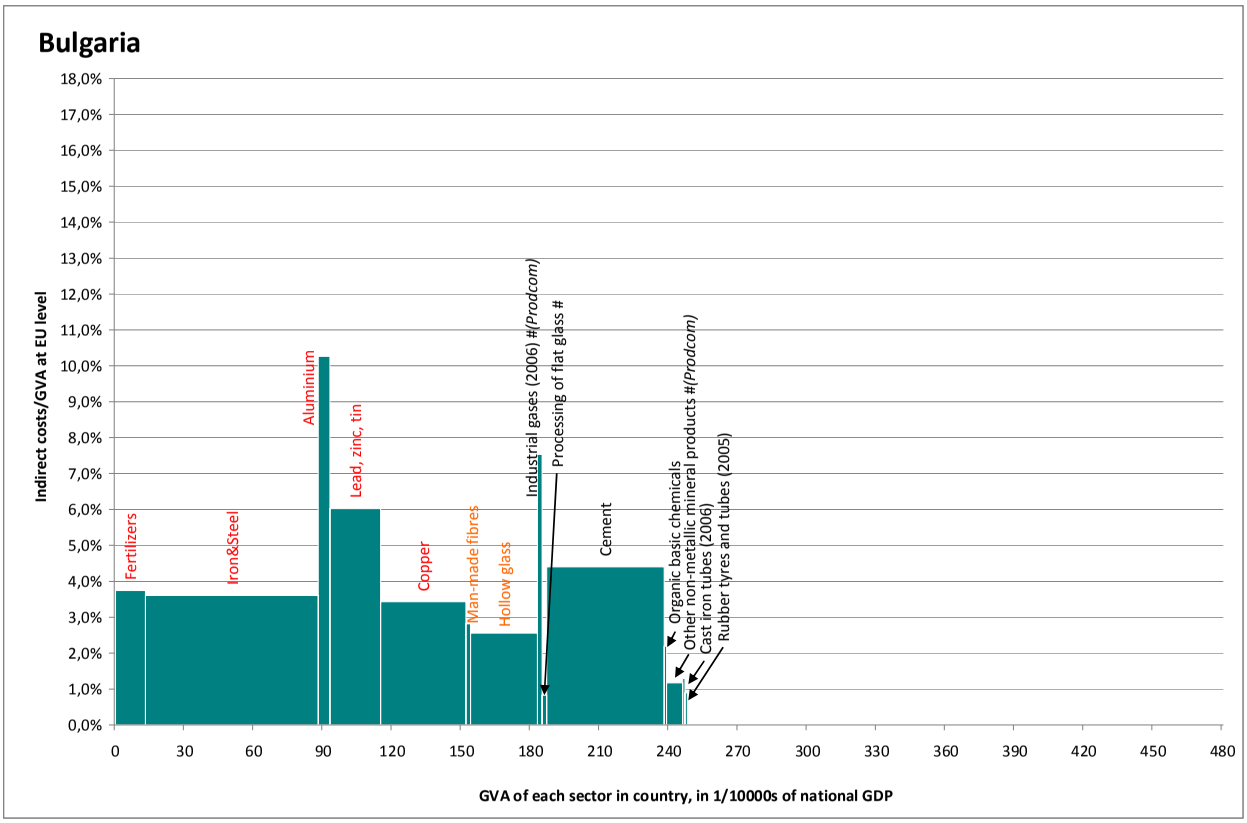
| | | | |
|---|---|---|---|
| 3120 | Manufacture of electricity distribution and control apparatus | 31,700 | 5,390 |
| 3130 | Manufacture of insulated wire and cable | 6,614 | n.a. |
| 3140 | Manufacture of accumulators, primary cells and primary batteries | 1,679.6 | 331 |
| 3150 | Manufacture of lighting equipment and electric lamps | 8,265.4 | 1,665 |
| 3161 | Manufacture of electrical equipment for engines and vehicles n.e.c. | 8,220.1 | 2,609 |
| 3162 | Manufacture of other electrical equipment n.e.c. | 12,259.5 | 2,419 |
| 3210 | Manufacture of electronic valves and tubes and other electronic components | 20,000 | n.a. |
| 3220 | Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy | n.a. | 2,714 |
| 3230 | Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods | 7,681.1 | 1,604 |
| 3310 | Manufacture of medical and surgical equipment and orthopaedic appliances | 24,064.3 | 4,567 |
| 3320 | Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment | 25,032 | 3,757 |
| 3330 | Manufacture of industrial process control equipment | 5,490.4 | 1,005 |
| 3340 | Manufacture of optical instruments and photographic equipment | 7,718.4 | 1,251 |
| 3350 | Manufacture of watches and clocks | 600 | 119 |
| 3410 | Manufacture of motor vehicles | 95,463.2 | 11,000 |
| 3420 | Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers | 9,273.2 | 2,000 |
| 3430 | Manufacture of parts and accessories for motor vehicles and their engines | 50,659.1 | 9,677 |
| 3511 | Building and repairing of ships | 9,525.9 | 2,326 |
| 3512 | Building and repairing of pleasure and sporting boats | 4,000 | 800 |
| 3520 | Manufacture of railway and tramway locomotives and rolling stock | 7,586.8 | 1,655 |
| 3530 | Manufacture of aircraft and spacecraft | 31,738.4 | 3,998 |
| 3541 | Manufacture of motorcycles | 1,469.9 | 265 |

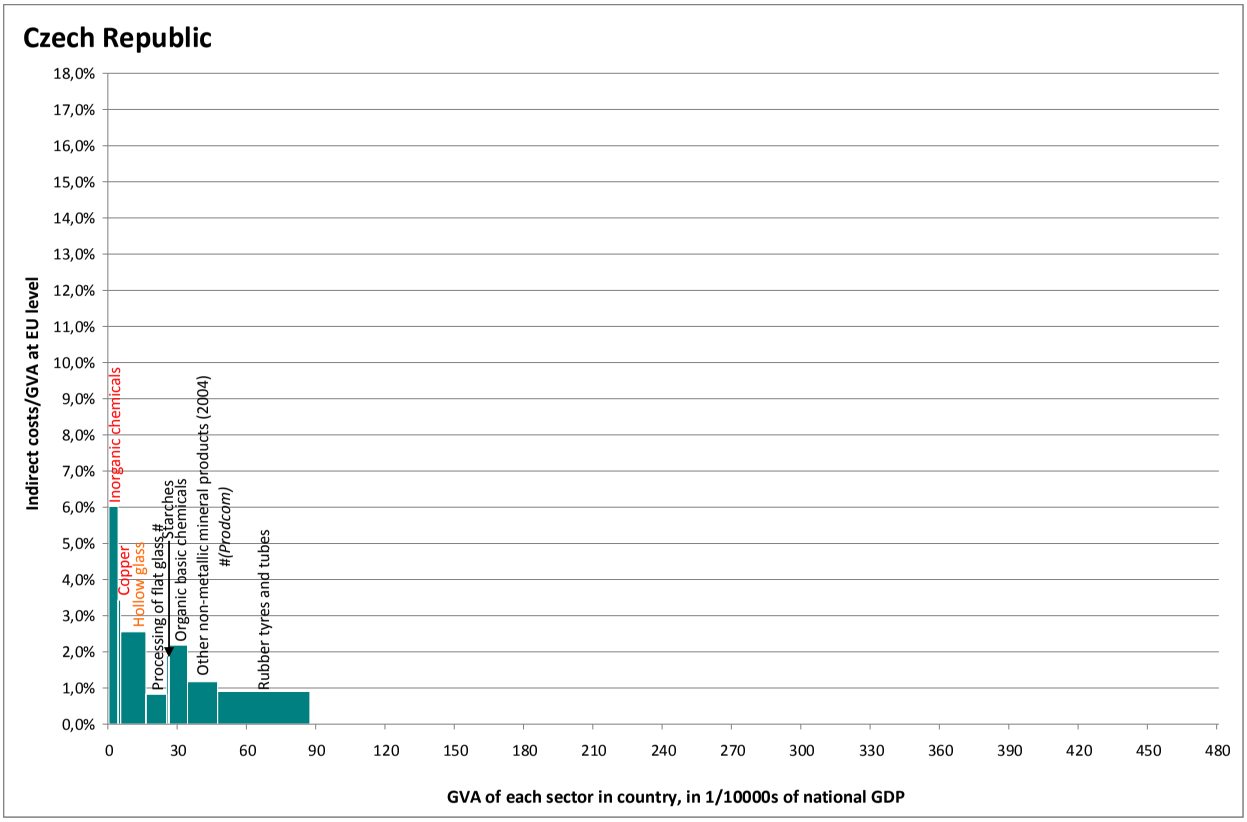
| | | | |
|---|---|---|---|
| 3542 | Manufacture of bicycles | 775.8 | 228 |
| 3543 | Manufacture of invalid carriages | 370.8 | 69 |
| 3550 | Manufacture of other transport equipment n.e.c. | 527.3 | 129 |
| 3611 | Manufacture of chairs and seats | 9,011.2 | 2,902 |
| 3612 | Manufacture of other office and shop furniture | 7,478.6 | 1,842 |
| 3613 | Manufacture of other kitchen furniture | 5,017.5 | 1,350 |
| 3614 | Manufacture of other furniture | 17,822.2 | 7,015 |
| 3615 | Manufacture of mattresses | 1,810.5 | 460 |
| 3621 | Striking of coins | 298.1 | 48 |
| 3622 | Manufacture of jewellery and related articles n.e.c. | 3,523.3 | 1,088 |
| 3630 | Manufacture of musical instruments | 738.9 | 236 |
| 3640 | Manufacture of sports goods | 1,700 | 430 |
| 3650 | Manufacture of games and toys | n.a. | 571 |
| 3661 | Manufacture of imitation jewellery | n.a. | n.a. |
| 3662 | Manufacture of brooms and brushes | 948.5 | 246 |
| 3663 | Other manufacturing n.e.c. | 5,799.7 | 1,811 |
| 3710 | Recycling of metal waste and scrap | n.a. | 800 |
| 3720 | Recycling of non-metal waste and scrap | 4,329.6 | 826 |

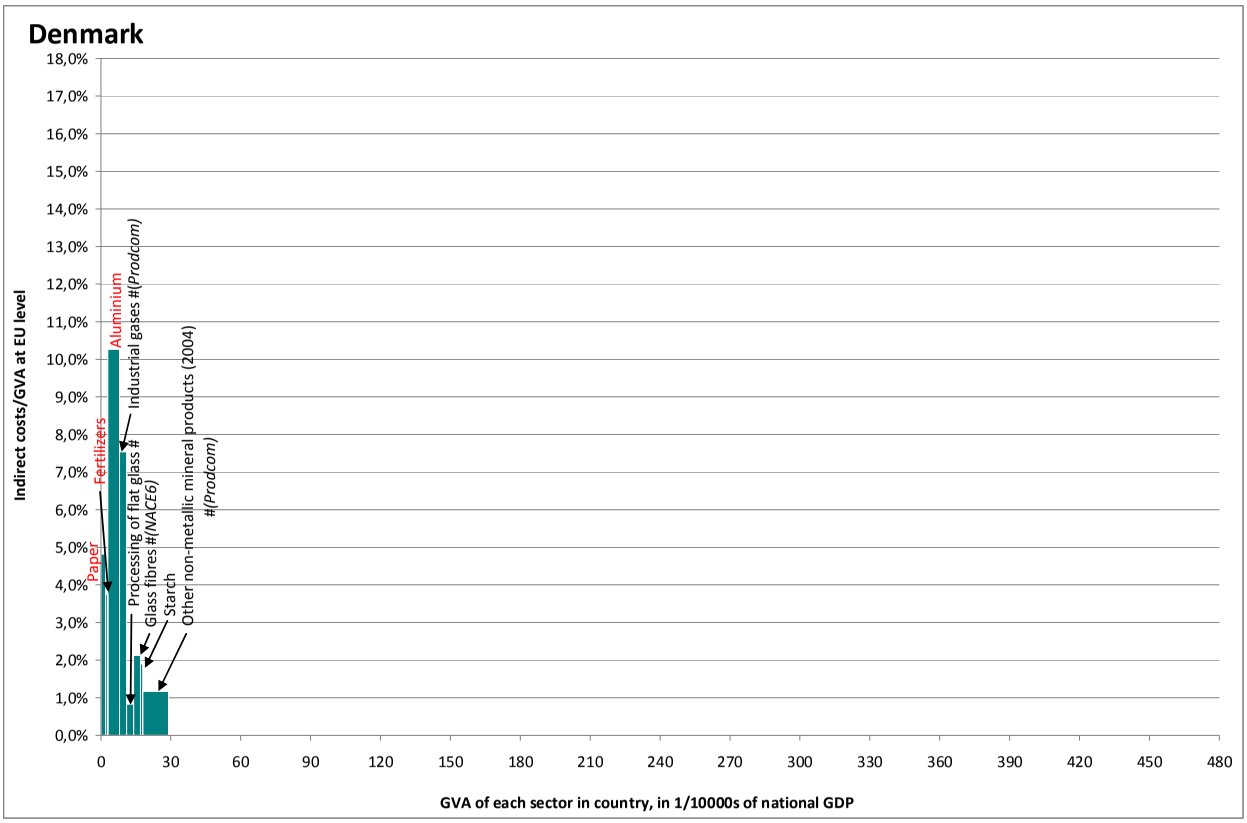
# ANNEX 15

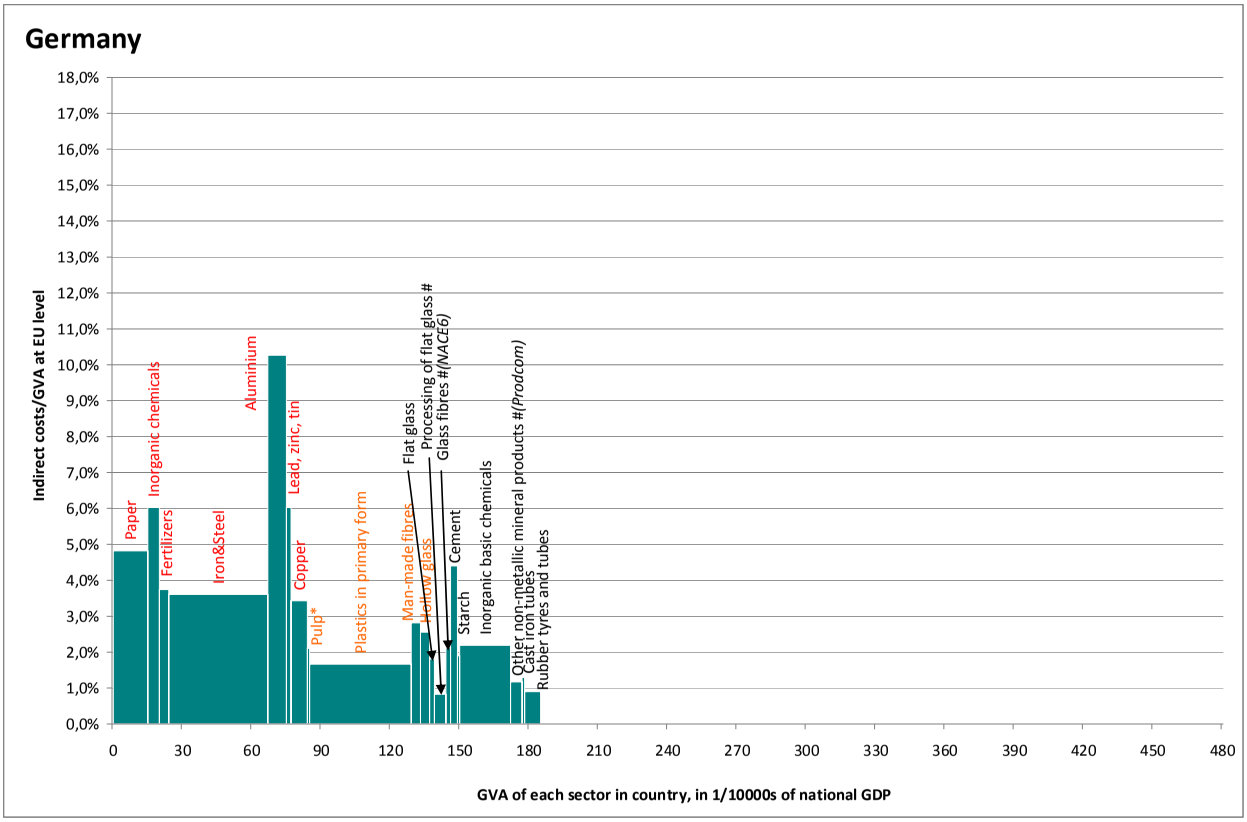
## Share of sectors of national GDP

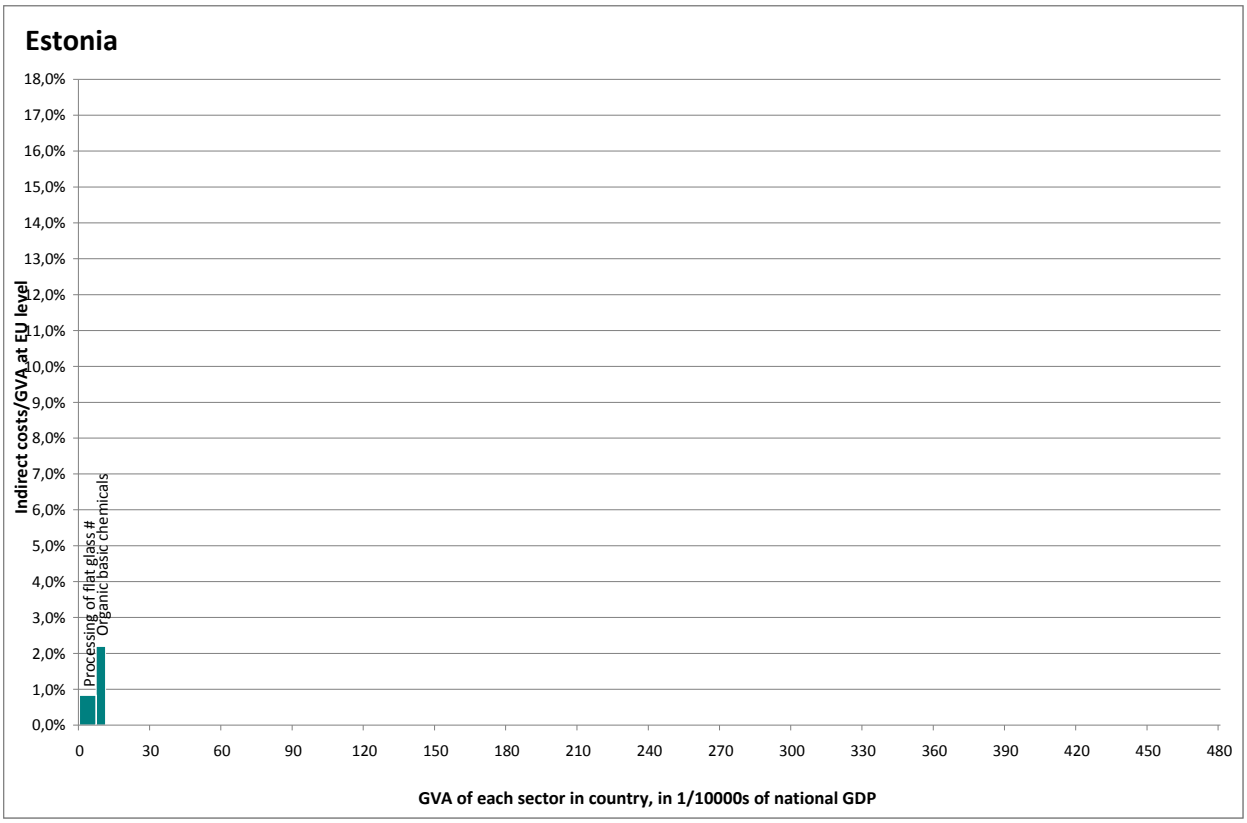


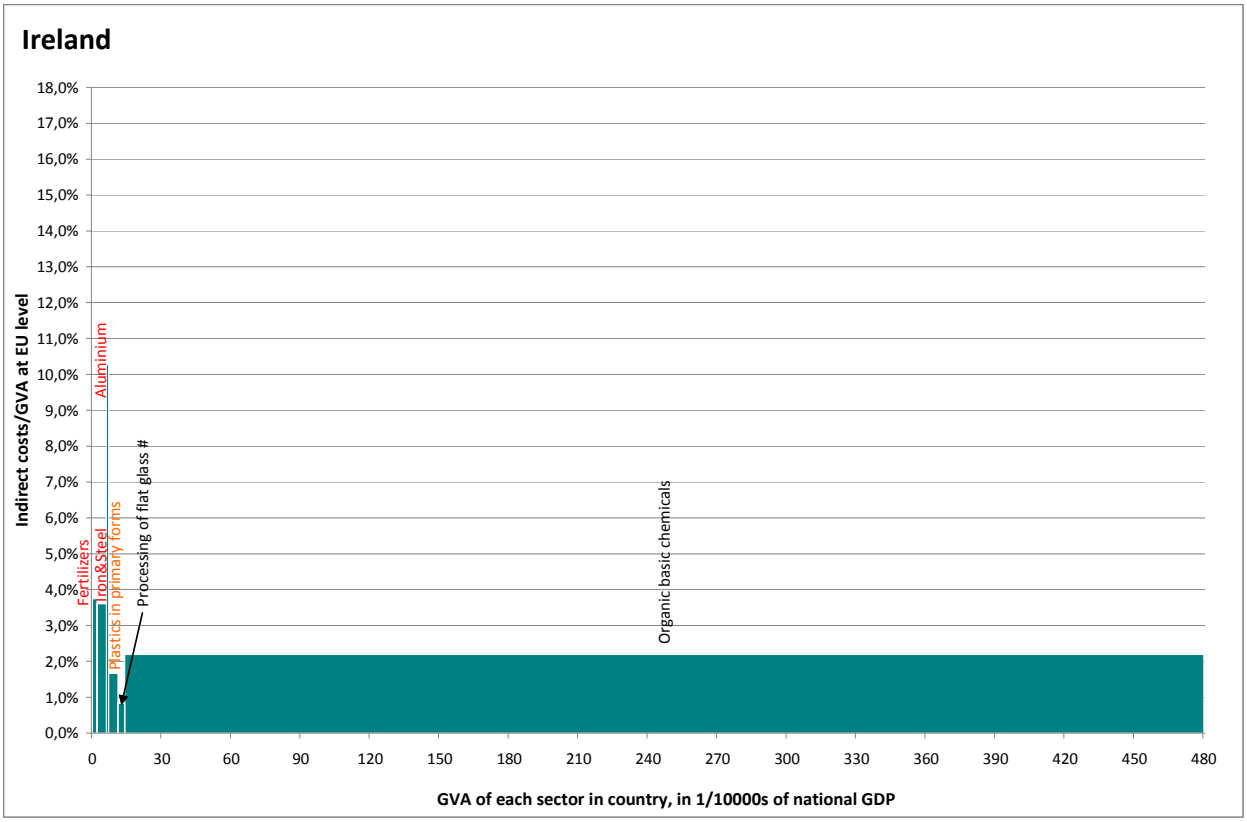

Bulgaria
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Fertilizers
Iron&Steel
Aluminium
Lead, zinc, tin
Copper
Man-made fibres
Hollow glass
Industrial gases (2006) #(Prodcom)
Processing of flat glass #
Cement
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
Cast iron tubes (2006)
Rubber tyres and tubes (2005)

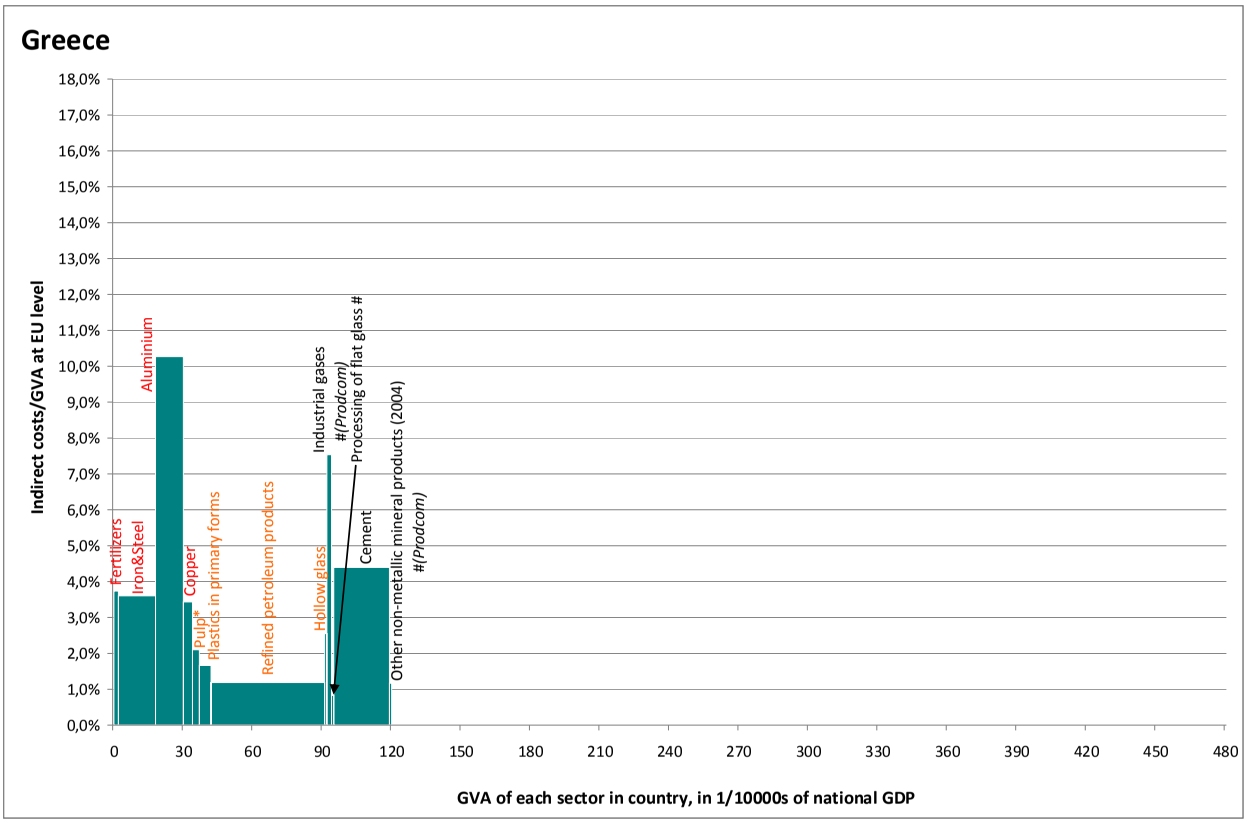

Czech Republic
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Inorganic chemicals
Copper
Hollow glass
Processing of flat glass #
Starches
Organic basic chemicals
Other non-metallic mineral products (2004) #(Prodcam)
Rubber tyres and tubes

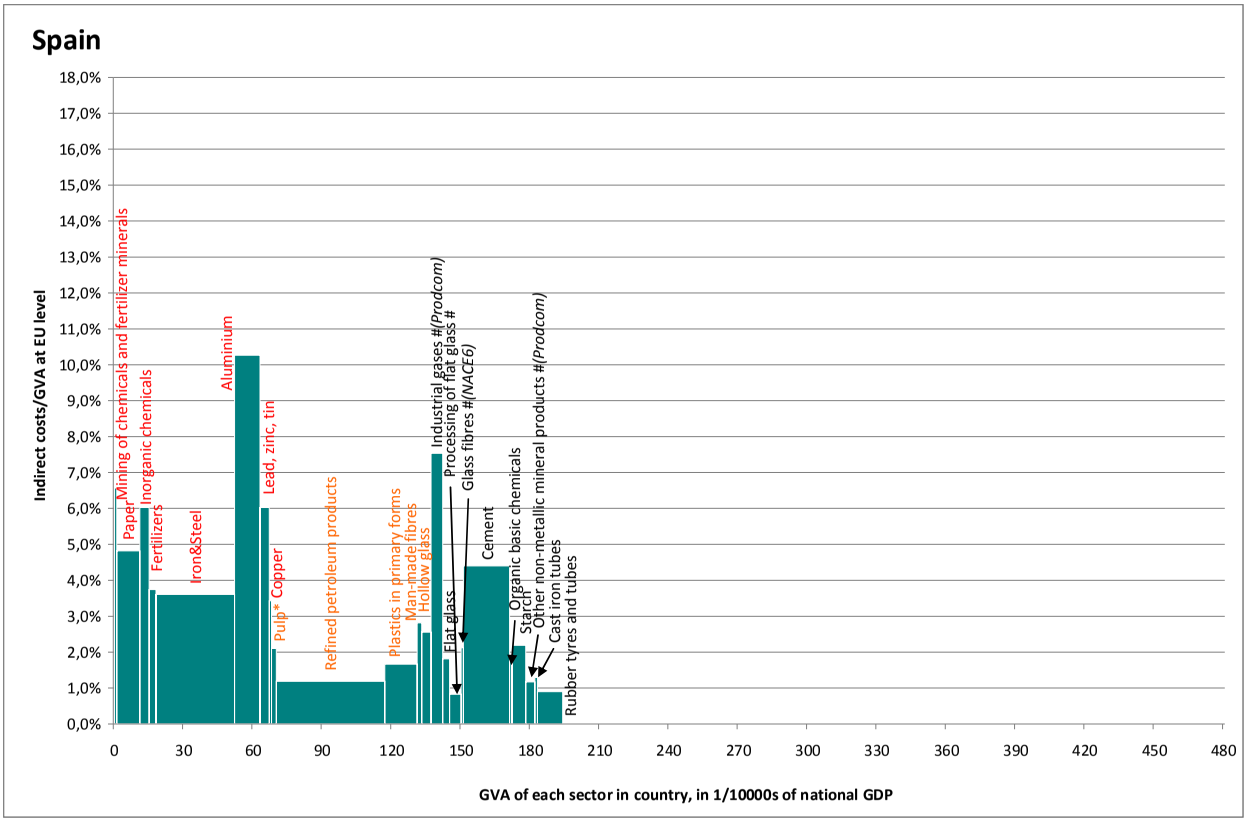

Denmark
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Fertilizers
Aluminium
Industrial gases #(Prodcom)
Processing of flat glass #(NACE6)
Glass fibres #
Starch
Other non-metallic mineral products (2004) #(Prodcom)

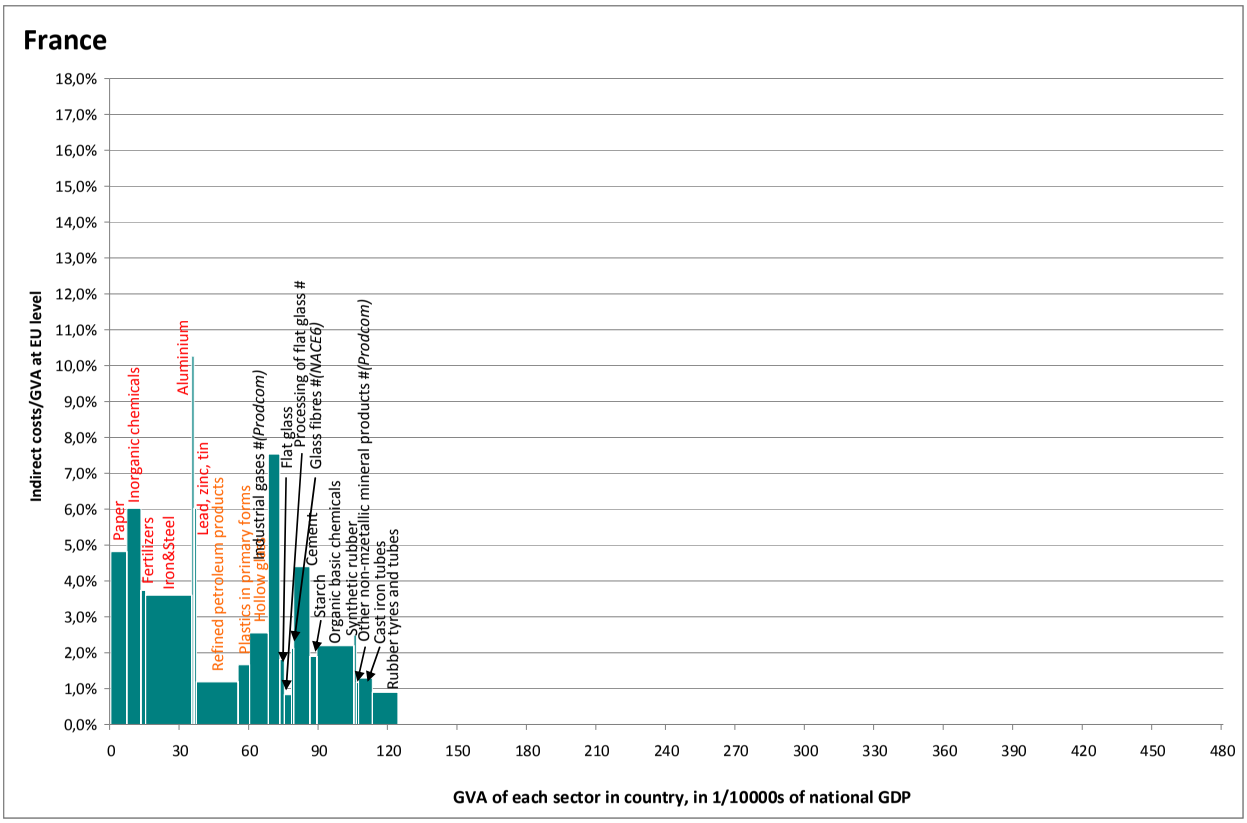

Germany
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Lead, zinc, tin
Copper
Pulp*
Plastics in primary form
Man-made fibres
Hollow glass
Flat glass
Processing of flat glass #(NACE6)
Glass fibres #
Cement
Starch
Inorganic basic chemicals
Other non-metallic mineral products #(Prodcom)
Cast iron tubes
Rubber tyres and tubes

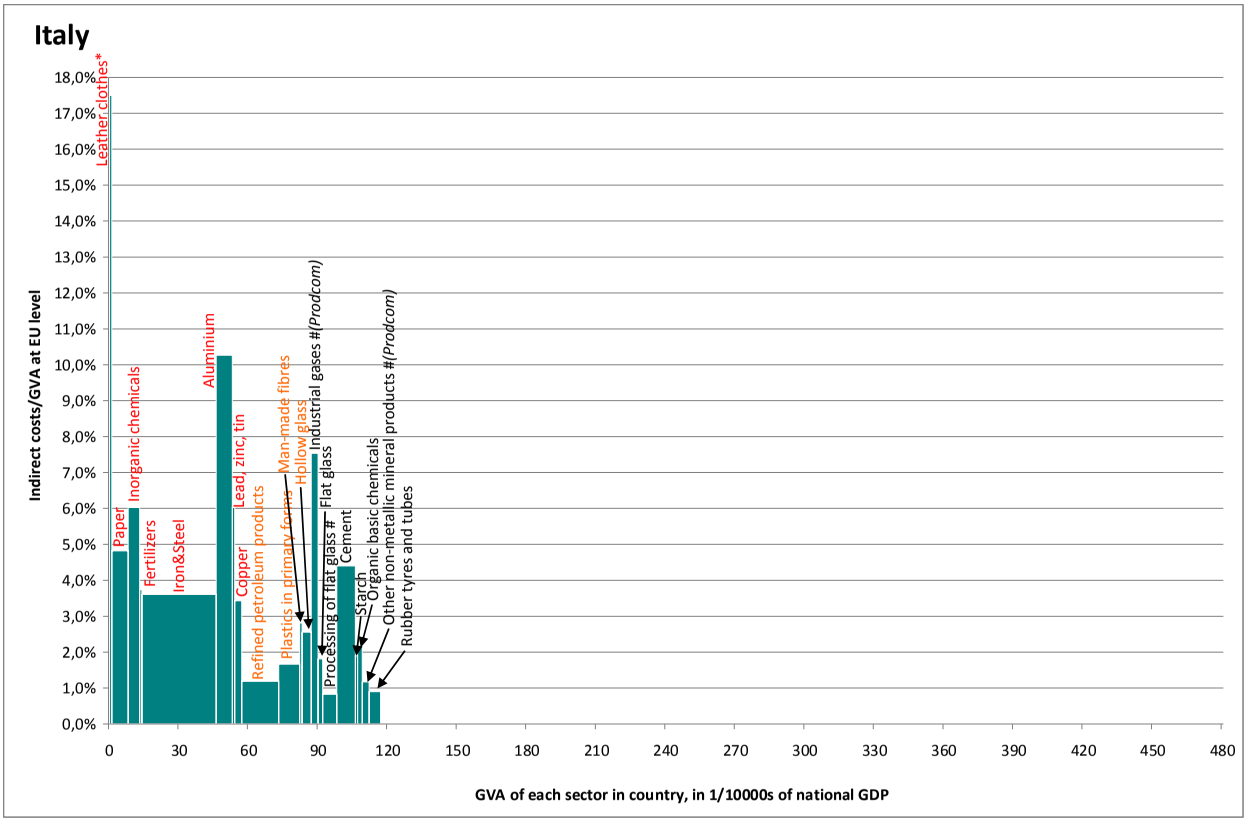

Estonia
Indirect costs/GVA at EU level
18,0%
17,0%
16,0%
15,0%
14,0%
13,0%
12,0%
11,0%
10,0%
9,0%
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
Processing of flat glass #
Organic basic chemicals
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
GVA of each sector in country, in 1/10000s of national GDP

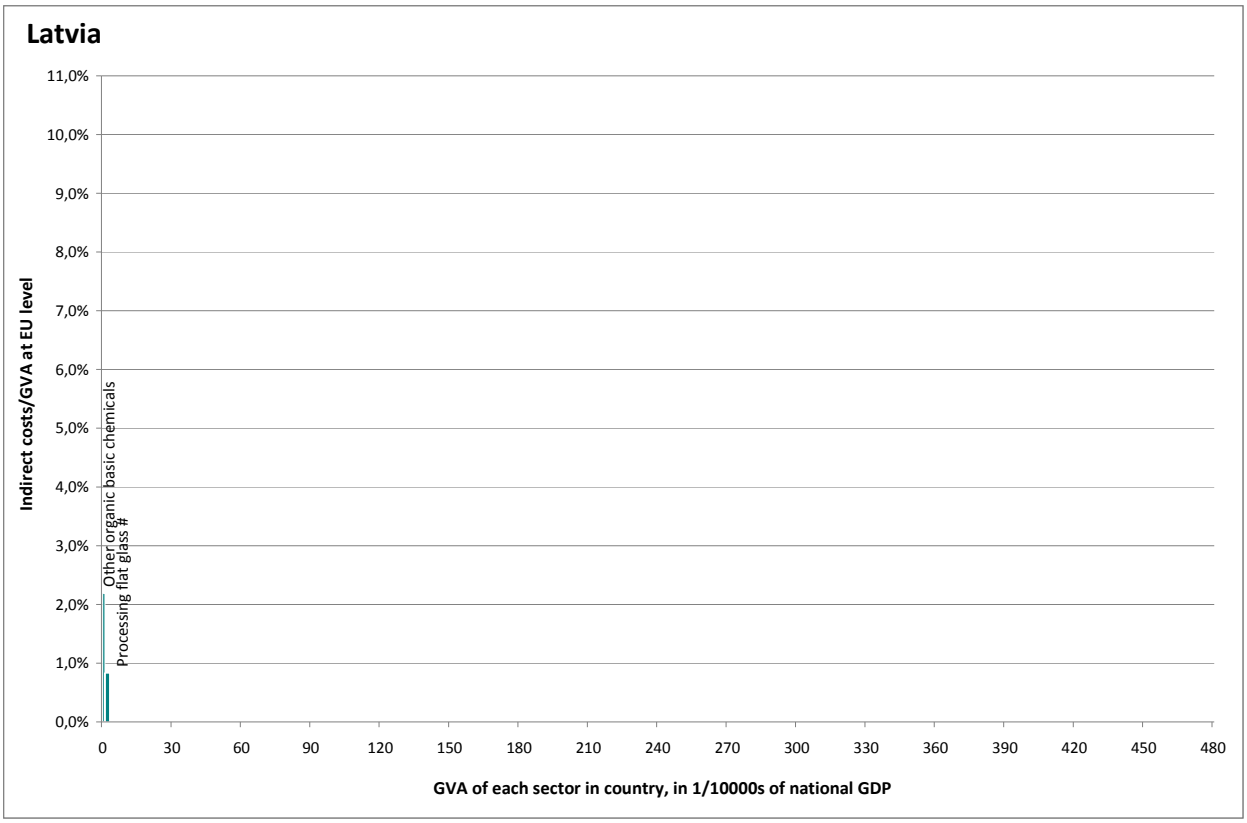

Ireland
Indirect costs/GVA at EU level
18,0%
17,0%
16,0%
15,0%
14,0%
13,0%
12,0%
11,0%
10,0%
9,0%
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
Fertilizers
Iron&Steel
Aluminium
Plastics in primary forms
Processing of flat glass #
Organic basic chemicals
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
GVA of each sector in country, in 1/10000s of national GDP

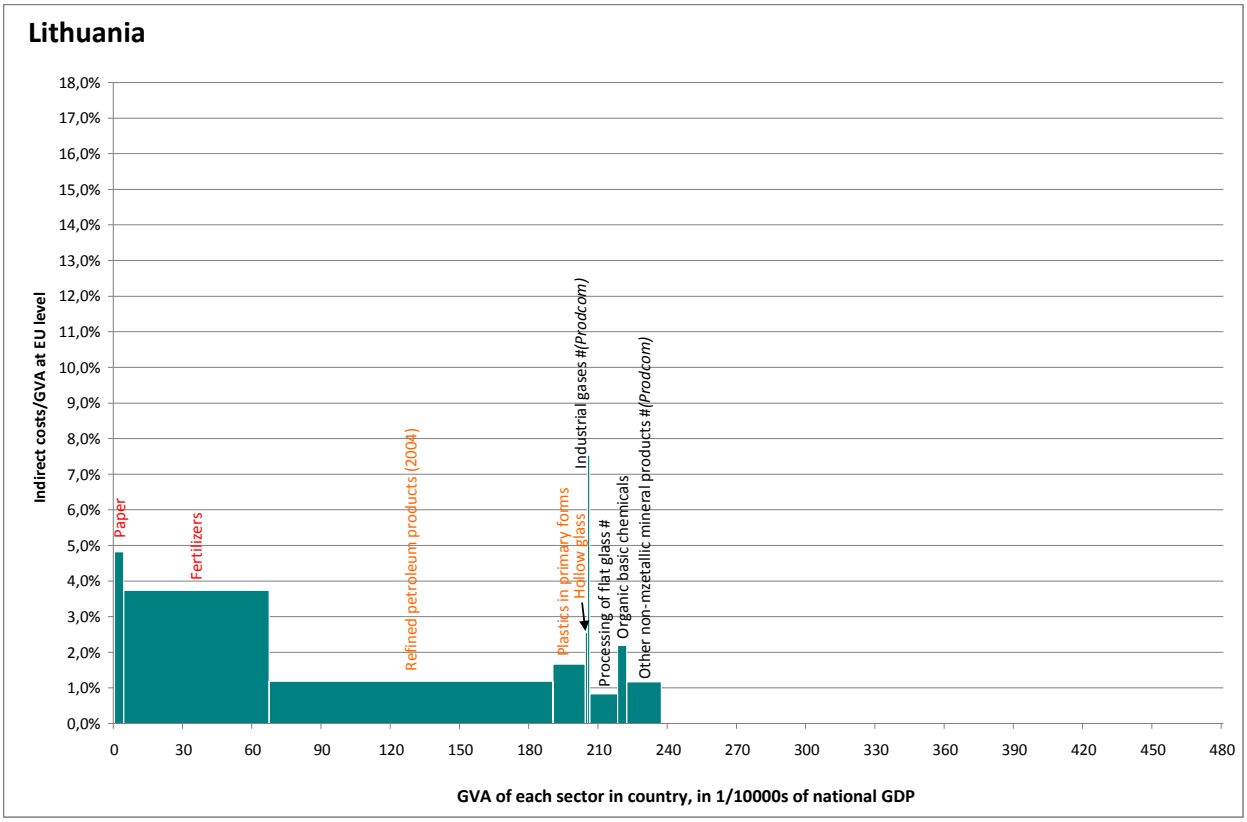

Greece
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Fertilizers
Iron&Steel
Aluminium
Copper
Pulp*
Plastics in primary forms
Refined petroleum products
Hollow glass
Industrial gases #(Prodcom)
Processing of flat glass #
Cement
Other non-metallic mineral products (2004) #(Prodcom)

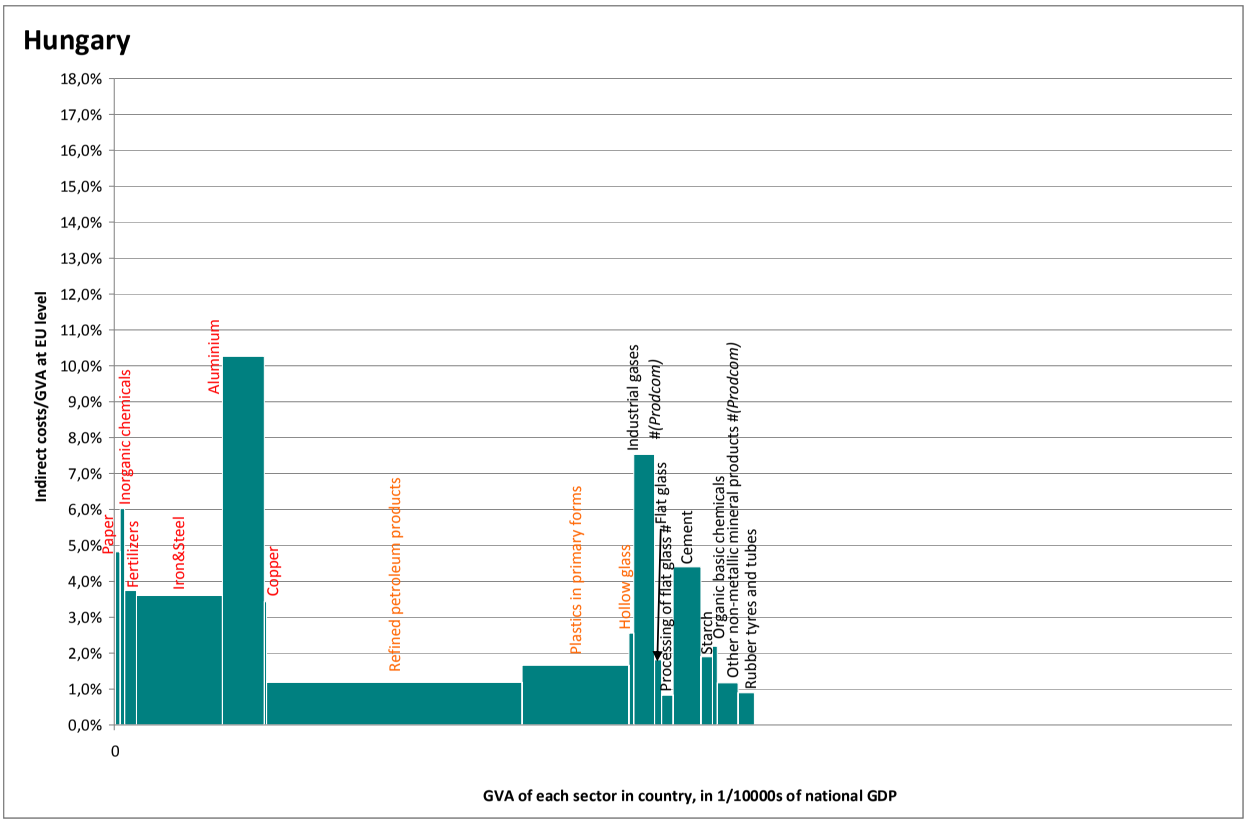

Spain
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Mining of chemicals and fertilizer minerals
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Lead, zinc, tin
Pulp*
Copper
Refined petroleum products
Plastics in primary forms
Man-made fibres
Hollow glass
Flat glass
Industrial gases #(Prodcom)
Processing of flat glass #
Glass fibres #(NACE6)
Cement
Organic basic chemicals
Starch
Other non-metallic mineral products #(Prodcom)
Cast iron tubes
Rubber tyres and tubes

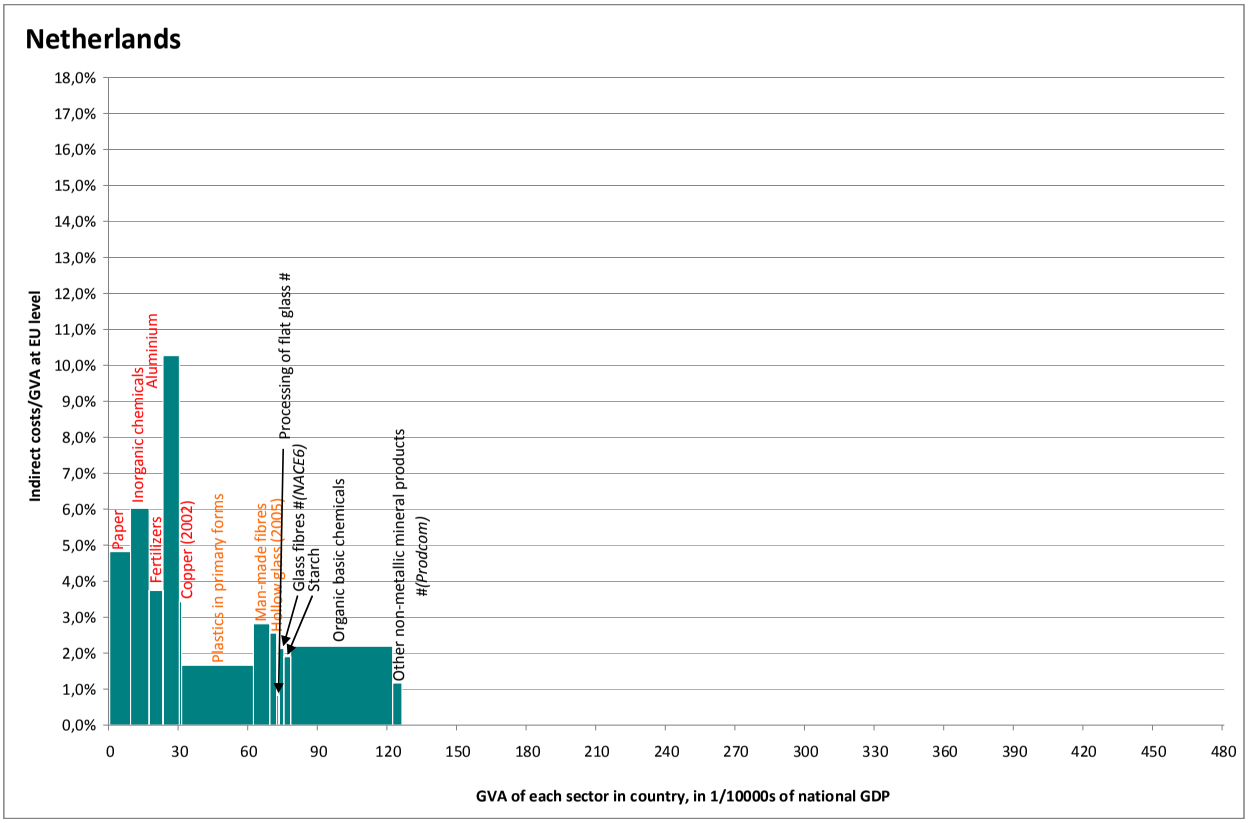

France
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Lead, zinc, tin
Refined petroleum products
Plastics in primary forms
Hollow glass
Industrial gases #(Prodcom)
Flat glass
Processing of flat glass #(NACE6)
Glass fibres #
Cement
Starch
Organic basic chemicals
Synthetic rubber
Other non-mzetallic mineral products #(Prodcom)
Cast iron tubes
Rubber tyres and tubes

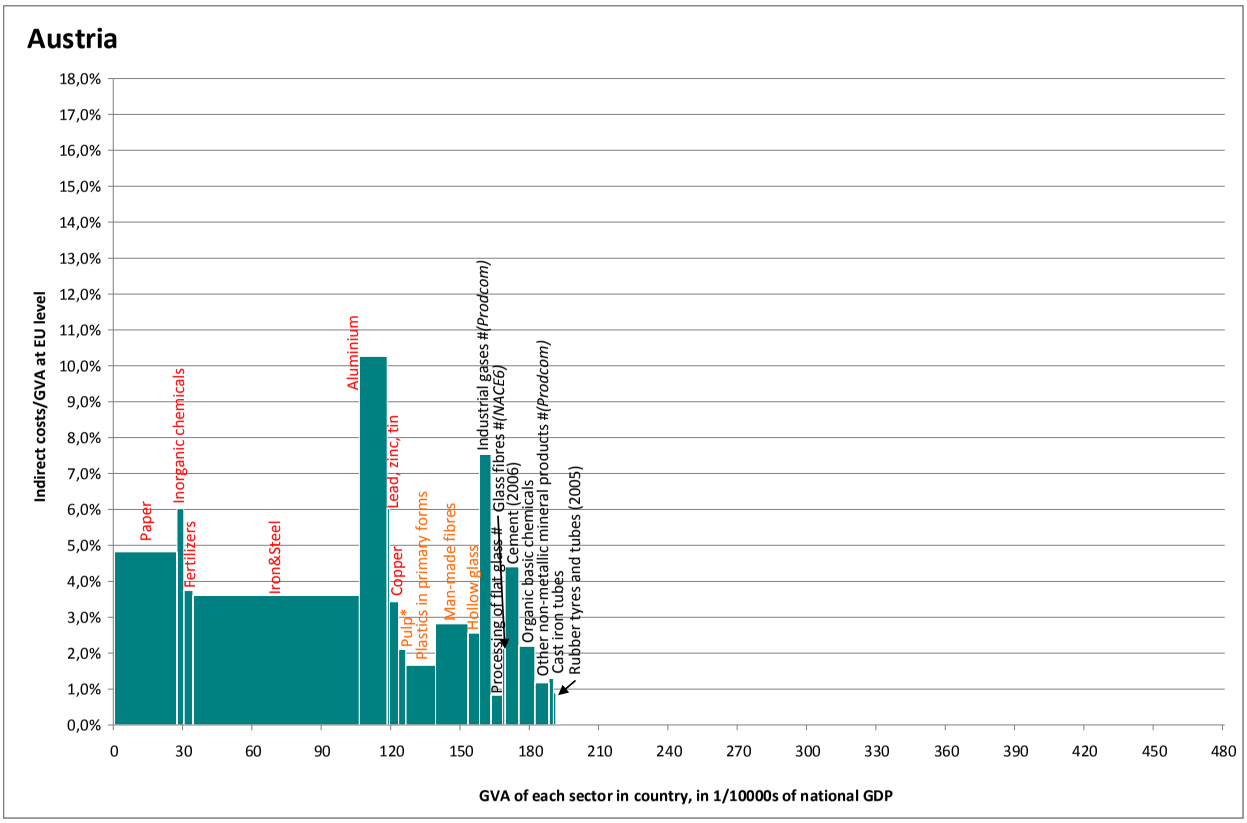

Italy
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Leather clothes*
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Lead, zinc, tin
Copper
Refined petroleum products
Plastics in primary forms
Man-made fibres
Hollow glass
Industrial gases #(Prodcom)
Flat glass
Processing of flat glass #
Cement
Starch
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
Rubber tyres and tubes

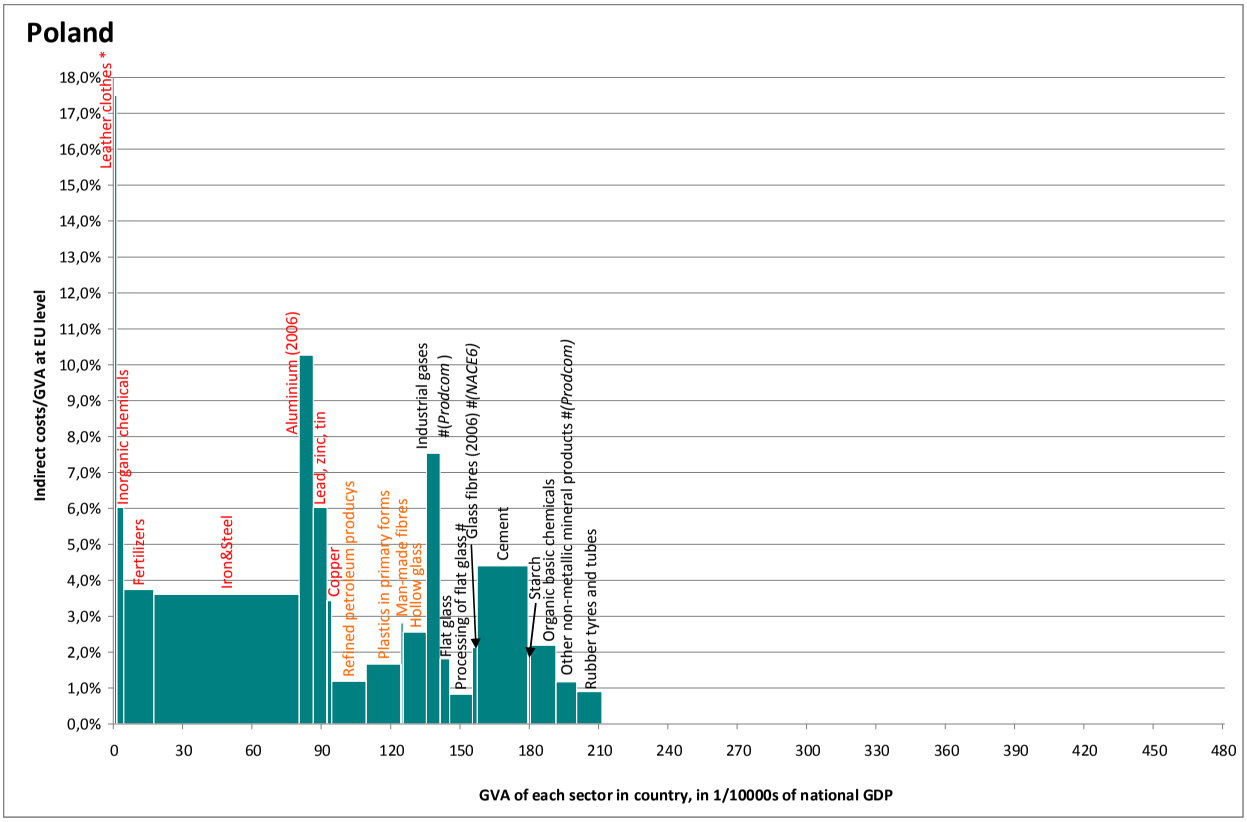

Latvia
Indirect costs/GVA at EU level
11,0%
10,0%
9,0%
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
Other organic basic chemicals
Processing flat glass #
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
GVA of each sector in country, in 1/10000s of national GDP

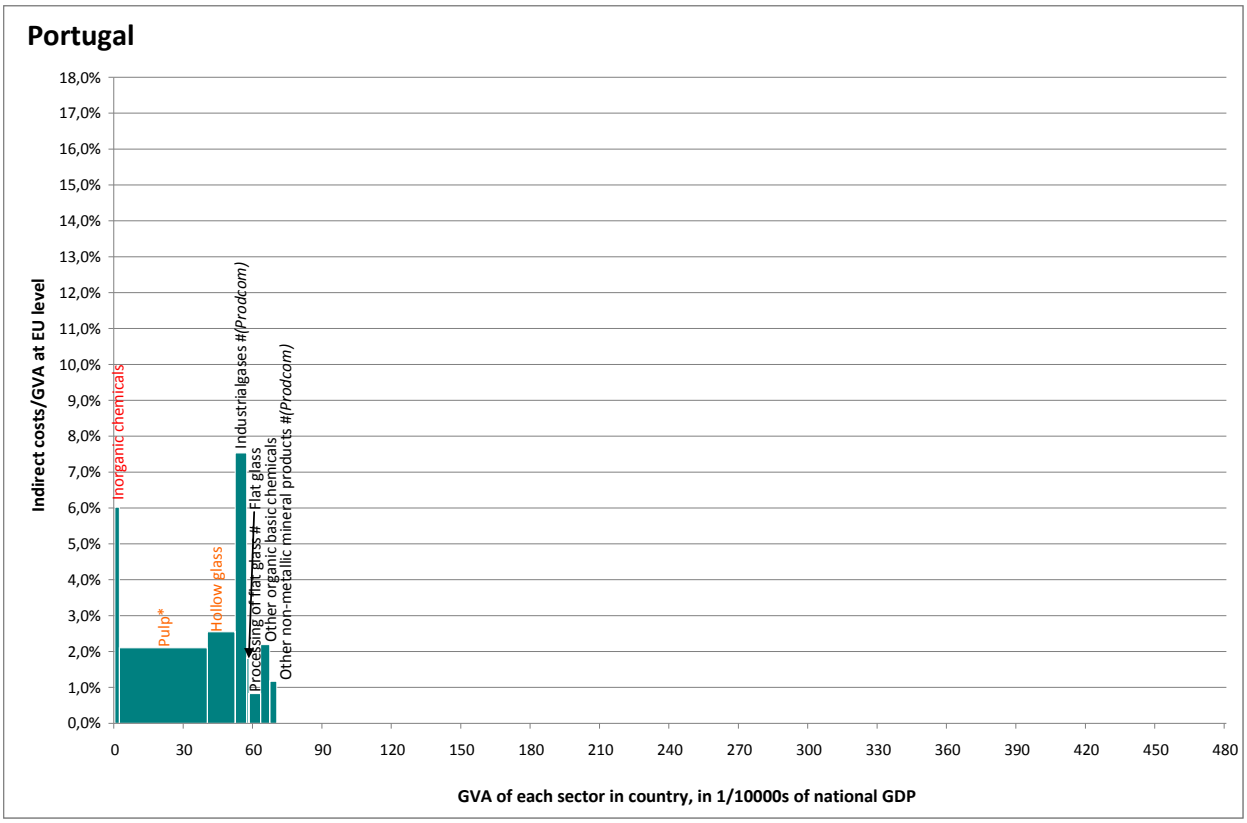

Lithuania
Indirect costs/GVA at EU level
18,0%
17,0%
16,0%
15,0%
14,0%
13,0%
12,0%
11,0%
10,0%
9,0%
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
Paper
Fertilizers
Refined petroleum products (2004)
Plastics in primary forms
Hollow glass
Industrial gases #(Prodcom)
Processing of flat glass #
Organic basic chemicals
Other non-mzetallic mineral products #(Prodcom)
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
GVA of each sector in country, in 1/10000s of national GDP

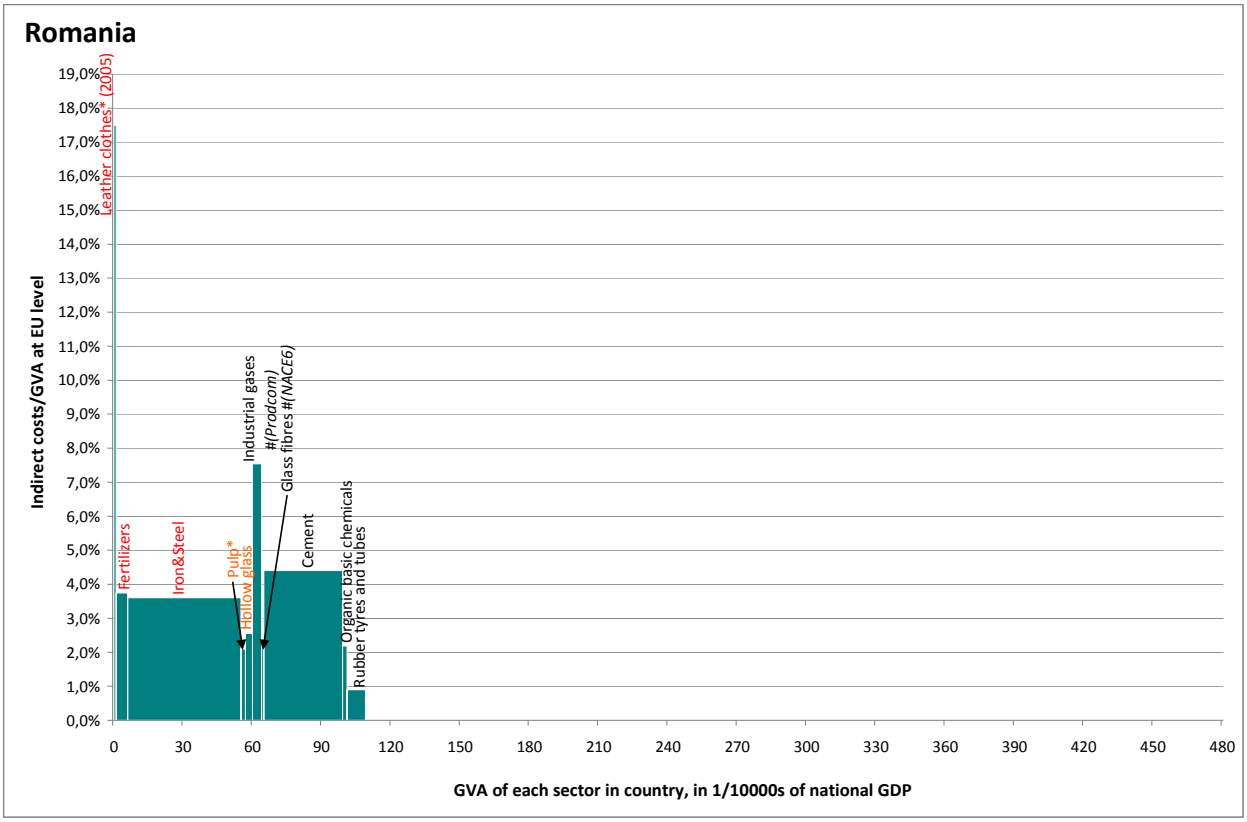

Hungary
Indirect costs/GVA at EU level
18,0%
17,0%
16,0%
15,0%
14,0%
13,0%
12,0%
11,0%
10,0%
9,0%
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
0
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Copper
Refined petroleum products
Plastics in primary forms
Hollow glass
Industrial gases #(Prodcom)
Processing of flat glass #
Flat glass
Cement
Starch
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
Rubber tyres and tubes
GVA of each sector in country, in 1/10000s of national GDP

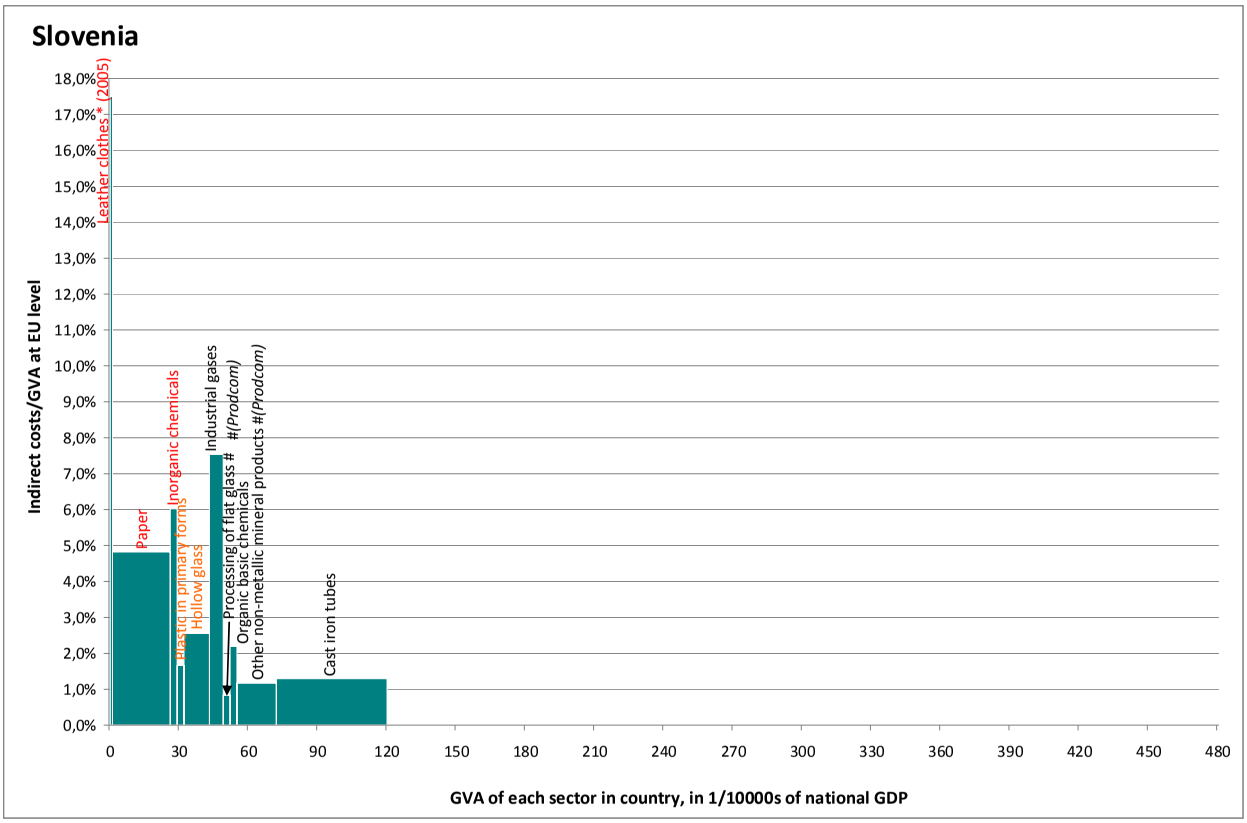

Netherlands
Indirect costs/GVA at EU level
18,0%
17,0%
16,0%
15,0%
14,0%
13,0%
12,0%
11,0%
10,0%
9,0%
8,0%
7,0%
6,0%
5,0%
4,0%
3,0%
2,0%
1,0%
0,0%
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
Paper
Inorganic chemicals
Fertilizers
Aluminium
Copper (2002)
Plastics in primary forms
Man-made fibres
Hollow glass (2005)
Glass fibres #(NACE6)
Processing of flat glass #
Starch
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
GVA of each sector in country, in 1/10000s of national GDP

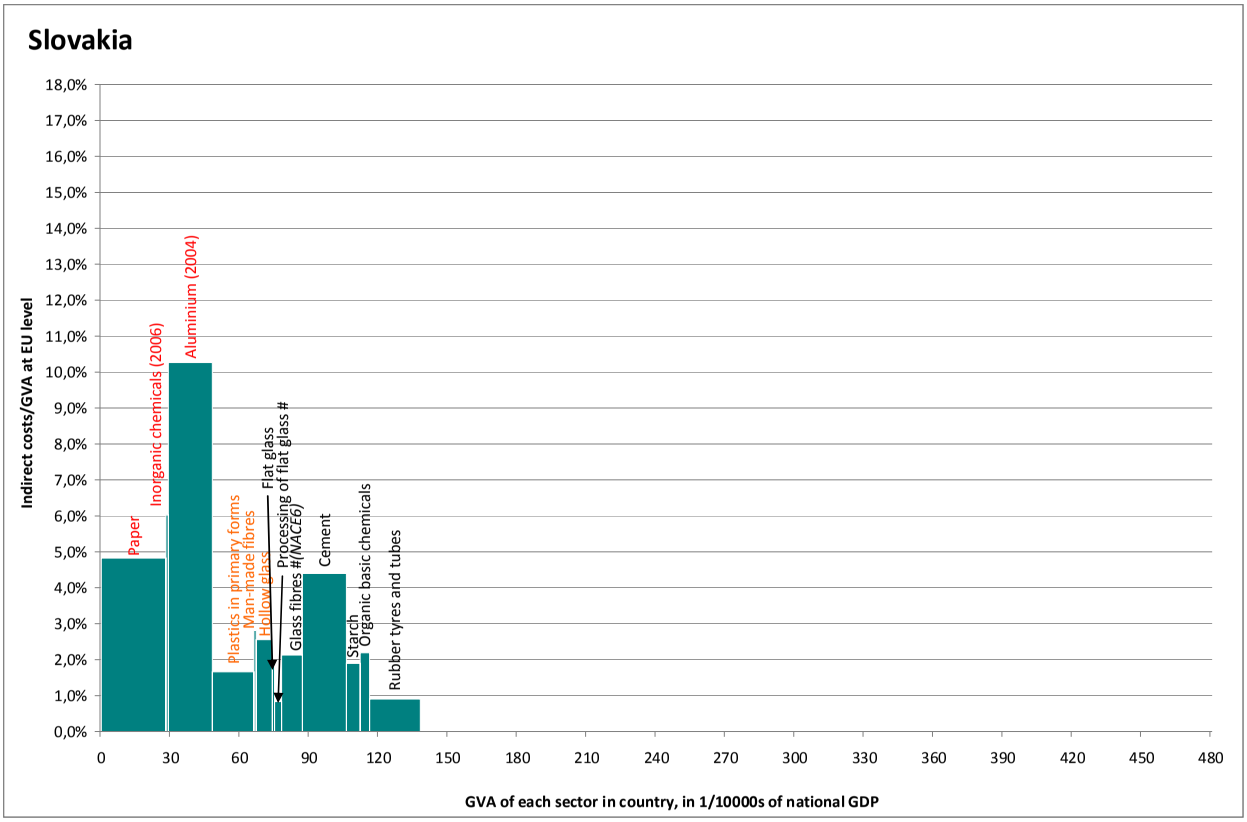

Austria
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Lead, zinc, tin
Copper
Pulp*
Plastics in primary forms
Man-made fibres
Hollow glass
Processing of flat glass #
Glass fibres #(NACE6)
Industrial gases #(Prodcom)
Cement (2006)
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
Cast iron tubes
Rubber tyres and tubes (2005)

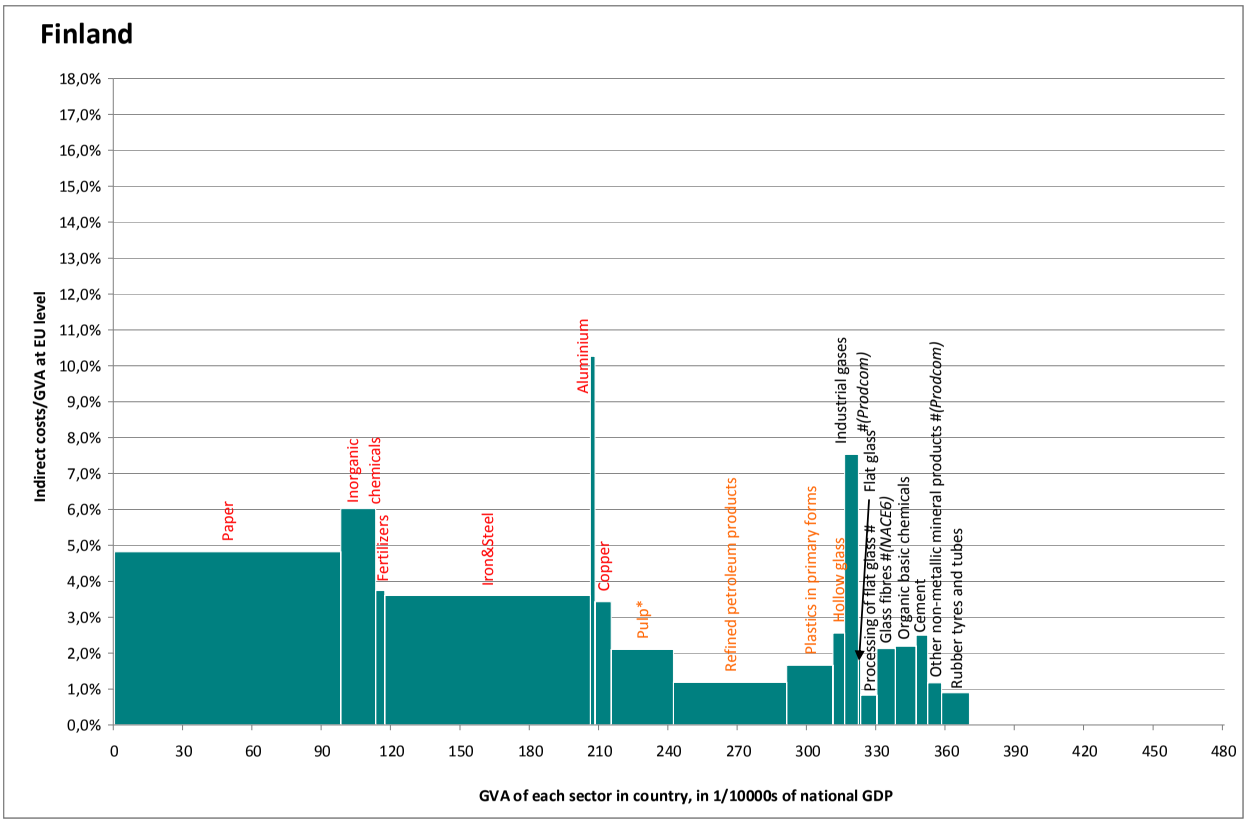

Poland
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Leather,clothes *
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium (2006)
Lead, zinc, tin
Refined petroleum producys
Copper
Plastics in primary forms
Man-made fibres
Hollow glass
Industrial gases #(Prodcom )
Flat glass
Processing of flat glass #
Glass fibres (2006) #(NACE6)
Cement
Starch
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
Rubber tyres and tubes

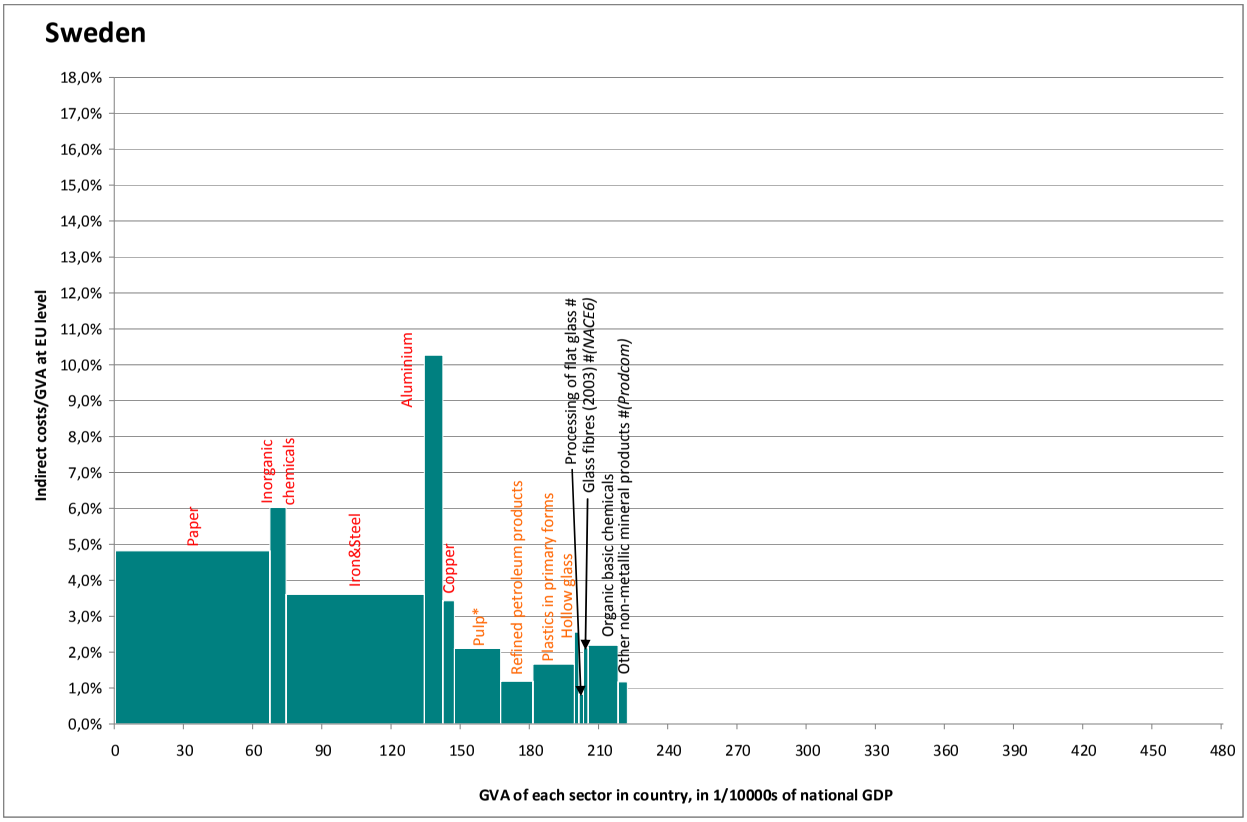

Portugal
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Inorganic chemicals
Pulp*
Hollow glass
Industrial gases #(Prodcom)
Processing of flat glass #
Flat glass
Other organic basic chemicals
Other non-metallic mineral products #(Prodcom)

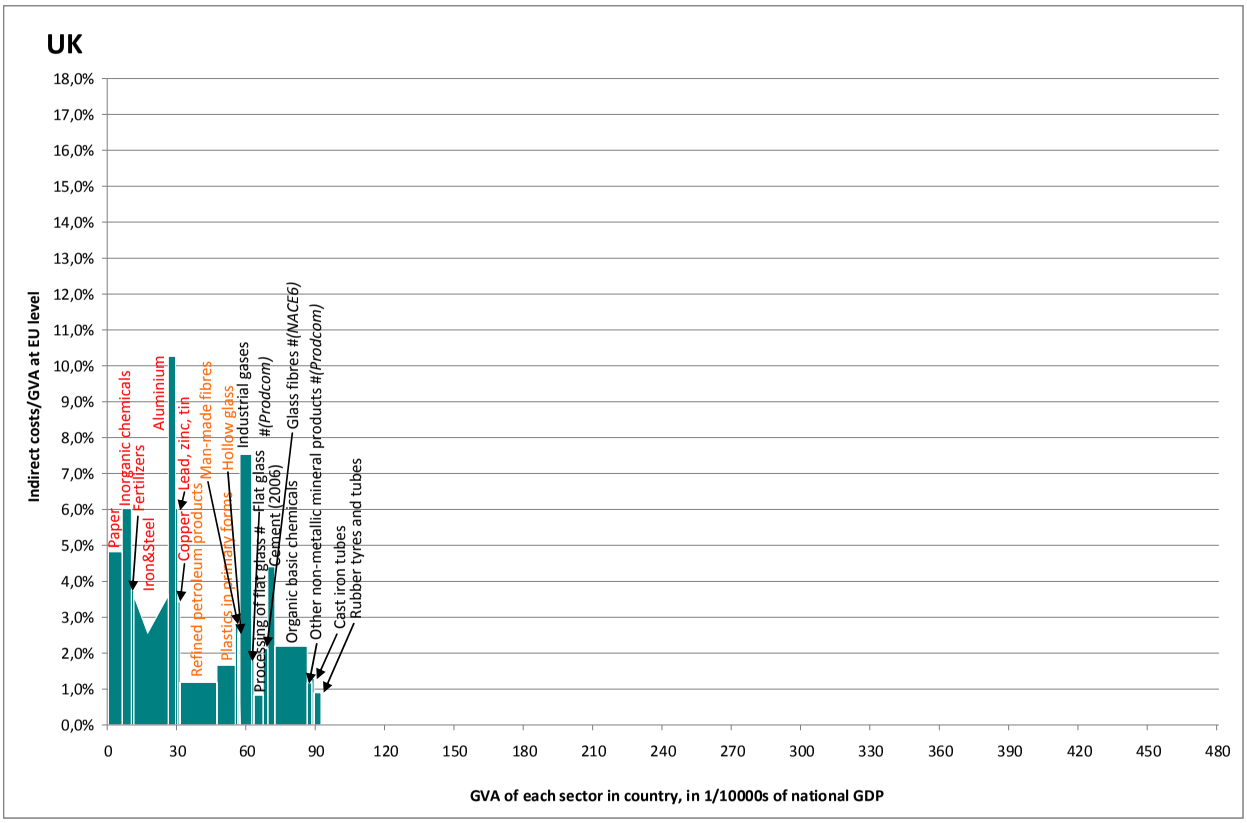

Romania
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Leather clothes* (2005)
Fertilizers
Iron&Steel
Pulp*
Hollow glass
Industrial gases #(Prodcom)
Glass fibres #(NACE6)
Cement
Organic basic chemicals
Rubber tyres and tubes

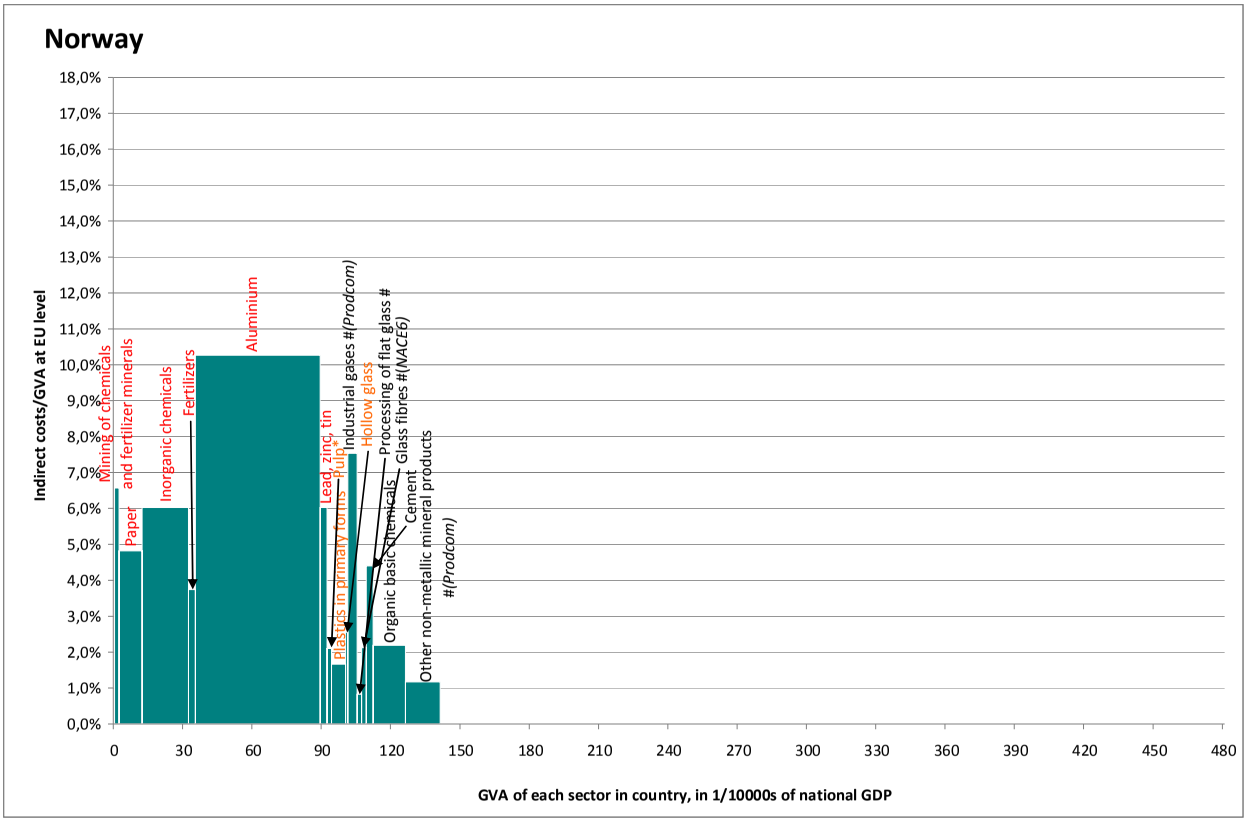

Slovenia
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Leather clothes * (2005)
Paper
Inorganic chemicals
Plastic in primary forms
Hollow glass
Industrial gases
Processing of flat glass # #(Prodcom)
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)
Cast iron tubes


Slovakia
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals (2006)
Aluminium (2004)
Plastics in primary forms
Man-made fibres
Hollow glass
Flat glass
Processing of flat glass # #(NACE6)
Glass fibres #(NACE6)
Cement
Starch
Organic basic chemicals
Rubber tyres and tubes


Finland
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Copper
Pulp*
Refined petroleum products
Plastics in primary forms
Hollow glass
Industrial gases
Flat glass #(Prodcom)
Processing of flat glass # Glass fibres #(NACE6)
Organic basic chemicals
Cement
Other non-metallic mineral products #(Prodcom)
Rubber tyres and tubes


Sweden
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals
Iron&Steel
Aluminium
Copper
Pulp*
Refined petroleum products
Plastics in primary forms
Hollow glass
Processing of flat glass # Glass fibres (2003) #(NACE6)
Organic basic chemicals
Other non-metallic mineral products #(Prodcom)


UK
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Paper
Inorganic chemicals
Fertilizers
Iron&Steel
Aluminium
Copper
Lead, zinc, tin
Refined petroleum products
Man-made fibres
Plastics in primary forms
Hollow glass
Industrial gases
Processing of flat glass #
Flat glass #(Prodcom)
Cement (2006)
Organic basic chemicals
Glass fibres #(NACE6)
Other non-metallic mineral products #(Prodcom)
Cast iron tubes
Rubber tyres and tubes


Norway
Indirect costs/GVA at EU level
GVA of each sector in country, in 1/10000s of national GDP
Mining of chemicals and fertilizer minerals
Paper
Inorganic chemicals
Fertilizers
Aluminium
Lead, zinc, tin
Plastics in primary forms
Industrial gases #(Prodcom)
Hollow glass
Processing of flat glass #
Glass fibres #(NACE6)
Organic basic chemicals
Cement
Other non-metallic mineral products #(Prodcom)

EUROPEAN COMMISSION

Strasbourg, 22.5.2012
SWD(2012) 130 final

Part 6

**COMMISSION STAFF WORKING DOCUMENT**

**Impact Assessment Report**

***Accompanying the document***

**Communication of the Commission**

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

{C(2012) 3230 final}
{SWD(2012) 131 final}

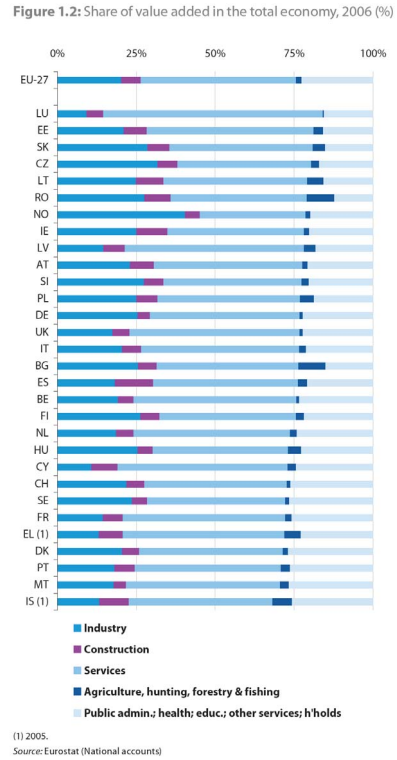
# ANNEXES

# ANNEX 16

## Additional figures

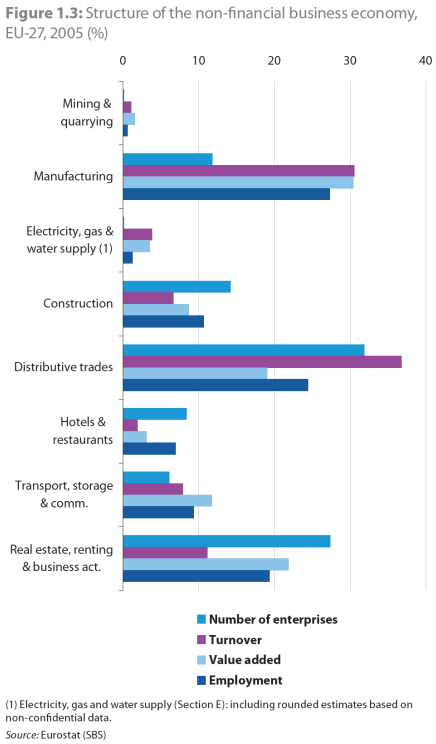
## List of figures

### Figure 1:



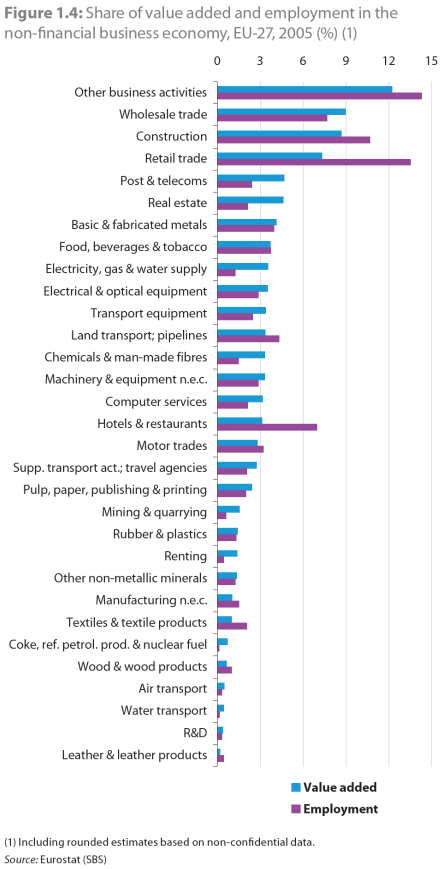

*Source: Eurostat Key Figures on European Business (2008)*

## Figure 2:




*Source: Eurostat Key Figures on European Business (2008)*

## Figure 3:




*Source: Eurostat Key Figures on European Business (2008)*

## Figure 4:

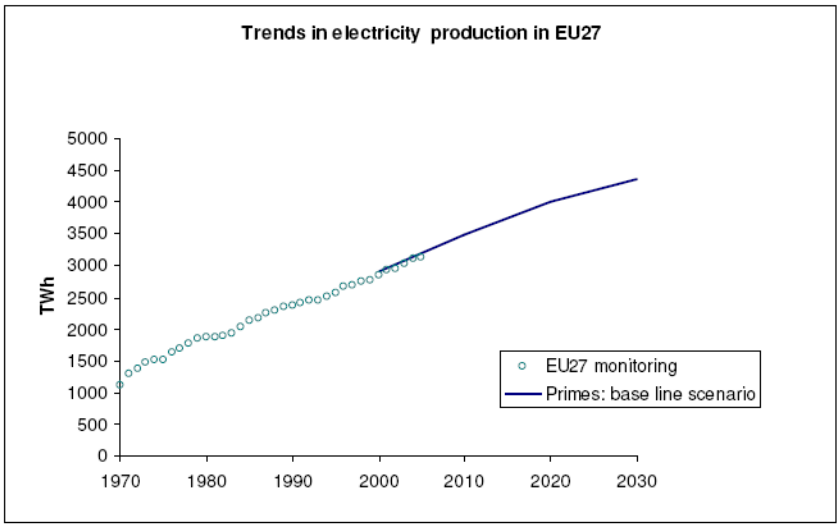



Figure 19 *Trends in electricity production in the EU 1970-2030. Monitoring data are from IEA and Eurostat. Scenario is from Primes (EC,2005).*

*Source: IFIEC (2008)*

**Figure 5:**

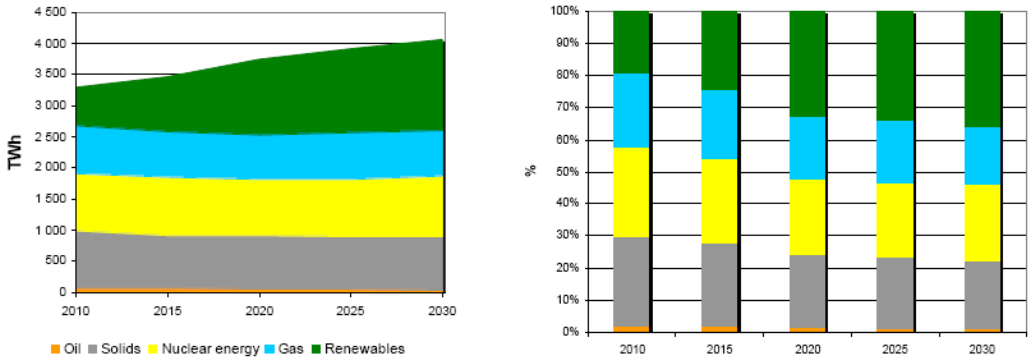
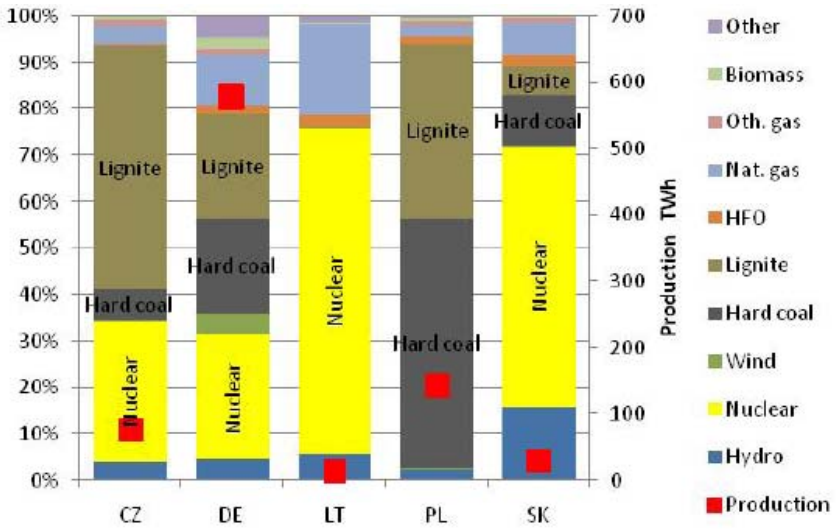



**Figure 4: Gross power generation mix 2000-2030 by source in TWh (left) and corresponding shares of sources in % (right), PRIMES reference scenario**

*Source: EC DG ENER – ENERGY INFRASTRUCTURE – Priorities for 2020 and beyond (2011*

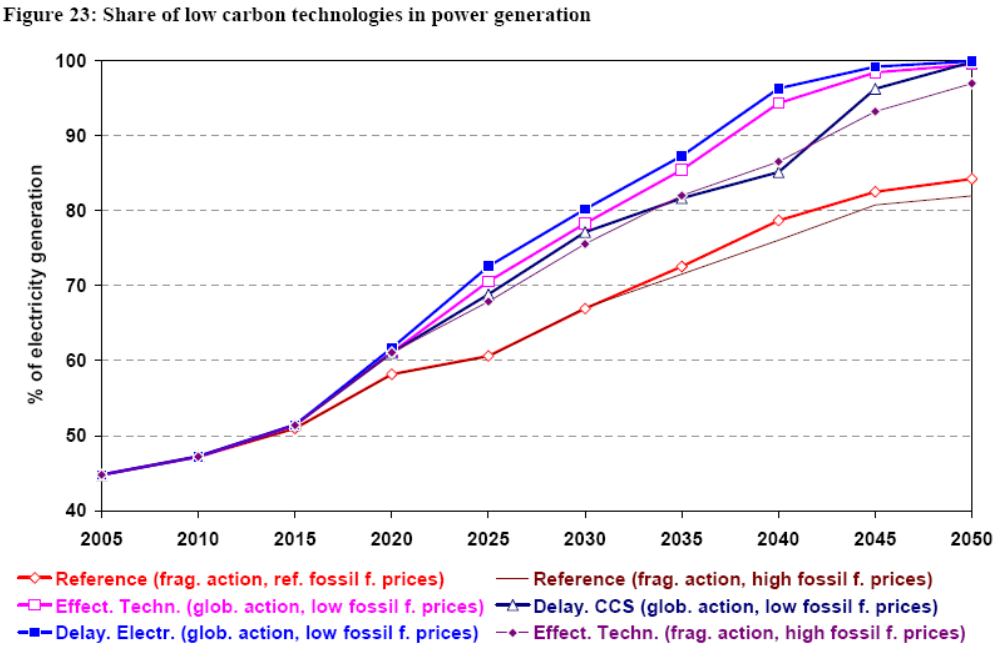
**Figure 6: Fuel structure of electricity generation in selected EU countries**




*Source: Suwala (forthcoming)*

*Source: Dröge (2009)*

**Figure 7:**




*Source: SEC(2011) 288 final*

**Figure 8:**

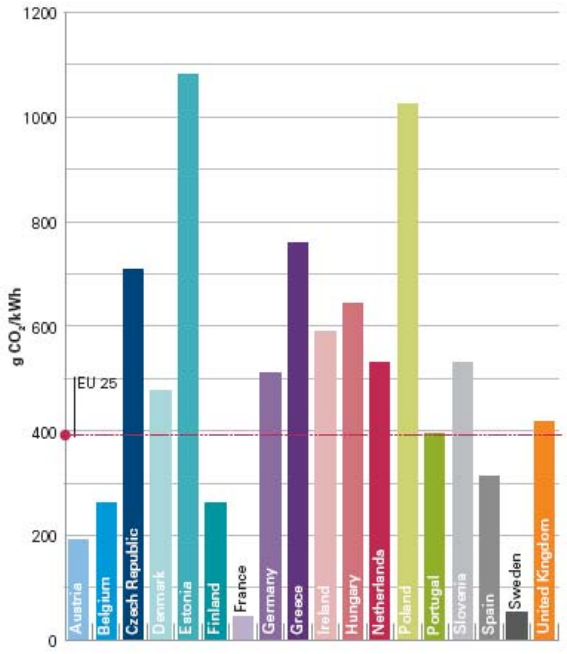



Chart 18

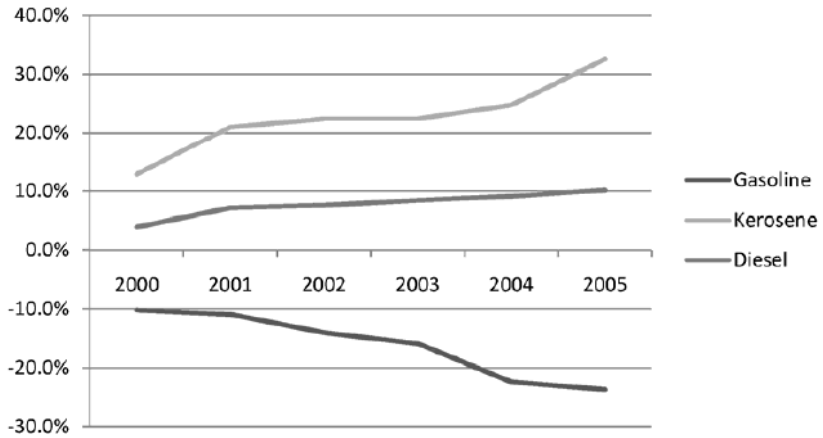
**Carbon intensity of electricity production in EU countries**

**Source** Climate Strategies (2007): Hourcade, Neuhoff, et al.

*Source: Carbon Trust (2008)*

**Figure 9:**

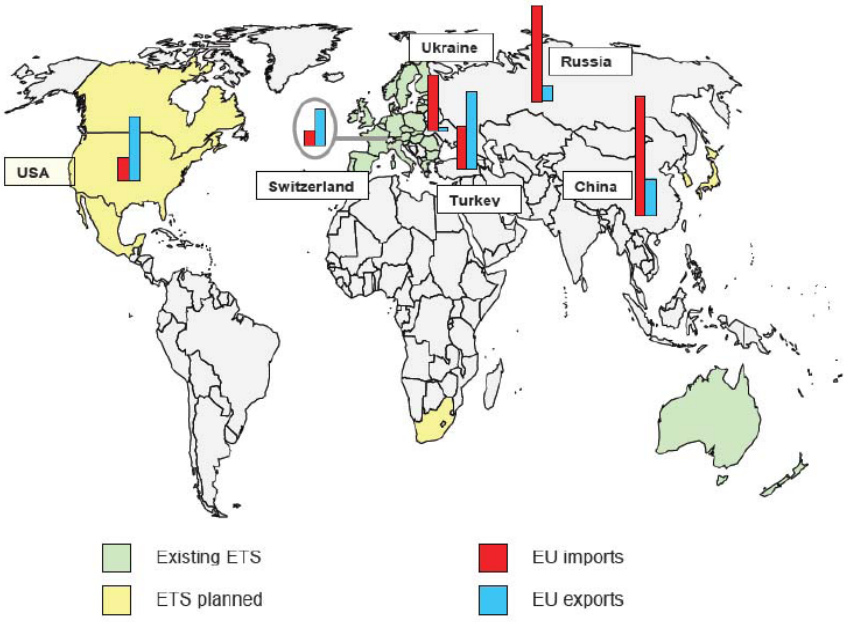
Figure 11: Trade flows as percentage of domestic production in EU-25 (2000-2005)




*Source: Barron et al (2008)*

**Figure 10:**

*Figure 8 Trade in iron and steel, extra-EU trade partners, 2007*




These 6 countries account for approximately 50% of total non-EU iron and steel trade.

*Source: Dröge (2009)*

**Figure 11:**

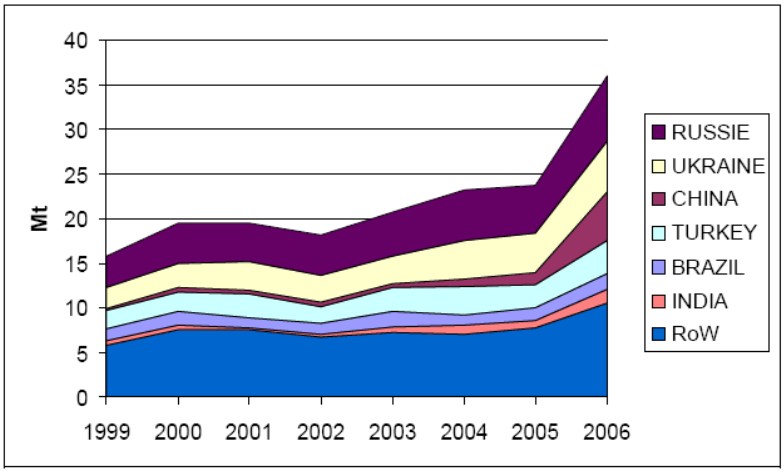
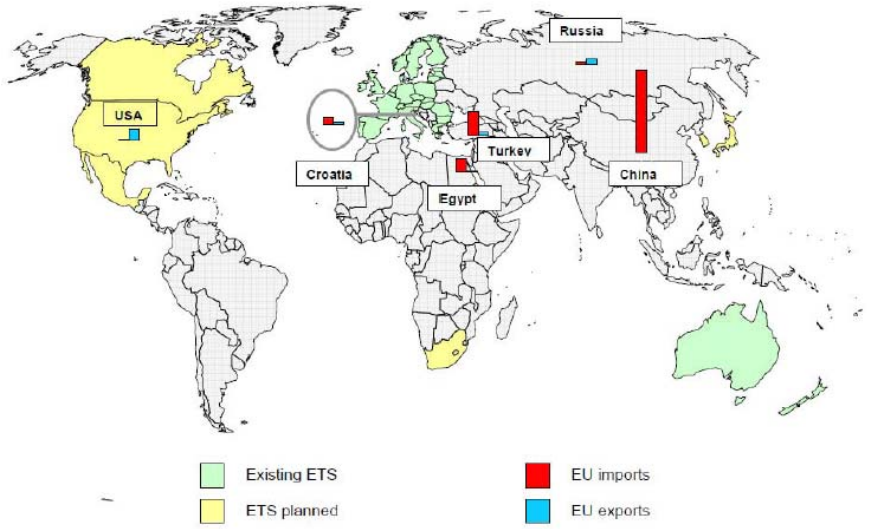



**Figure 54: Extra EU steel imports**

**Figure 12: Trade in cement with non-EU partners (2007)**




*Source: Dröge (2009)*

**Figure 13:**

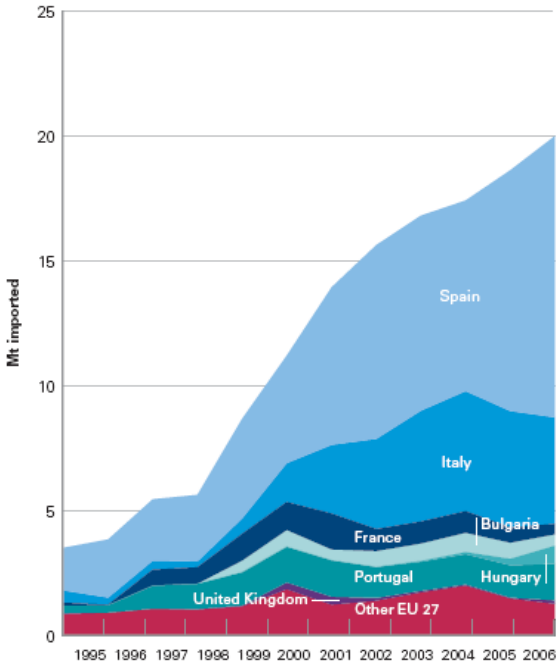



Chart 9

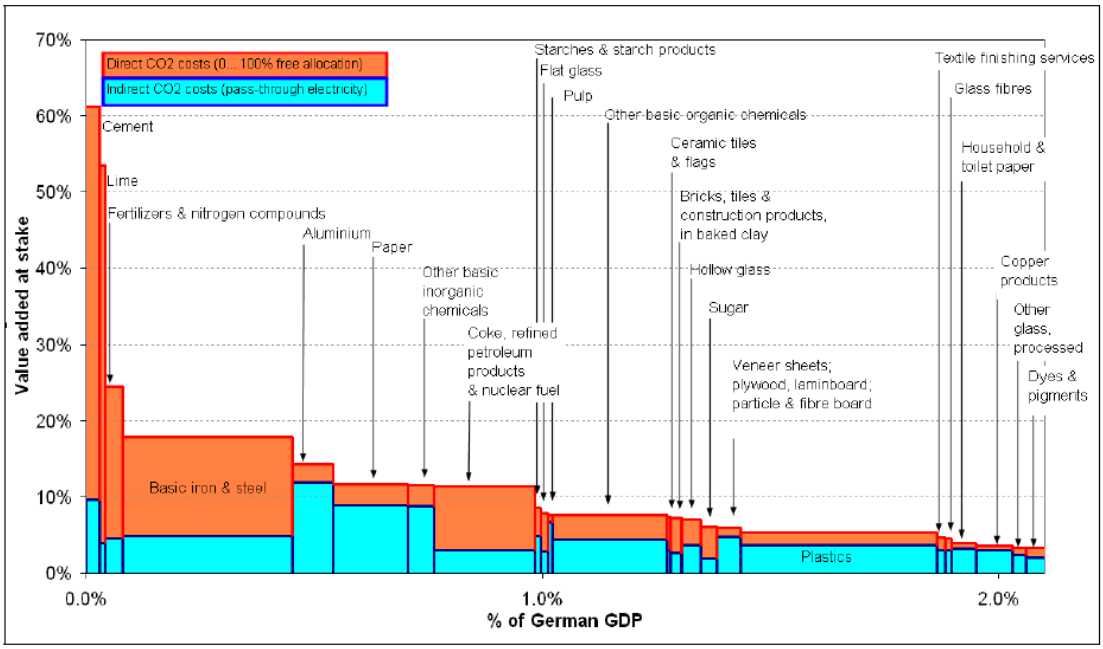
**Trends in cement imports to the EU by country (1995–2006)**

**Source** Climate Strategies (2007): Hourcade, Neuhoff, et al.

*Source: Climate Strategies (2007)*

## Figure 14: Direct and indirect CO2 costs as a share of sector value added and GDP in Germany

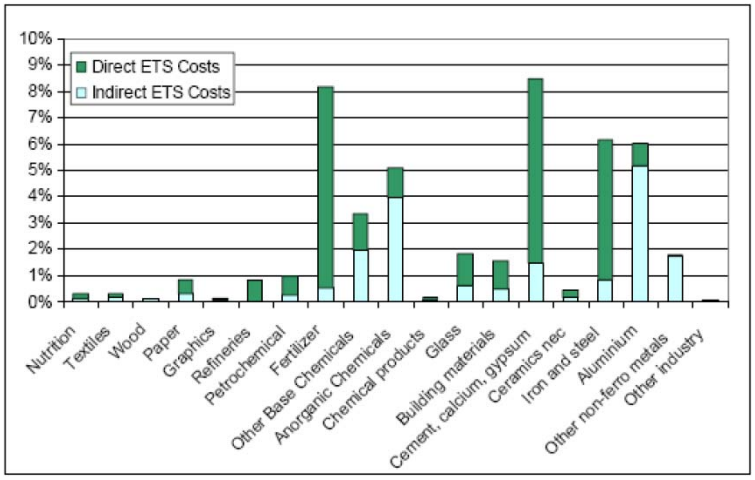
*Figure 1 Value at stake relative to GDP – area in light blue represent indirect costs, areas in red reflect direct costs*




*Source: Graichen, Mattes et al (2009)*

## Figure 15: Direct and indirect CO2 costs as shares total costs for manufacturing sectors in the Netherlands

*Figure 4 Potential cost price increase as a percentage of sectors' total costs for Dutch manufacturing sectors. Scenario with full auctioning.*




Note: Assuming 20 EUR/$tCO_2$ carbon price, and 14 EUR/MWh electricity price increase. Source: de Bruyn et al., 2008.

*Source: De Bruyn et al (2008)*

**Figure 16:**

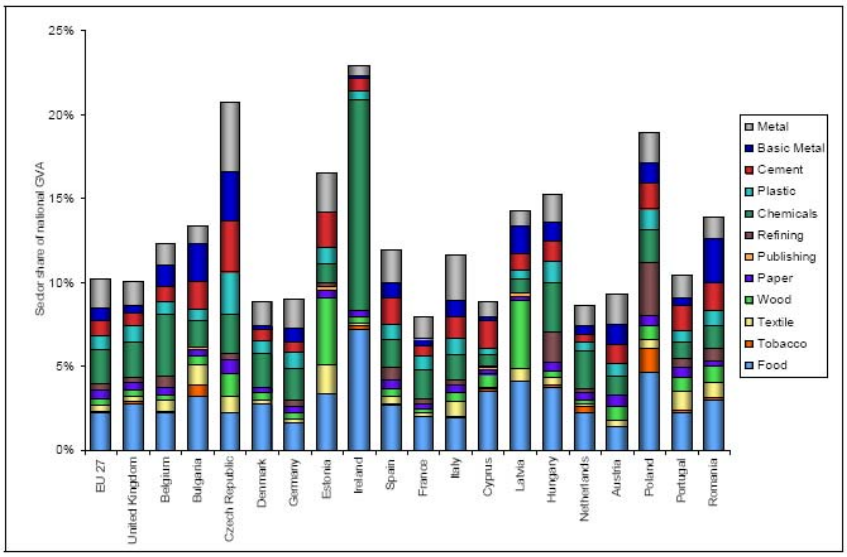



**Figure 30 Manufacturing sectors' relative share of national GVA across EU (2004) Source: Eurostat (2007a).**

*Source: Hourcade et al (2007)*

## Figure 17: Share of mechanical and semi-chemical pulp of production in selected EU countries

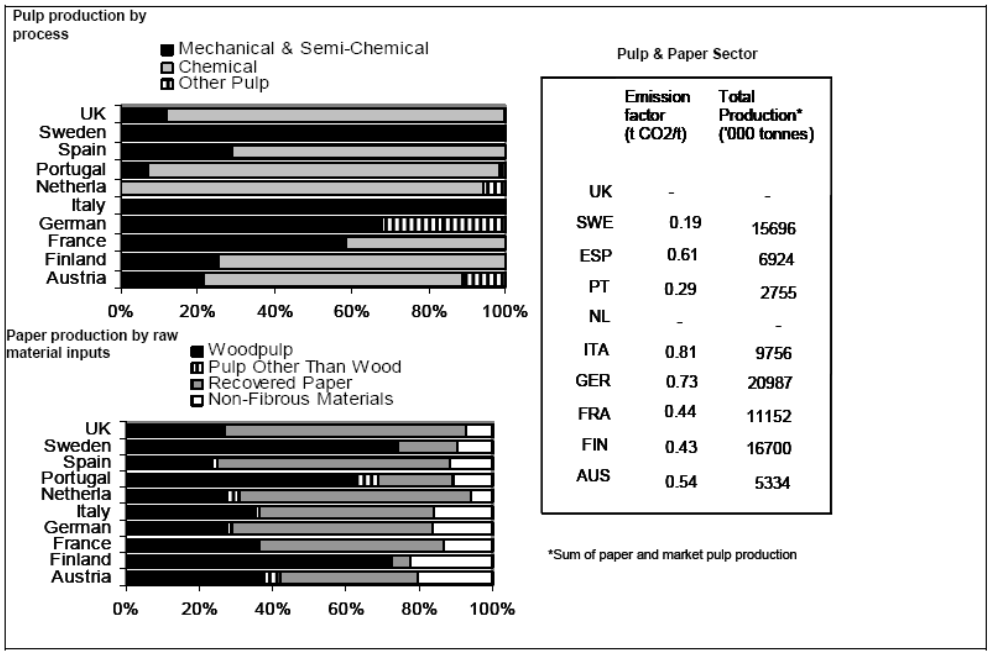
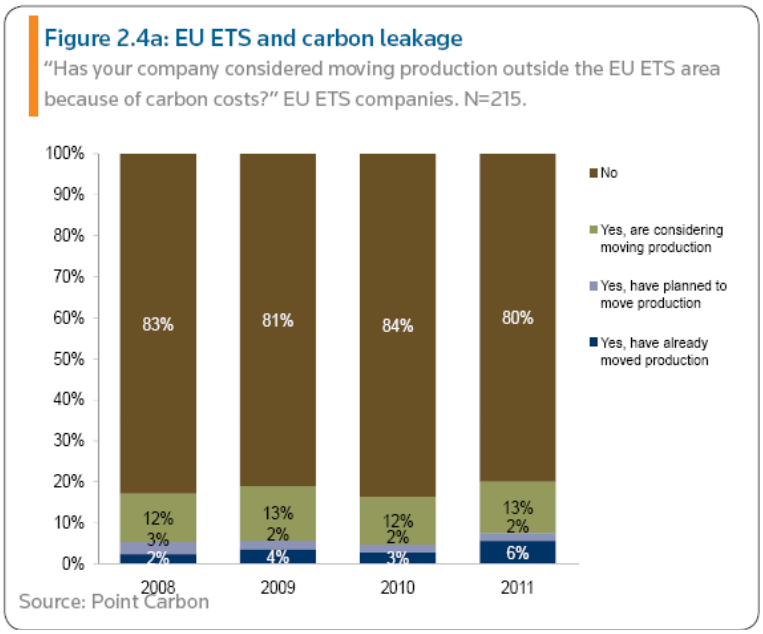



**Figure 7 - Pulp and Paper production of selected EU countries in 2002** ***Source: adapted from CEPI Annual Statistics 2002 & Finnish Forestries Industries federation.***

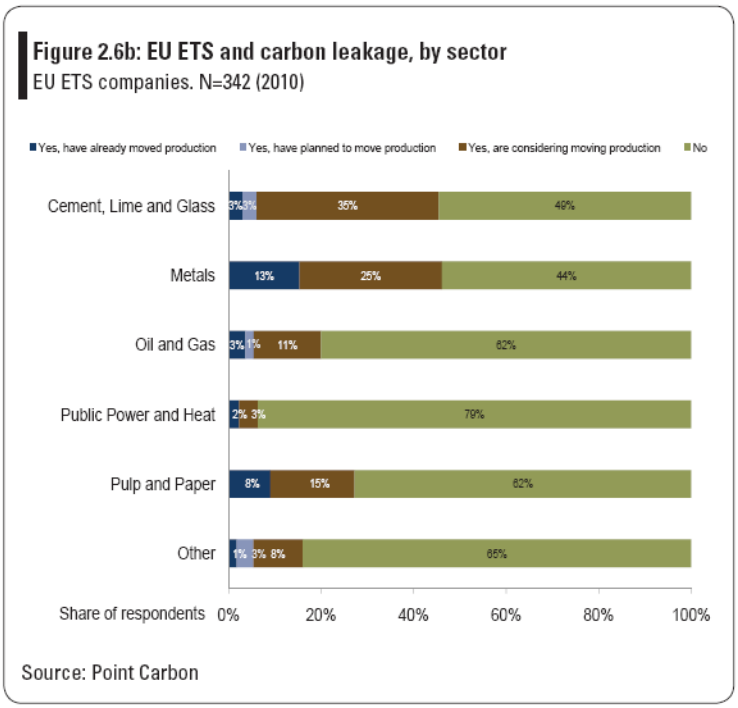
*Source: Hourcade et al (2007)*

**Figure 18:**



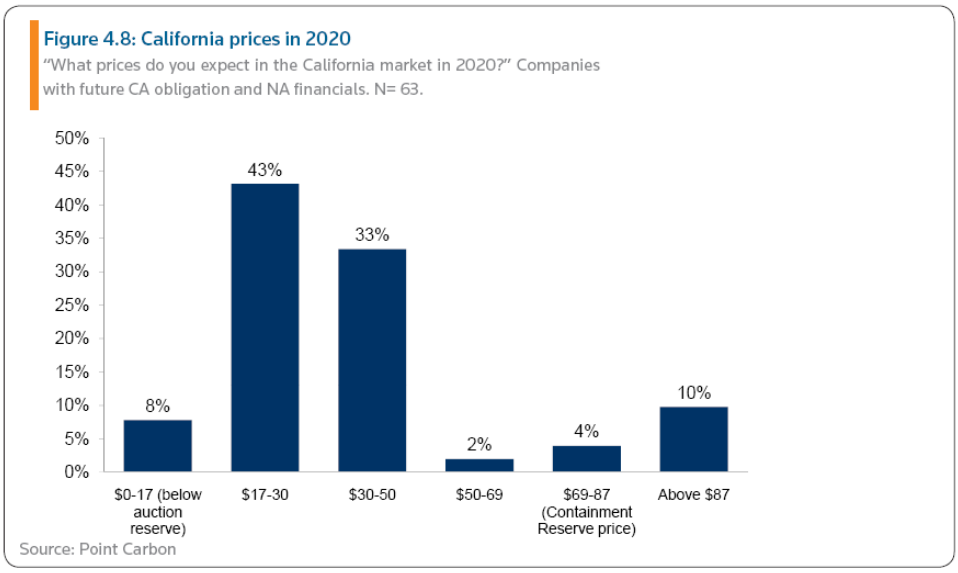

*Source: Carbon 2011*

**Figure 19:**




*Source: Carbon 2010*

**Figure 20:**




*Source: Carbon 2011*

**Figure 21:**

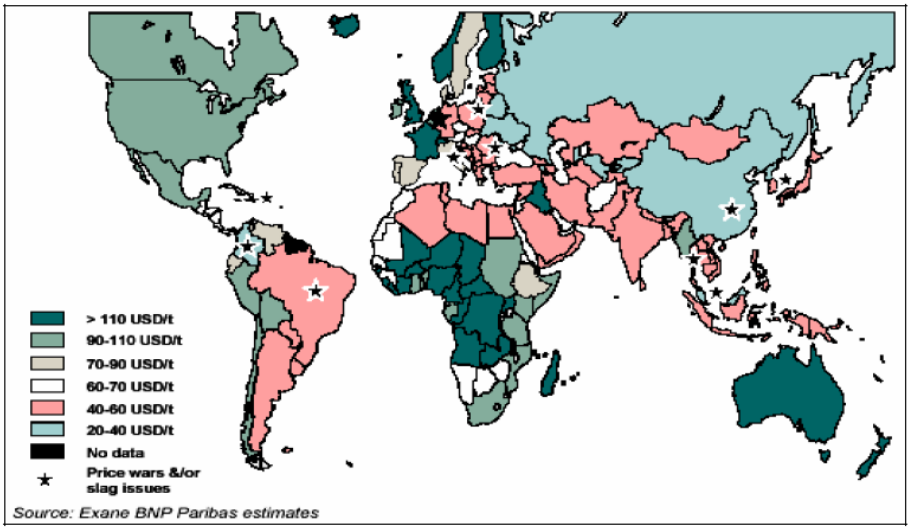



**Figure 40 - World Cement Prices (2006)**

**Figure 22:**

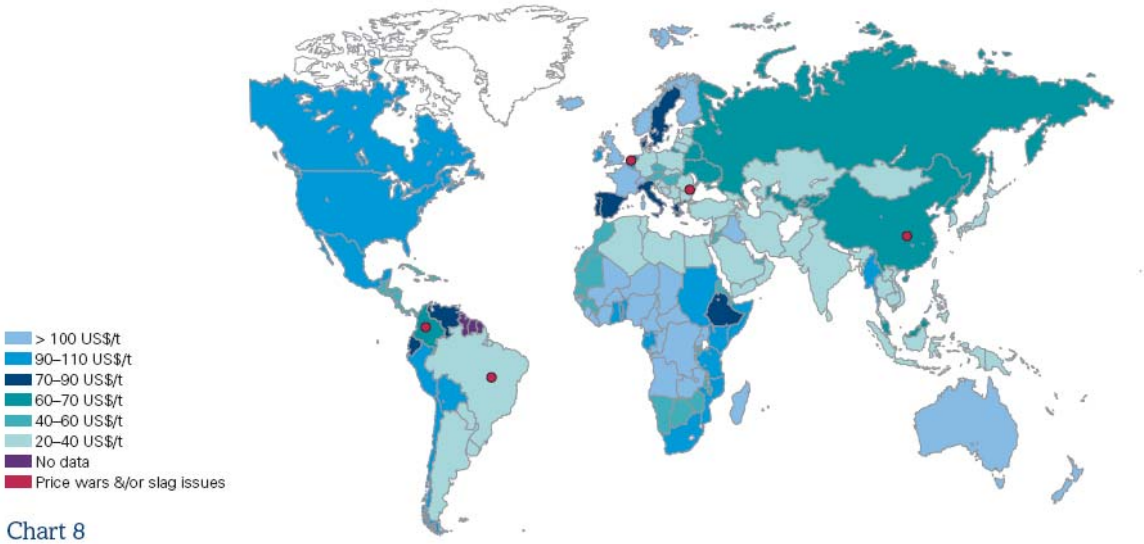



Chart 8

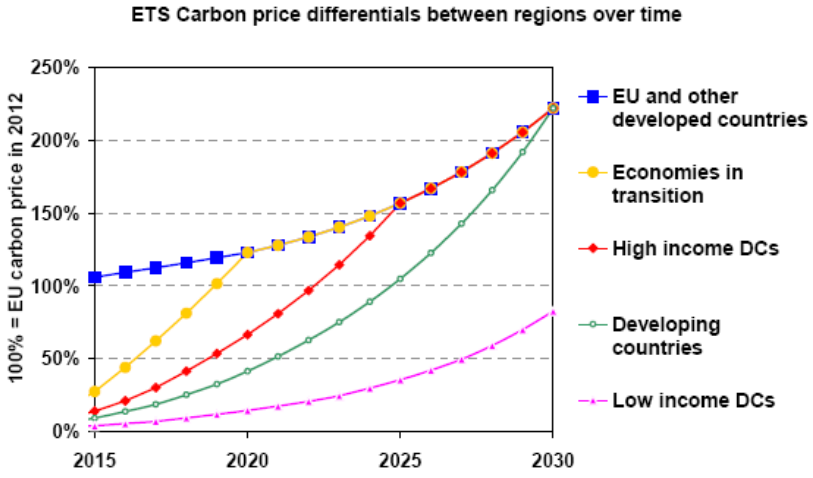
**World cement prices in US$/t (2006)**

**Source** Climate Strategies (2007): Hourcade, Neuhoff, et al.
Underlying data from Exane BNP Paribas.

*Source: Carbon Trust (2008)*

**Figure 23:**

**Figure 10: ETS carbon price differentials between regions over time**



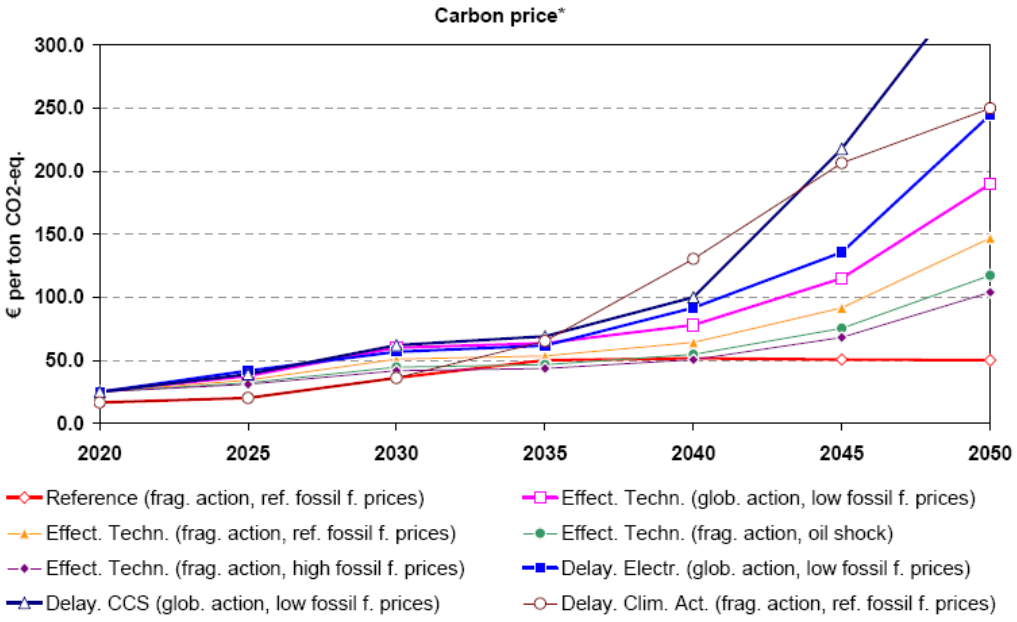

Source, POLES, JRC, IPTS

*Results of the global GHG emissions projections using the POLES model:*

*Source: SEC(2011) 288 final*

## Figure 24:

**Figure 20: Carbon price evolution**



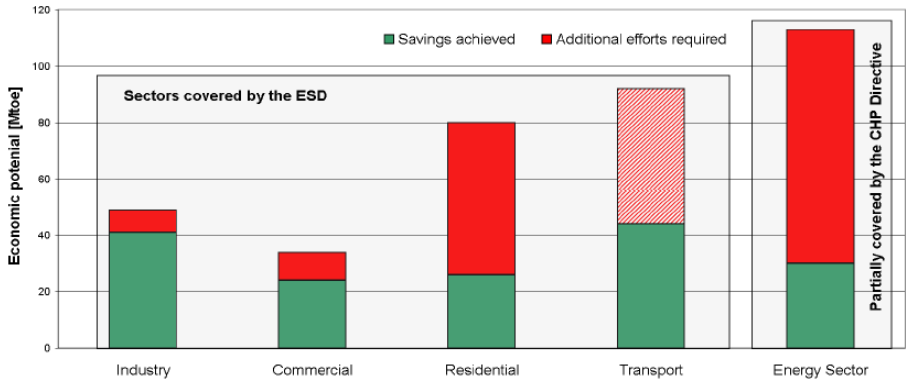

*For reference only ETS carbon price is represented

Source: PRIMES, GAINS

*Source: SEC(2011) 288 final*

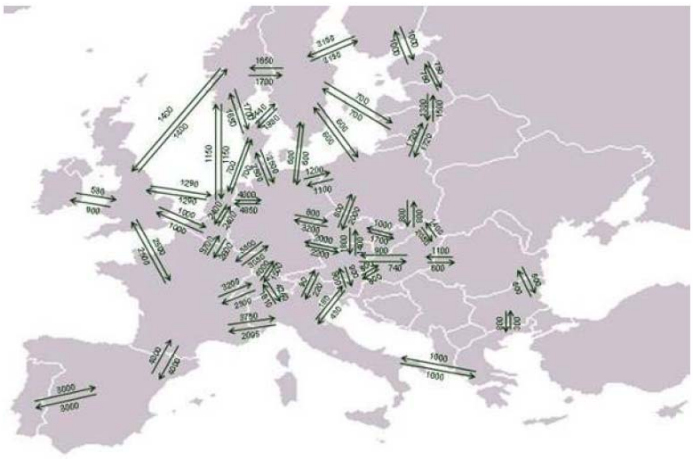
## Figure 25:

**Figure 1: Expected improvements in 2020 and need for additional effort per sector[18]**




*Source: SEC(2011) 779 final*

**Figure 26:**



Map 6: Interconnection capacity requirements 2020 in MW[47], PRIMES Reference scenario (source: KEMA, Imperial College London)

*Source: EC DG ENER – ENERGY INFRASTRUCTURE – Priorities for 2020 and beyond (2011)*

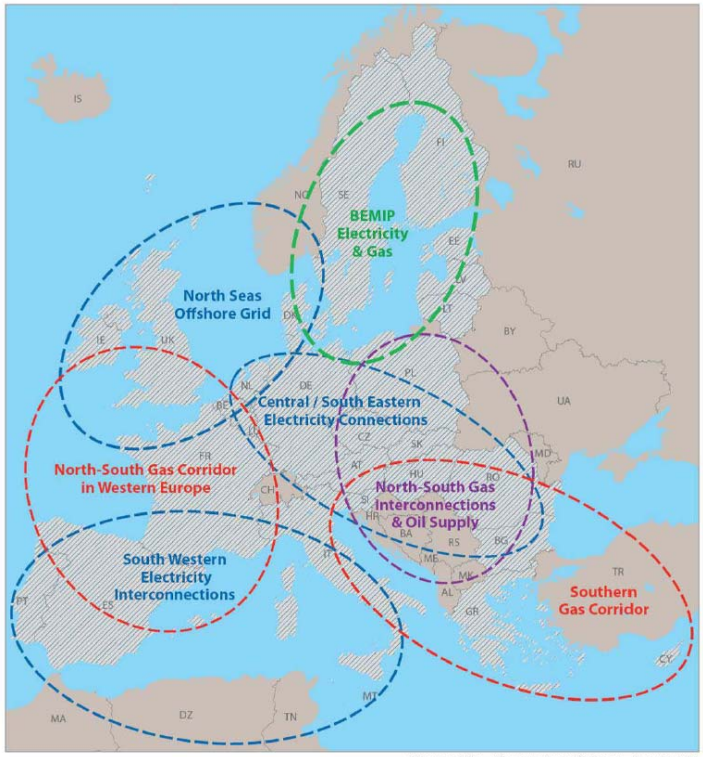
**Figure 27: Volumes of electricity traded in the EU's main markets in 2009 (in TWh)**

| | Brokered OTC | | Exchange | | Total traded |
|---|---|---|---|---|---|
| | forward | spot | futures / forwards derivatives | spot | volumes |
| Germany | 4,109.9 | 38.2 | 257.0 | 135.0 | 4,540.0 |
| Nordic | 1,100.0 | 0.0 | 1,195.9 | 285.5 | 2,581.4 |
| UK | 1,020.8 | 39.9 | 0.0 | 12.6 | 1,073.4 |
| France | 500.7 | 11.7 | 28.0 | 52.6 | 593.0 |
| The Netherlands | 205.8 | 2.3 | 34.0 | 29.1 | 271.2 |
| Spain | 168.1 | 1.5 | 0.0 | 201.0 | 370.6 |
| Czech Rep | 82.6 | 1.1 | 24.3 | 3.0 | 111.0 |
| Italy | 72.0 | 0.0 | 0.0 | 213.0 | 285.0 |
| Belgium | 71.1 | 0.4 | 8.4 | 10.1 | 90.0 |
| Hungary | 38.7 | 0.4 | 3.5 | 0.0 | 42.6 |
| Poland | 31.3 | 0.0 | 0.0 | 2.8 | 34.1 |
| Romania | 6.9 | 0.0 | 11.5 | 6.3 | 24.7 |
| **Total traded volumes** | **7,407.8** | **95.6** | **1,562.6** | **951.0** | **10,017.0** |
| **Total in %** | **74.0%** | **1.0%** | **15.6%** | **9.5%** | **100.0%** |

Source: Argus Media Limited, GME, EEX, APX, PXE, Polpx, Opcom

*Source: EC DG ENER B2 – REMIT: ensuring integrity of gas and electricity markets – Florence School of Regulation Energy Law & Policy (2011)*

**Figure 28:**

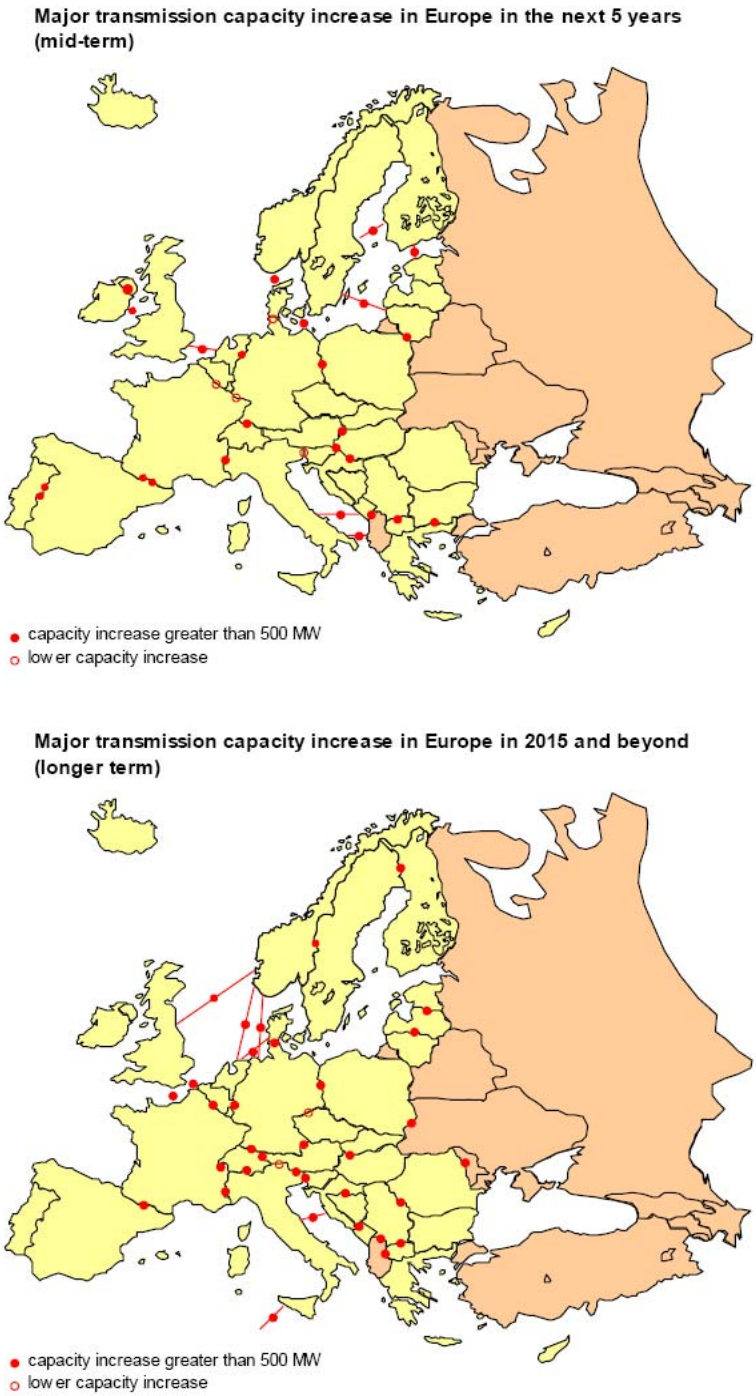



**Map 1: Priority corridors for electricity, gas and oil**

*Source: EC DG ENER – ENERGY INFRASTRUCTURE – Priorities for 2020 and beyond (2011)*

**Figure 29:**

ANNEX 1: ELECTRICITY TRANSMISSION CAPACITY INCREASES FOR THE PERIOD 2010-2015 AND 2015-2025




Source: ENTSO-E

*Source: SEC(2010) 1395/2*

**Figure 30:**

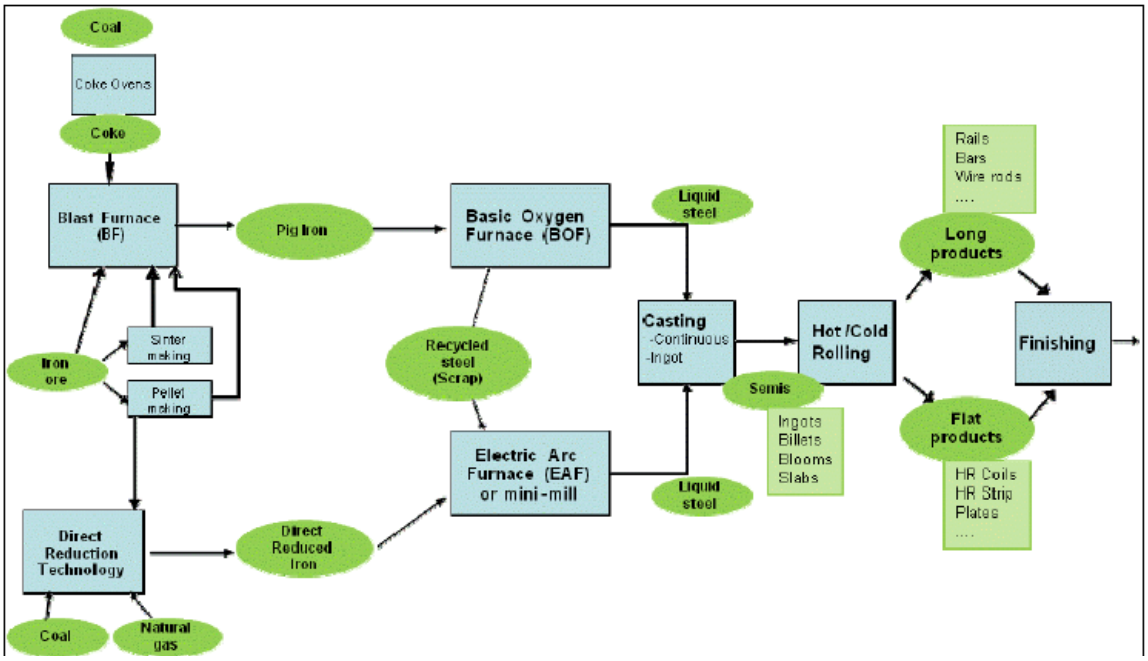
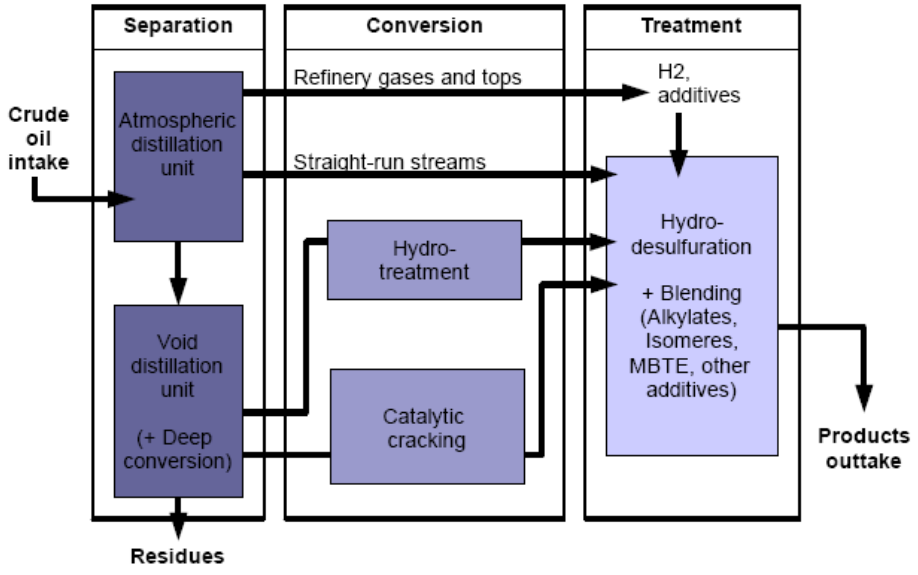


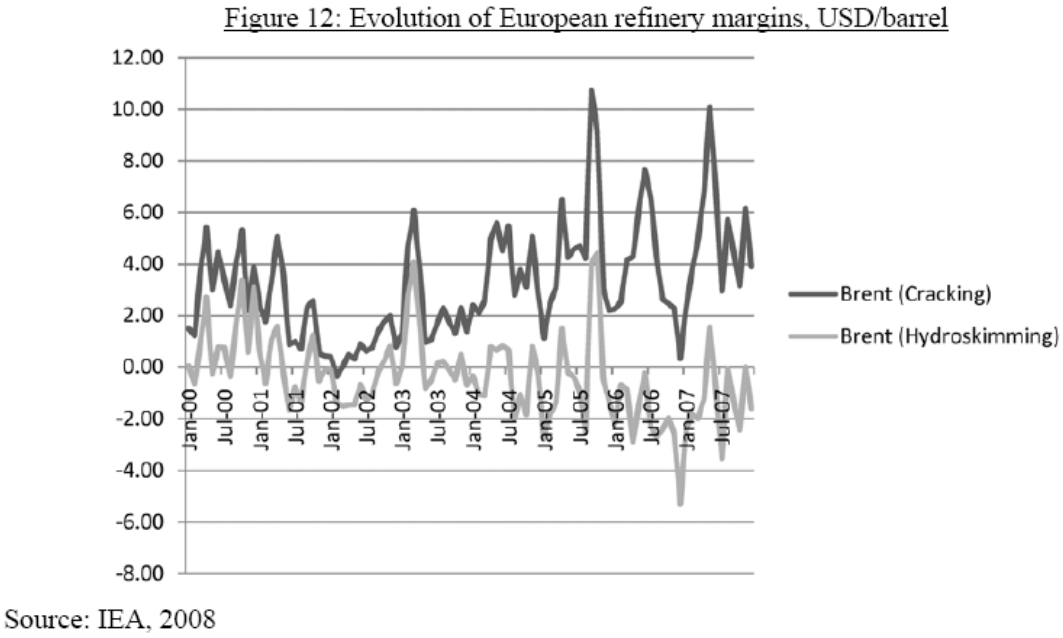

**Figure 31:**

Figure 10: Schematic organization of a complex refinery



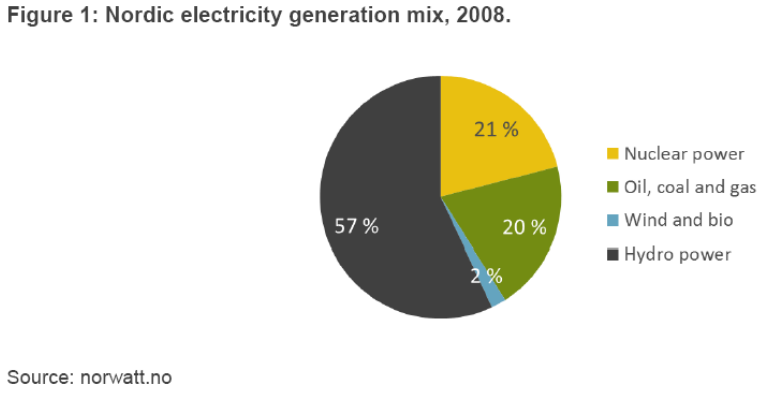

*Source: Barron et al (2008)*

**Figure 32:**




*Source: Barron et al (2008)*

**Figure 33:**




*Source: Reply to questionnaire by Norwegian Industries.*

**Figure 34:**

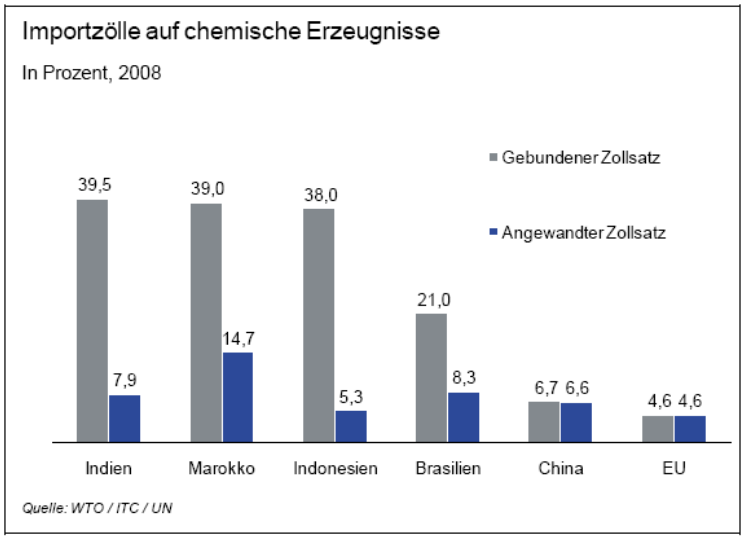
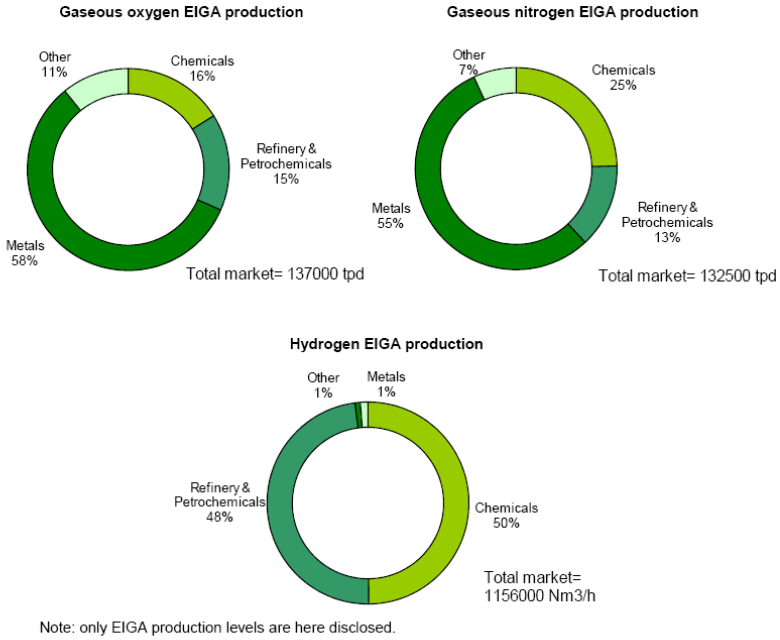



**Figure 35:**

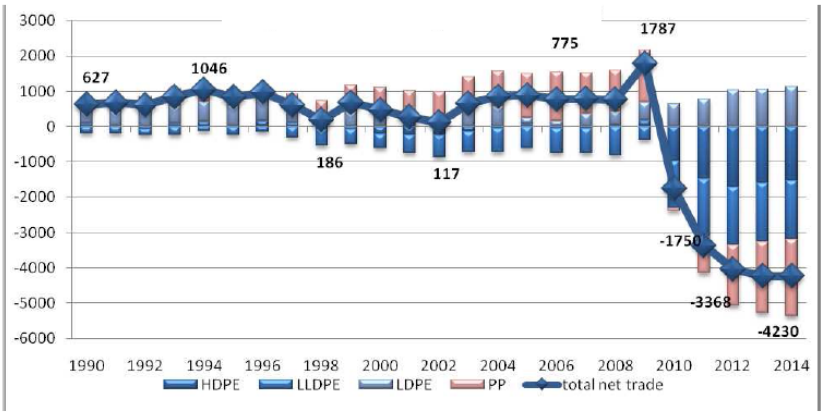



*Source: Presentation of the findings of the Deloitte report Analyzing the post 2012 EU-ETS potential impacts on the European Industrial Gases sector July 25th 2008 (part of reply to questionnaire)*

**Figure 36:**

Nel settore delle poliolefine (polietilene e polipropilene) i trend internazionali evidenziano per l'Europa un netto peggioramento della posizione di net trade.

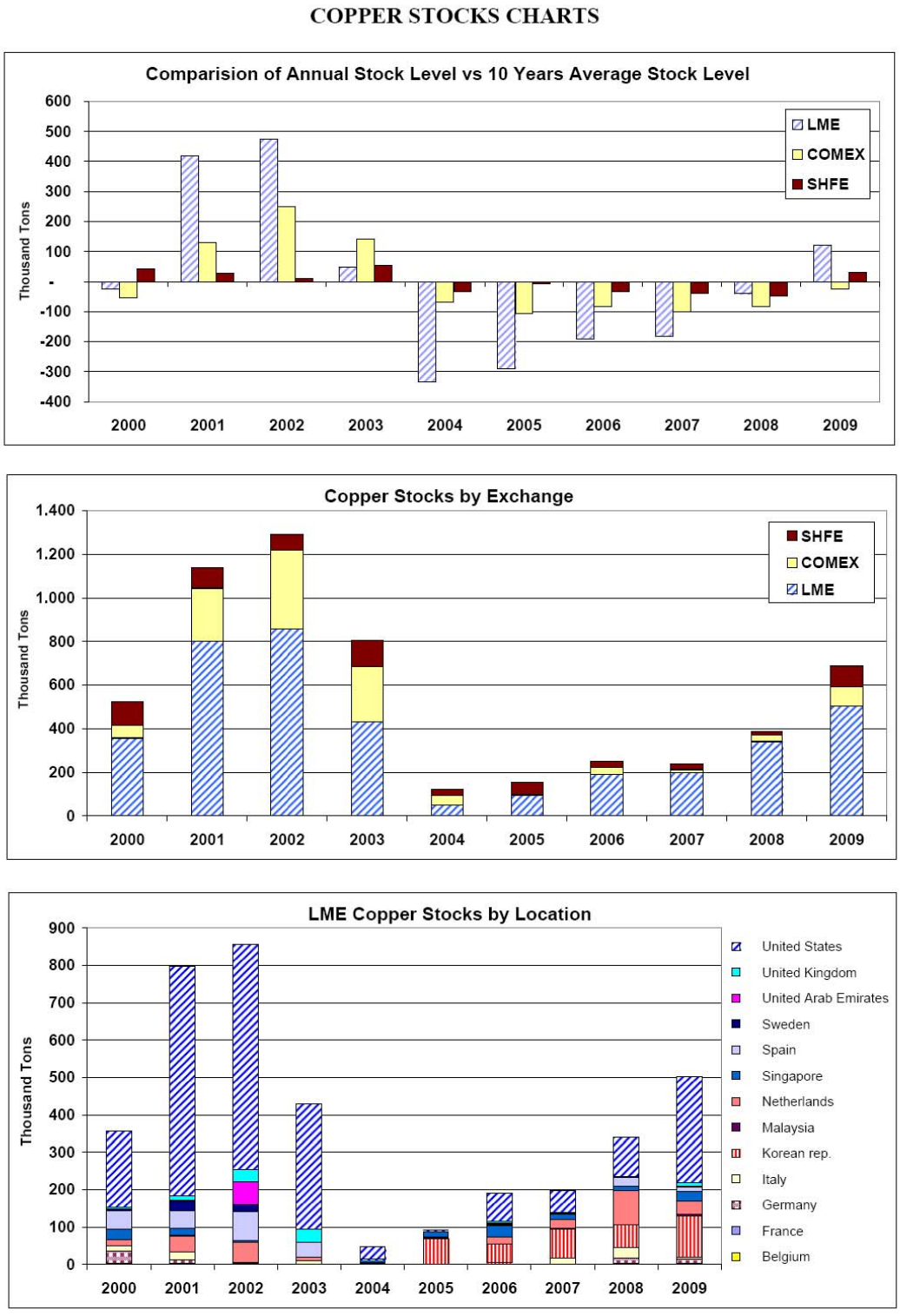
*Grafico 1 – Net trade poliolefine in Europa (kton)*




*Fonte: CMAI*

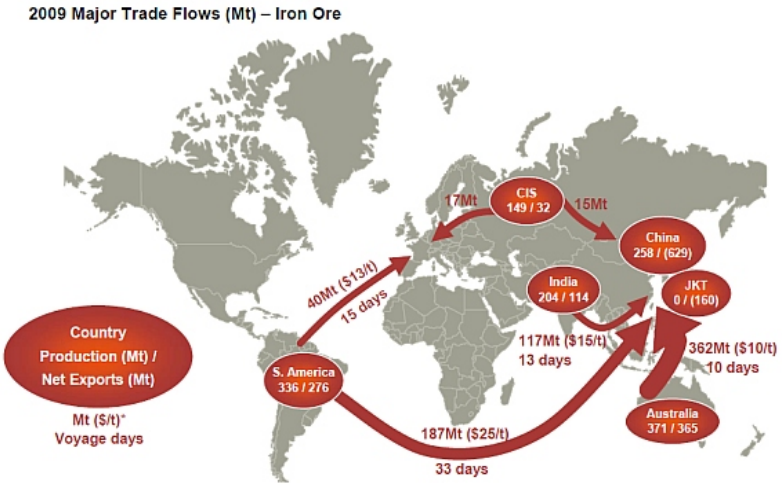
*Source: Reply to Questionnaire by ENI S.p.a*

**Figure 37:**




*Source: ICSG Statistical Yearbook – July 2010*

**Figure 38: Trade in iron ore**

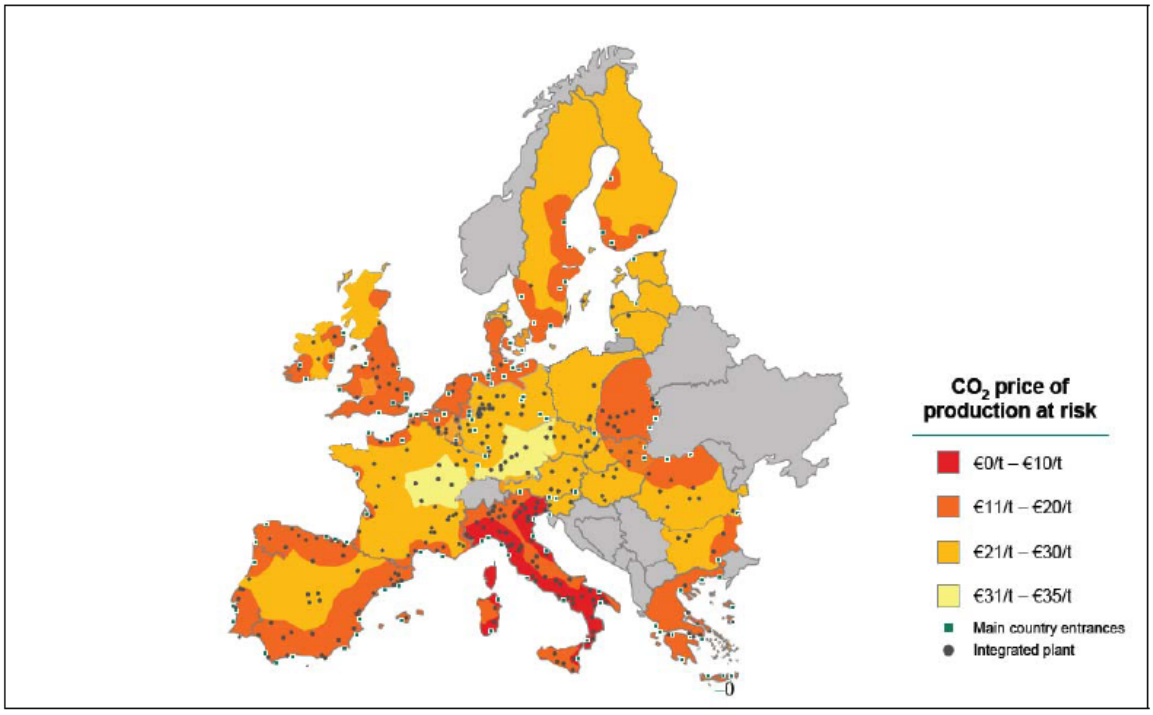



*Source:* BHP

**Figure 39: Cement**

Figure 1 illustrates the EU regions at risk of offshoring for different $CO_2$ prices.

Figure 1




*Source: Boston Consulting Group ("Assessment of the Impact of the 2013-2020 ETS Proposal on the European Cement Industry") (2008) (submitted by Cembureau)*

EUROPEAN COMMISSION

Strasbourg, 22.5.2012
SWD(2012) 130 final

Part 7

**COMMISSION STAFF WORKING DOCUMENT**

**Impact Assessment Report**

***Accompanying the document***

**Communication of the Commission**

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

{C(2012) 3230 final}
{SWD(2012) 131 final}

# ANNEXES

# ANNEX 16

## Additional tables

## Table 1:

**Table 1.3:** Share of value added in the non-financial business economy, 2005 (%) (1)

| | BE | BG | CZ | DK | DE | EE | IE | EL | ES | FR | IT | CY | LV | LT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mining & quarrying** | 0.2 | 3.9 | 2.0 | 5.5 | 0.6 | 1.5 | 0.7 | 1.3 | 0.5 | 0.5 | 1.3 | 0.6 | 0.5 | 1.0 |
| **Food, bev. & tob.** | 4.3 | 5.8 | 4.4 | 4.3 | 3.2 | 3.4 | 6.5 | 4.9 | 3.8 | 3.9 | 3.4 | 5.2 | 4.3 | 5.6 |
| **Textiles & textile prod.** | 1.3 | 4.5 | 1.6 | 0.4 | 0.6 | 2.5 | 0.3 | 1.6 | 0.9 | 0.8 | 2.7 | 0.5 | 1.7 | 3.3 |
| **Leather & leather prod.** | 0.1 | 0.4 | 0.1 | : | 0.1 | 0.2 | 0.0 | 0.2 | 0.2 | 0.2 | 0.9 | 0.1 | 0.0 | 0.1 |
| **Wood & wood prod.** | 0.6 | 0.7 | 1.3 | 0.7 | 0.6 | 3.8 | 0.4 | 0.3 | 0.6 | 0.5 | 0.9 | 1.1 | 4.7 | 2.2 |
| **Pulp, paper, printing** | 2.3 | 1.6 | 2.1 | 2.2 | 2.6 | 2.1 | 4.8 | 2.5 | 2.2 | 2.0 | 2.2 | 1.3 | 1.8 | 1.6 |
| **Ref. petr.; nucl. Fuel** | 1.4 | : | 0.3 | : | 0.5 | 0.4 | : | 1.7 | 1.4 | 0.8 | 0.5 | 0.1 | : | 5.0 |
| **Chem. & man-made fib.** | 7.3 | 2.4 | 2.3 | 3.1 | 4.1 | 1.3 | 13.1 | 1.3 | 2.2 | 3.4 | 2.6 | 1.0 | 0.9 | 1.8 |
| **Rubber & plastics** | 1.4 | 1.0 | 2.4 | 1.2 | 1.9 | 1.0 | 0.6 | 0.7 | 1.2 | 1.5 | 1.6 | 0.5 | 0.6 | 1.2 |
| **Other non-metal. min.** | 1.6 | 2.5 | 3.0 | 1.0 | 1.2 | 2.2 | 1.0 | 1.7 | 2.3 | 1.1 | 2.1 | 2.5 | 1.1 | 1.4 |
| **Basic & fabric. metals** | 4.9 | 4.2 | 6.9 | 2.4 | 5.5 | 2.5 | 0.8 | 4.0 | 3.9 | 3.6 | 6.2 | 1.8 | 2.1 | 1.6 |
| **Mach. & equip. n.e.c.** | 2.1 | 3.2 | 3.9 | 3.3 | 6.1 | 1.2 | 0.8 | 0.8 | 1.8 | 2.3 | 5.0 | 0.4 | 0.8 | 1.0 |
| **Elec. & optical equip.** | 2.4 | 2.2 | 5.1 | 2.6 | 5.8 | 3.2 | 7.8 | 0.8 | 1.4 | 3.3 | 3.3 | 0.2 | 1.2 | 1.7 |
| **Transport equip.** | 2.7 | 0.8 | 5.1 | 0.7 | 6.6 | 1.2 | 0.5 | 0.9 | 2.3 | 3.7 | 2.1 | 0.1 | 0.8 | 1.0 |
| **Manufacturing n.e.c.** | 0.9 | 1.0 | 1.6 | 1.3 | 1.0 | 2.1 | : | 0.6 | 1.0 | 1.0 | 1.7 | 0.9 | 1.3 | 2.0 |
| **Elec., gas & water** | 3.7 | 10.1 | 5.8 | 2.6 | 3.9 | 5.7 | : | 5.0 | 2.8 | 3.1 | 3.2 | 3.9 | 4.7 | 7.1 |
| **Construction** | 7.1 | 7.4 | 7.8 | 8.0 | 5.1 | 9.3 | 6.4 | 9.0 | 16.9 | 8.3 | 9.8 | 15.4 | 8.6 | 10.6 |
| **Motor trades** | 2.8 | 3.1 | 2.1 | 2.6 | 3.4 | 3.1 | 1.5 | 3.1 | 2.8 | 2.4 | 2.5 | 3.3 | 4.2 | 3.6 |
| **Wholesale trade** | 10.5 | 9.9 | 9.4 | 11.5 | 7.5 | 13.0 | 9.0 | 14.9 | 9.3 | 8.3 | 8.7 | 9.3 | 16.5 | 10.8 |
| **Retail trade** | 7.0 | 4.9 | 5.6 | 5.7 | 6.4 | 6.3 | 5.6 | 11.7 | 8.1 | 8.3 | 7.2 | 10.1 | 8.1 | 7.0 |
| **Hotels & restaurants** | 2.6 | 2.9 | 2.0 | 1.9 | 1.9 | 2.3 | 3.6 | 4.9 | 4.7 | 3.5 | 3.2 | 12.2 | 2.3 | 1.6 |
| **Land trans.; pipe.** | 4.7 | 5.2 | 5.5 | 3.4 | 2.3 | 4.5 | 1.4 | 4.1 | 3.8 | 4.2 | 3.6 | 1.2 | 6.4 | 7.6 |
| **Water transport** | 0.5 | 1.0 | : | 3.4 | 0.6 | -0.1 | : | 1.7 | 0.1 | 0.2 | 0.5 | 2.1 | 0.3 | 0.7 |
| **Air transport** | 0.3 | 0.3 | : | 0.3 | -0.2 | 0.3 | : | 0.2 | 0.5 | 0.7 | 0.4 | 1.4 | 1.0 | 0.1 |
| **Other trans.; travel ag.** | 2.8 | 3.5 | 1.4 | 2.5 | 3.3 | 5.6 | 2.1 | 2.8 | 2.6 | 2.5 | 2.6 | 4.4 | 7.3 | 3.1 |
| **Post & telecoms** | 5.7 | 9.5 | 4.7 | 3.6 | 4.4 | 5.0 | 6.4 | 6.1 | 3.9 | 4.9 | 5.1 | 5.7 | 5.7 | 4.6 |
| **Real estate** | 2.2 | 1.2 | 2.2 | 11.3 | 5.6 | 6.2 | 2.4 | 0.4 | 6.1 | 4.7 | 2.9 | 6.2 | 4.5 | 4.1 |
| **Renting** | 1.6 | 0.3 | 0.4 | 0.7 | 1.6 | 1.0 | 0.7 | 0.7 | 1.0 | 1.4 | 0.6 | 0.7 | 0.9 | 0.4 |
| **Computer services** | 2.6 | 1.3 | 2.0 | 3.2 | 2.8 | 1.3 | 3.3 | 1.1 | 1.7 | 3.1 | 2.7 | 1.1 | 1.4 | 1.1 |
| **R&D** | 0.4 | 0.0 | 0.1 | 0.2 | 0.5 | 0.1 | 0.2 | 0.4 | 0.2 | 0.4 | 0.2 | : | 0.3 | 0.1 |
| **Other business act.** | 11.8 | 4.3 | 8.4 | 10.0 | 10.5 | 7.6 | 8.9 | 10.3 | 9.8 | 15.3 | 10.5 | 6.6 | 5.8 | 6.2 |

(1) The Czech Republic, 2004; data not available for some Member States in 2005 were substituted by information for 2004.

*Source:* Eurostat (SBS)

*Source: Eurostat Key Figures on European Business (2008)*

## Table 2:

**Table 1.3:** Share of value added in the non-financial business economy, 2005 (%) (1) (continued)

| | LU | HU | MT | NL | AT | PL | PT | RO | SI | SK | FI | SE | UK | NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mining & quarrying** | 0.2 | 0.4 | : | 2.4 | 0.7 | 4.7 | 0.8 | 8.2 | 0.8 | 1.2 | 0.4 | 0.9 | 3.5 | 39.2 |
| **Food, bev. & tob.** | 2.1 | 4.9 | : | 4.5 | 2.9 | 9.2 | 3.9 | 5.0 | 3.2 | 2.8 | 2.8 | 2.4 | 3.2 | 2.3 |
| **Textiles & textile prod.** | 1.4 | 1.2 | : | 0.4 | 0.7 | 1.3 | 3.3 | 4.1 | 2.1 | 1.4 | 0.6 | 0.3 | 0.5 | 0.2 |
| **Leather & leather prod.** | 0.0 | 0.2 | : | 0.0 | 0.2 | 0.2 | 0.9 | 1.1 | 0.6 | 0.6 | 0.1 | 0.0 | 0.0 | 0.0 |
| **Wood & wood prod.** | 0.4 | 0.6 | : | 0.4 | 1.4 | 1.1 | 1.2 | 1.1 | 1.3 | 0.9 | 1.7 | 1.3 | 0.4 | 0.6 |
| **Pulp, paper, printing** | 1.6 | 2.0 | : | 2.7 | 2.6 | 2.4 | 2.5 | 1.5 | 2.8 | 2.4 | 6.3 | 3.8 | 2.6 | 1.7 |
| **Ref. petr.; nuclear fuel** | : | 2.9 | : | 0.2 | : | 4.3 | : | 0.6 | 0.0 | : | 1.0 | 0.3 | 0.3 | 0.3 |
| **Chem. & man-made fib.** | 0.6 | 4.0 | : | 4.4 | 2.2 | 2.9 | 1.6 | 2.0 | 5.7 | 1.4 | 2.5 | 4.0 | 2.3 | 1.3 |
| **Rubber & plastics** | 3.3 | 1.8 | : | 0.8 | 1.3 | 1.9 | 1.0 | 1.2 | 2.6 | 2.1 | 1.3 | 0.9 | 1.1 | 0.2 |
| **Other non-metal. min.** | 2.0 | 1.7 | : | 0.8 | 2.0 | 2.2 | 2.5 | 2.1 | 1.8 | 2.4 | 1.6 | 0.7 | 0.7 | 0.6 |
| **Basic & fabric. metals** | 6.1 | 3.5 | : | 3.1 | 5.7 | 4.1 | 2.9 | 4.2 | 7.3 | 8.7 | 5.5 | 4.9 | 2.2 | 1.9 |
| **Mach. & equip. n.e.c.** | 1.2 | 2.6 | : | 2.4 | 4.4 | 2.6 | 1.7 | 2.0 | 4.6 | 3.4 | 4.8 | 4.3 | 1.7 | 1.1 |
| **Elec. & optical equip.** | 0.2 | 10.7 | : | 2.3 | 4.1 | 2.5 | 2.0 | 2.4 | 4.5 | 5.0 | 9.7 | 5.0 | 2.1 | 1.1 |
| **Transport equip.** | 0.2 | 4.8 | : | 1.5 | 2.8 | 3.3 | 1.4 | 3.1 | 2.3 | 4.2 | 1.2 | 4.5 | 2.4 | 1.8 |
| **Manufacturing n.e.c.** | 0.2 | 0.7 | : | 0.7 | 1.5 | 1.7 | 1.2 | 1.8 | 1.9 | 1.4 | 0.9 | 0.9 | 0.9 | 0.5 |
| **Elec., gas & water** | 1.8 | 5.7 | : | 2.0 | 3.8 | 7.2 | 4.6 | 7.3 | 4.4 | 14.8 | 3.9 | 4.3 | 3.0 | 2.9 |
| **Construction** | 11.2 | 5.8 | : | 9.6 | 9.0 | 5.9 | 12.2 | 7.0 | 8.3 | 5.4 | 8.7 | 7.3 | 9.0 | 5.9 |
| **Motor trades** | 3.0 | 2.5 | : | 2.6 | 2.7 | 2.1 | 3.4 | 3.0 | 3.4 | 1.4 | 2.7 | 2.7 | 3.1 | 1.9 |
| **Wholesale trade** | 9.1 | 8.5 | : | 13.6 | 10.0 | 11.1 | 11.7 | 10.2 | 9.0 | 9.5 | 8.0 | 9.2 | 8.3 | 6.0 |
| **Retail trade** | 5.3 | 5.4 | : | 6.9 | 6.9 | 6.5 | 8.3 | 5.5 | 7.9 | 5.5 | 6.5 | 5.9 | 8.0 | 4.5 |
| **Hotels & restaurants** | 3.6 | 1.7 | : | 2.7 | 4.6 | 1.1 | 4.1 | 1.5 | 3.1 | 1.0 | 2.2 | 2.1 | 3.8 | 1.5 |
| **Land trans.; pipe.** | 5.9 | 5.2 | : | 3.9 | 4.3 | 4.2 | 3.4 | 4.4 | 3.7 | 4.4 | 4.5 | 3.7 | 2.5 | 3.3 |
| **Water transport** | 0.1 | 0.1 | : | 1.0 | 0.0 | 0.1 | 0.2 | : | 0.1 | 0.1 | 0.7 | 0.7 | 0.3 | 2.7 |
| **Air transport** | 3.5 | 0.2 | : | 1.2 | 0.4 | 0.2 | 0.9 | : | 0.3 | 0.0 | 0.8 | 0.3 | 1.0 | 0.5 |
| **Other trans.; travel ag.** | 1.1 | 1.9 | : | 2.7 | 3.6 | 1.2 | 3.2 | 2.2 | 1.9 | 1.6 | 2.1 | 2.2 | 3.0 | 1.9 |
| **Post & telecoms** | 9.2 | 6.5 | : | 4.7 | 3.4 | 5.3 | 5.2 | 7.2 | 4.5 | 6.2 | 3.5 | 3.8 | 4.7 | 2.6 |
| **Real estate** | : | 3.8 | : | 4.9 | 4.5 | 3.1 | 2.9 | 1.8 | 1.5 | 1.5 | 4.2 | 7.4 | 4.3 | 4.4 |
| **Renting** | 1.4 | 0.8 | : | 1.6 | 1.9 | 0.4 | 1.1 | 0.5 | 0.1 | 0.6 | 0.5 | 0.8 | 1.7 | 0.5 |
| **Computer services** | 2.5 | 2.0 | : | 3.4 | 2.2 | 1.2 | 1.4 | 1.7 | 1.9 | 1.9 | 3.3 | 4.7 | 5.1 | 2.1 |
| **R&D** | : | 0.2 | : | 0.7 | 0.3 | 0.1 | 0.0 | 0.5 | 0.5 | 0.2 | 0.2 | 0.3 | 0.7 | 0.3 |
| **Other business act.** | 16.4 | 7.6 | : | 14.0 | 9.4 | 5.9 | 9.5 | 6.2 | 8.1 | 5.8 | 7.9 | 9.9 | 17.2 | 6.5 |

(1) The Czech Republic, 2004; data not available for some Member States in 2005 were substituted by information for 2004.

*Source:* Eurostat (SBS)

*Source: Eurostat Key Figures on European Business (2008)*

# Table 3:

**Table 2.1:** Most specialised Member States by activity, 2005 (% of national value added in the non-financial business economy) (1)

| | 1st | Share (%) | 2nd | Share (%) |
|---|---|---|---|---|
| **Mining & quarrying** | RO | 8.2 | DK | 5.5 |
| **Food, bev. & tob.** | PL | 9.2 | IE | 6.5 |
| **Textiles & textile prod.** | BG | 4.5 | RO | 4.1 |
| **Leather & leather prod.** | RO | 1.1 | IT | 0.9 |
| **Wood & wood prod.** | LV | 4.7 | EE | 3.8 |
| **Pulp, paper, printing** | FI | 6.3 | IE | 4.8 |
| **Coke, ref. petr.; nucl. fuel** | LT | 5.0 | PL | 4.3 |
| **Chem. & man-made fib.** | IE | 13.1 | BE | 7.3 |
| **Rubber & plastics** | LU | 3.3 | SI | 2.6 |
| **Other non-metal. min.** | CZ | 3.0 | BG | 2.5 |
| **Basic & fabric. metals** | SK | 8.7 | SI | 7.3 |
| **Mach. & equip. n.e.c.** | DE | 6.1 | IT | 5.0 |
| **Elec. & optical equip.** | HU | 10.7 | FI | 9.7 |
| **Transport equip.** | DE | 6.6 | CZ | 5.1 |
| **Manufacturing n.e.c.** | EE | 2.1 | LT | 2.0 |
| **Elec., gas & water** | SK | 14.8 | BG | 10.1 |
| **Construction** | ES | 16.9 | CY | 15.4 |
| **Motor trades** | LV | 4.2 | LT | 3.6 |
| **Wholesale trade** | LV | 16.5 | EL | 14.9 |
| **Retail trade** | EL | 11.7 | CY | 10.1 |
| **Hotels & restaurants** | CY | 12.2 | EL | 4.9 |
| **Land trans.; pipe.** | LT | 7.6 | LV | 6.4 |
| **Water transport** | DK | 3.4 | CY | 2.1 |
| **Air transport** | LU | 3.5 | CY | 1.4 |
| **Other trans.; travel ag.** | LV | 7.3 | EE | 5.6 |
| **Post & telecoms** | BG | 9.5 | LU | 9.2 |
| **Real estate** | DK | 11.3 | SE | 7.4 |
| **Renting** | AT | 1.9 | UK | 1.7 |
| **Computer services** | UK | 5.1 | SE | 4.7 |
| **R&D** | NL | 0.7 | UK | 0.7 |
| **Other business act.** | UK | 17.2 | LU | 16.4 |

(1) Including rounded estimates based on non-confidential data; the Czech Republic, 2004; Malta, not available; data not available for some Member States in 2005 were substituted by information for 2004; there are a limited number of activity-country pairings for which no information was available.

*Source:* Eurostat (SBS)

*Source: Eurostat Key Figures on European Business (2008)*

## Table 4:

**Table 2.2:** Most specialised activities per Member State, 2005 (% of national value added in the non-financial business economy, EU-27=100) (1)

| | 1st | 2nd |
|---|---|---|
| **BE** | Chem. & man-made fib. (220.3) | Ref. petr.; nuclear fuel (205.1) |
| **BG** | Textiles & textile prod. (410.0) | Elec., gas & water (304.5) |
| **CZ** | Other non-metal. min. (220.7) | Wood & wood prod. (200.3) |
| **DK** | Water transport (766.2) | Mining & quarrying (410.0) |
| **DE** | Transport equip. (186.5) | Mach. & equip. n.e.c. (180.7) |
| **EE** | Wood & wood prod. (558.4) | Textiles & textile prod. (229.2) |
| **IE** | Chem. & man-made fib. (393.0) | Elec. & optical equip. (209.5) |
| **EL** | Water transport (384.8) | Ref. petr.; nuclear fuel (234.2) |
| **ES** | Ref. petr.; nuclear fuel (203.8) | Construction (198.9) |
| **FR** | Other business act. (133.5) | Air transport (127.5) |
| **IT** | Leather & leather prod. (384.1) | Textiles & textile prod. (244.0) |
| **CY** | Water transport (470.9) | Hotels & restaurants (381.0) |
| **LV** | Wood & wood prod. (692.1) | Other trans.; travel ag. (262.5) |
| **LT** | Ref. petr.; nuclear fuel (715.9) | Wood & wood prod. (319.7) |
| **LU** | Air transport (632.7) | Rubber & plastics (221.2) |
| **HU** | Ref. petr.; nuclear fuel (417.0) | Elec. & optical equip. (288.7) |
| **MT** | : | : |
| **NL** | Water transport (227.2) | Air transport (225.8) |
| **AT** | Wood & wood prod. (208.8) | Renting (145.5) |
| **PL** | Ref. petr.; nuclear fuel (605.1) | Mining & quarrying (348.8) |
| **PT** | Leather & leather prod. (364.7) | Textiles & textile prod. (298.3) |
| **RO** | Mining & quarrying (605.1) | Leather & leather prod. (477.7) |
| **SI** | Leather & leather prod. (263.7) | Wood & wood prod. (192.2) |
| **SK** | Elec., gas & water (445.3) | Leather & leather prod. (263.8) |
| **FI** | Elec. & optical equip. (260.0) | Wood & wood prod. (253.1) |
| **SE** | Wood & wood prod. (194.3) | Real estate (171.8) |
| **UK** | Mining & quarrying (262.0) | R&D (184.5) |

(1) Including rounded estimates based on non-confidential data; the Czech Republic, 2004; data not available for some Member States in 2005 were substituted by information for 2004; there are a limited number of activity-country pairings for which no information was available.

*Source:* Eurostat (SBS)

*Source: Eurostat Key Figures on European Business (2008)*

## Table 5:

**Table 6.1:** Most specialised region by activity (NACE sections and divisions), EU-27 and Norway, 2007 (1)
(%, share of total non-financial business economy employment of the region and the median and average share of all regions)

| Activity (NACE) | All regions | | Most specialised region | |
|---|---|---|---|---|
| | Median share (%) | Average share (%) | Name (NUTS 2 region) | Share of the region (%) |
| **Mining and quarrying (C 10–14)** | 0.3 | 0.7 | Agder og Rogaland (NO04) | 13.1 |
| Coal, lignite and peat (10) | 0.0 | 0.2 | Śląskie (PL22) | c |
| Crude petroleum and natural gas (11) | 0.0 | 0.2 | Agder og Rogaland (NO04) | 12.8 |
| Uranium and thorium ores (12) | 0.0 | 0.0 | Severovýchod (CZ05) | c |
| Metal ores (13) | 0.0 | 0.0 | Övre Norrland (SE33) | c |
| Gewinnung von Steinen und Erden (14) | 0.2 | 0.2 | Świętokrzyskie (PL33) | c |
| **Manufacturing (D 15–37)** | 24.9 | 25.9 | Západné Slovensko (SK02) | 56.1 |
| Food and beverages (15) | 3.6 | 3.8 | Bretagne (FR52) | 10.9 |
| Tobacco products (16) | 0.0 | 0.1 | Trier (DEB2) | c |
| Textiles (17) | 0.4 | 0.7 | Prov. West-Vlaanderen (BE25) | 5.5 |
| Wearing apparel; fur (18) | 0.3 | 1.0 | Dytiki Makedonia (GR13) | 11.6 |
| Leather and leather products (19) | 0.1 | 0.3 | Marche (ITE3) | 7.6 |
| Wood and wood products (20) | 0.9 | 1.2 | Itä-Suomi (FI13) | 5.7 |
| Pulp, paper and paper products (21) | 0.4 | 0.6 | Norra Mellansverige (SE31) | 4.5 |
| Publishing and printing (22) | 1.0 | 1.1 | Inner London (UKI1) | 4.0 |
| Fuel processing (23) | 0.0 | 0.1 | Cumbria (UKD1) | c |
| Chemicals and chemical products (24) | 1.0 | 1.3 | Rheinhessen-Pfalz (DEB3) | 10.9 |
| Rubber and plastic products (25) | 1.2 | 1.4 | Auvergne (FR72) | 6.3 |
| Other non-metallic mineral products (26) | 1.1 | 1.3 | Świętokrzyskie (PL33) | 5.4 |
| Basic metals (27) | 0.5 | 1.0 | Východné Slovensko (SK04) | 8.3 |
| Fabricated metal products (28) | 2.7 | 3.0 | Arnsberg (DEA5) | 8.8 |
| Machinery and equipment (29) | 2.2 | 2.8 | Unterfranken (DE26) | 12.3 |
| Office machinery and computers (30) | 0.0 | 0.1 | Southern and Eastern (IE02) | 1.3 |
| Electrical machinery and apparatus (31) | 0.9 | 1.3 | Západné Slovensko (SK02) | 10.2 |
| Radio, TV and communication equipment (32) | 0.3 | 0.5 | Pohjois-Suomi (FI1A) | 5.9 |
| Medical, precision and optical equipment (33) | 0.6 | 0.7 | Border, Midland and Western (IE01) | 5.5 |
| Motor vehicles and (semi)-trailers (34) | 0.8 | 1.6 | Braunschweig (DE91) | c |
| Other transport equipment (35) | 0.5 | 0.8 | Sud-Est (RO22) | 6.1 |
| Furniture and other manufacturing (36) | 1.0 | 1.4 | Warmińsko-mazurskie (PL62) | 7.9 |
| Recycling (37) | 0.1 | 0.1 | Brandenburg-Nordost (DE41) | 0.7 |
| **Electricity, gas and water supply (E 40–41)** | 1.0 | 1.2 | Severozapaden (BG31) | 5.3 |
| Electricity, gas and hot water supply (40) | 0.8 | 0.9 | Sud-Vest Oltenia (RO41) | 4.4 |
| Water supply (41) | 0.2 | 0.3 | Východné Slovensko (SK04) | 1.8 |
| **Construction (F 45)** | 10.9 | 11.2 | Castilla-La Mancha (ES42) | 29.0 |
| **Distributive trades (G 50–52)** | 25.8 | 25.7 | Kriti (GR43) | 46.3 |
| Motor trades (50) | 3.5 | 3.6 | Brandenburg-Südwest (DE42) | 7.0 |
| Wholesale trade (51) | 7.2 | 7.5 | Peloponnisos (GR25) | 16.1 |
| Retail trade and repair (52) | 14.3 | 14.6 | Kriti (GR43) | 31.3 |
| **Hotels and restaurants (H 55)** | 7.1 | 8.0 | Notio Aigaio (GR42) | 31.6 |
| **Transport, storage and communication (I 60–64)** | 8.2 | 8.9 | Åland (FI20) | 45.0 |
| Real estate activities (60) | 4.3 | 4.5 | Bourgogne (FR26) | 20.6 |
| Renting (61) | 0.1 | 0.4 | Åland (FI20) | 35.7 |
| Computer activities (62) | 0.0 | 0.2 | Outer London (UKI2) | 3.7 |
| Research and development (63) (2) | 1.8 | 2.0 | Bremen (DE50) | 13.1 |

*Source: Eurostat Regional Yearbook 2010*

# Table 6:

**Table 3.1:** Most specialised regions in different activities, 2005 (% of non-financial business economy employment) (1)

| | Median share (%) (2) | Most specialised region (NUTS code) | (%) |
|---|---|---|---|
| **Mining & quarrying** | 0.3 | Slaskie (PL22) | 11.0 |
| **Food, bev. & tob.** | 3.9 | Bretagne (FR52) | 12.1 |
| **Textiles** | 0.8 | Norte (PT11) | 14.1 |
| **Leather** | 0.1 | Marche (ITE3) | 7.9 |
| **Wood & wood prod.** | 0.9 | Itä-Suomi (FI13) | c |
| **Pulp, paper, printing** | 1.7 | Mellersta Norrland (SE07) | 6.5 |
| **Ref. petr.; nuc. fuel** | 0.0 | Cumbria (UKD1) | c |
| **Chem. & man-m. fib.** | 1.0 | Rheinhessen-Pfalz (DEB3) | 12.4 |
| **Rubber & plastics** | 1.2 | Auvergne (FR72) | 9.1 |
| **Oth. non-metal. min.** | 1.2 | Swietokrzyskie (PL33) | 5.5 |
| **Basic & fabr. metals** | 3.5 | Arnsberg (DEA5) | 14.7 |
| **Mach. & equip. n.e.c.** | 2.2 | Unterfranken (DE26) | 12.3 |
| **Elec. & optical equip.** | 2.2 | Západné Slovensko (SK02) | 14.0 |
| **Transport equip.** | 1.6 | Braunschweig (DE91) | c |
| **Manufacturing n.e.c.** | 1.2 | Warmińsko-Mazurskie (PL62) | 8.1 |
| **Elec., gas & water** | 1.0 | Severozapaden (BG11) | 9.0 |
| **Construction** | 10.3 | Andalucía (ES61) | 28.2 |
| **Motor trades** | 3.6 | Réunion (FR94) | 6.8 |
| **Wholesale trade** | 7.2 | Attiki (GR30) | 15.4 |
| **Retail trade** | 14.6 | Kriti (GR43) | 24.9 |
| **Hotels & rest.** | 7.0 | Ionia Nisia (GR22) | 29.8 |
| **Land trans.; pipe.** | 4.5 | Bratislavsky kraj (SK01) | 14.9 |
| **Water transport** | 0.1 | Åland (FI20) | 41.3 |
| **Air transport** | 0.0 | Corse (FR83) | 7.2 |
| **Oth. trans.; trav. ag.** | 1.7 | Bremen (DE50) | 11.9 |
| **Post & telecoms** | 1.8 | Köln (DEA2) | 25.7 |
| **Real estate** | 1.9 | Latvija (LV) | 5.4 |
| **Renting** | 0.4 | Hamburg (DE60) | 1.7 |
| **Computer serv.** | 1.3 | Berks., Bucks. and Oxon (UKJ1) | 7.8 |
| **R&D** | 0.2 | Oberbayern (DE21) | 2.2 |
| **Other business act.** | 11.6 | Inner London (UKI1) | 36.9 |

(1) NUTS 2003 classification; Bulgaria, pre-accession NUTS; the Czech Republic and Norway, 2004; Luxembourg, national series based on enterprises and not local units; Malta, not available; c, confidential.
(2) The median share is the share of the middle region when ranking all regions by their employment share.

*Source:* Eurostat (SBS)

*Source: Eurostat Key Figures on European Business (2008)*

# Table 7:

| Analyst | Instru-ment | Q2-11 (€) | H2-11 (€) | FY-11 (€) | 2012 (€) | 2013 (€) | P3 (€) |
|---|---|---|---|---|---|---|---|
| **70Watt** | EUAs | 17 | 17 | 16.6 | – | – | – |
| | CERs | 13 | 13 | 12.7 | – | – | – |
| **BarCap** | EUAs | 17.6 | 21 | 18.75 | 28 | 30 | 40 |
| | CERs | 13.3 | 16 | 14.25 | 20 | 22 | 25 |
| **Citi** | EUAs | – | – | – | 20 | – | 25 |
| | CERs | – | – | – | – | – | – |
| **Deutsche Bank** | EUAs | 18.5 | 18.5 | 17.75 | 21.85 | 22.7 | 26.2 |
| | CERs | – | – | – | – | – | – |
| **Nomisma Energy** | EUAs | 16.4 | 17 | 16.5 | 20.1 | 19.4 | 24.8 |
| | CERs | 12.4 | 13.1 | 12.60 | 15.9 | – | – |
| **Point Carbon** | EUAs | 19 | 19 | 18 | 22 | 22 | 30 |
| | CERs | 15 | 15 | 14 | 14 | 18 | 23 |
| **Sagacarbon** | EUAs | 16.5 | 17 | 16.5 | 21 | 35 | 35 |
| | CERs | 12 | 13 | 12.45 | 19 | 25 | 31 |
| **SocGen/orbeo** | EUAs | 16 | 16.75 | 16.2 | 19 | 24 | |
| | CERs | 11.5 | 12 | 11.8 | 13 | 21 | |
| **UniCredit** | EUAs | 18.05 | 18.05 | 17.4 | 19.3 | 20 | 25 |
| | **CERs** | **13.45** | **13.45** | **13** | **–** | **–** | **–** |
| **Average** | **EUAs** | **17.35** | **18** | **17.2** | **21.6** | **24.75** | **30.15** |

*Source: PointCarbon*

## Table 8:

**Table 12: Average yearly total investments and fuel expenses**

| Total average yearly investments | 2011-20 | 2021-30 | 2031-40 | 2041-50 | Average |
|---|---|---|---|---|---|
| Reference (frag. action, ref. fossil f. prices) | 816 | 916 | 969 | 1014 | 929 |
| Effect. Techn. (frag. action, ref. fossil f. prices) | 863 | 1040 | 1299 | 1589 | 1198 |
| Effect. Techn. (glob. action, low fossil f. prices) | 858 | 1040 | 1309 | 1592 | 1200 |
| Delay. Clim. Act. (frag. action, ref. fossil f. prices) | 845 | 1011 | 1392 | 1689 | 1234 |
| **Total average yearly fuel expenses** | **2011-20** | **2021-30** | **2031-40** | **2041-50** | **Average** |
| Reference (frag. action, ref. fossil f. prices) | 930 | 1170 | 1259 | 1376 | 1184 |
| Effect. Techn. (frag. action, ref. fossil f. prices) | 911 | 1067 | 1034 | 1019 | 1008 |
| Effect. Techn. (glob. action, low fossil f. prices) | 892 | 968 | 834 | 760 | 863 |
| Delay. Clim. Act. (frag. action, ref. fossil f. prices) | 922 | 1118 | 1061 | 993 | 1023 |

Source: PRIMES, GAINS

*Source: European Commission (SEC (2011) 288)*

## Table 9:

**Table 26: EU-27 Greenhouse gas emissions by sector in the Global action scenario,**

| Variable | 1990 | 2000 | 2005 | 2010 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|---|
| 1990 = 100% | | | | | | | | |
| *GHG Total* | 100 | 93 | 95 | 86 | 73 | 55 | 36 | 22 |
| GHG Power Sector | 100 | 89 | 95 | 82 | 61 | 40 | 20 | 7 |
| GHG industry | 100 | 89 | 87 | 79 | 65 | 57 | 41 | 28 |
| GHG transport | 100 | 111 | 118 | 120 | 117 | 94 | 71 | 48 |
| GHG residential services | 100 | 90 | 91 | 81 | 77 | 54 | 33 | 21 |

Source: POLES, JRC, IPTS

*Source: European Commission (SEC (2011) 288)*

## Table 10:

**Table 1: Sectoral reductions**

| GHG reductions compared to 1990 | 2005 | 2030 | 2050 |
|---|---|---|---|
| Total | -7% | -40 to -44% | -79 to -82% |
| Sectors | | | |
| Power ($CO_2$) | -7% | -54 to -68% | -93 to -99% |
| Industry ($CO_2$) | -20% | -34 to -40% | -83 to -87% |
| Transport (incl. CO2 aviation, excl. maritime) | +30% | +20 to -9% | -54 to -67% |
| Residential and services ($CO_2$) | -12% | -37 to -53% | -88 to-91% |
| Agriculture (non-$CO_2$) | -20% | -36 to -37% | -42 to -49% |
| Other non-$CO_2$ emissions | -30% | -72 to -73% | -70 to -78% |

*Source:* European Commission (COM (2011) 112).

## Table 11:

| Industry | Indirect $CO_2$ emissions | Direct $CO_2$ emissions | Total $CO_2$ emissions |
|---|---|---|---|
| Chemical pulp | 0.07 | 0.04 | 0.12 |
| Chemical P&P | 0.62 | 0.00 | 0.62 |
| Mechanical P&P | 1.03 | 0.00 | 1.03 |
| Thermo-mech.P&P | 0.12 | 0.02 | 0.14 |
| Recovered fibre P&P | 0.27 | 0.34 | 0.61 |

**Table 2 - Carbon intensity in pulp and paper production, tons of $CO_2$ per ton of pulp/paper produced.** ***Source: McKinsey and Ecofys (2006), p.32.***

*Source: Hourcade et al (2007)*

## Table 12:

**Table 15: Energy and $CO_2$ related data for the *production of basic organic chemicals* (DG2414)**

| | Fuel ($GJ/t_{ch}$) | Electricity [1] ($GJ/t_{ch}$) | Energy intensity ($GJ/t_{ch}$) | $CO_2$ intensity ($t_{CO2}/t_{ch}$) | Energy cost (€/$t_{ch}$) | Price of product (€/$t_{ch}$) | Cost for $CO_2$ -allowance | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Euro (€/$t_{ch}$) | Percentage of energy cost (%) | Percentage of product price (%) |
| **Ethylene** [1] | 34 | n/a | 33 | 1.9 | 355 | 900 [3] (5/2007) | 38 | 10.7 | 4.2 |
| **Propylene** [1][2] | 57 | n/a | 57 | 2.9 | 600 | 850 [3] (5/2007) | 58 | 9.7 | 6.8 |
| **Butadiene** [1] [2] | 192 | n/a | 192 | 9.8 | 2020 | 920 [3] (5/2007) | 196 | 9.7 | 21.3 |
| **Ethylene oxide** (integrated) [4] | 51.3 | 0.2 | 51.5 | total: 3.7 process related: 0.7 | 542 | 890 [3] (5/2007) | 74 | 13.7 | 8.3 |
| **Mono ethylene glycol** (integrated) [5] | 64.2 | 0.3 | 64.5 | 4.6 | 678 | 810 [3] (5/2007) | 93 | 13.7 | 11.5 |
| **Vinyl Chloride Monomer (VCM)** (integrated) [6] | 20.7 | 3.7 | 24.4 | 1.6 | 247 | 600 [3] (5/2007) | 32 | 13.0 | 5.3 |
| **Benzene from pygas** | 9.5 | 0.9 | 10.4 | 0.8 | 113 | 870 [3] (5/2007) | 16.2 | 14.3 | 1.9 |
| **Benzene from HDA** | 9.7 | 0.3 | 10.0 | 0.7 | 106 | 870 [3] (5/2007) | 14.9 | 14.1 | 1.7 |
| **Benzene from reformate** | 14.4 | 1.4 | 15.8 | 1.2 | 171 | 970 [3] (5/2007) | 24.5 | 14.3 | 2.5 |
| **Para-Xylene from reformate** | 21.6 | 2.1 | 23.7 | 1.8 | 256 | 880 [3] (5/2007) | 36.7 | 14.3 | 4.2 |

*Source: Energy consumption of current installations for the production of basic organic chemicals in Europe (BREF-orgchem).*

*Source: Bergman et al (2007)*

**Table 13:**

**C02 per electricity output**

**(tCO2 / MWh)**

| Country | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EU-27 | 0.445 | 0.428 | 0.426 | 0.428 | 0.430 | 0.436 | 0.422 | 0.415 | 0.413 | 0.414 | 0.392 | 0.380 |
| Austria | 0.174 | 0.164 | 0.158 | 0.180 | 0.169 | 0.216 | 0.198 | 0.192 | 0.181 | 0.161 | 0.154 | 0.135 |
| Belgium | 0.302 | 0.258 | 0.275 | 0.268 | 0.279 | 0.282 | 0.284 | 0.280 | 0.266 | 0.253 | 0.241 | 0.234 |
| Bulgaria | 0.646 | 0.604 | 0.564 | 0.614 | 0.569 | 0.616 | 0.623 | 0.588 | 0.573 | 0.687 | 0.685 | 0.663 |
| Cyprus | 0.869 | 0.883 | 0.862 | 0.799 | 0.778 | 0.784 | 0.790 | 0.793 | 0.785 | 0.780 | 0.781 | 0.764 |
| Czech Republic | 0.819 | 0.781 | 0.778 | 0.760 | 0.718 | 0.747 | 0.735 | 0.756 | 0.733 | 0.732 | 0.724 | 0.695 |
| Denmark | 0.713 | 0.670 | 0.637 | 0.643 | 0.621 | 0.629 | 0.574 | 0.552 | 0.610 | 0.590 | 0.578 | 0.584 |
| Estonia | 1.484 | 1.477 | 1.377 | 1.356 | 1.308 | 1.273 | 1.251 | 1.185 | 1.172 | 1.106 | 1.138 | 1.171 |
| Finland | 0.298 | 0.293 | 0.271 | 0.327 | 0.359 | 0.400 | 0.343 | 0.265 | 0.358 | 0.337 | 0.269 | 0.307 |
| France | 0.100 | 0.085 | 0.080 | 0.067 | 0.076 | 0.081 | 0.077 | 0.087 | 0.081 | 0.082 | 0.078 | 0.080 |
| Germany | 0.559 | 0.543 | 0.547 | 0.564 | 0.565 | 0.566 | 0.550 | 0.535 | 0.525 | 0.538 | 0.510 | 0.515 |
| Greece | 1.014 | 0.960 | 0.956 | 0.967 | 0.938 | 0.900 | 0.906 | 0.904 | 0.845 | 0.863 | 0.836 | 0.824 |
| Hungary | 0.649 | 0.633 | 0.630 | 0.611 | 0.563 | 0.629 | 0.574 | 0.480 | 0.495 | 0.463 | 0.443 | 0.408 |
| Iceland | | | | | | | | | | | | |
| Ireland | 0.696 | 0.700 | 0.653 | 0.673 | 0.628 | 0.599 | 0.576 | 0.583 | 0.524 | 0.494 | 0.464 | 0.441 |
| Italy | 0.442 | 0.420 | 0.416 | 0.417 | 0.431 | 0.425 | 0.404 | 0.393 | 0.383 | 0.382 | 0.358 | 0.334 |
| Latvia | 0.528 | 0.640 | 0.540 | 0.542 | 0.562 | 0.546 | 0.421 | 0.403 | 0.409 | 0.396 | 0.350 | 0.328 |
| Lithuania | 0.356 | 0.383 | 0.354 | 0.285 | 0.225 | 0.198 | 0.197 | 0.267 | 0.302 | 0.240 | 0.216 | 0.206 |
| Luxembourg | 0.118 | 0.167 | 0.152 | 0.214 | 0.289 | 0.296 | 0.308 | 0.303 | 0.305 | 0.295 | 0.283 | 0.298 |
| Malta | 0.939 | 0.906 | 0.869 | 0.918 | 0.877 | 0.882 | 0.868 | 0.876 | 0.874 | 0.879 | 0.855 | 0.857 |
| Netherlands | 0.564 | 0.559 | 0.555 | 0.568 | 0.567 | 0.571 | 0.553 | 0.538 | 0.506 | 0.501 | 0.487 | 0.463 |
| Norway | 0.005 | 0.005 | 0.004 | 0.005 | 0.005 | 0.007 | 0.006 | 0.004 | 0.005 | 0.007 | 0.005 | 0.013 |
| Poland | 1.202 | 1.178 | 1.141 | 1.150 | 1.129 | 1.126 | 1.096 | 1.072 | 1.073 | 1.058 | 1.055 | 1.039 |
| Portugal | 0.411 | 0.508 | 0.425 | 0.409 | 0.482 | 0.381 | 0.427 | 0.479 | 0.395 | 0.368 | 0.365 | 0.344 |
| Romania | 0.992 | 0.916 | 0.898 | 0.925 | 0.927 | 0.951 | 0.867 | 0.779 | 0.778 | 0.785 | 0.730 | 0.675 |
| Slovakia | 0.333 | 0.310 | 0.294 | 0.309 | 0.293 | 0.316 | 0.305 | 0.279 | 0.263 | 0.259 | 0.262 | 0.255 |
| Slovenia | 0.422 | 0.389 | 0.399 | 0.425 | 0.439 | 0.444 | 0.411 | 0.416 | 0.420 | 0.436 | 0.387 | 0.369 |
| Spain | 0.355 | 0.409 | 0.400 | 0.356 | 0.401 | 0.349 | 0.357 | 0.374 | 0.339 | 0.352 | 0.289 | 0.255 |
| Sweden | 0.058 | 0.049 | 0.041 | 0.045 | 0.056 | 0.070 | 0.057 | 0.049 | 0.052 | 0.049 | 0.047 | 0.055 |
| Switzerland | 0.037 | 0.031 | 0.032 | 0.031 | 0.034 | 0.034 | 0.036 | 0.041 | 0.041 | 0.037 | 0.037 | 0.037 |
| Turkey | 0.530 | 0.554 | 0.577 | 0.607 | 0.532 | 0.491 | 0.468 | 0.517 | 0.484 | 0.525 | 0.511 | 0.494 |
| United Kingdom | 0.427 | 0.398 | 0.420 | 0.439 | 0.425 | 0.436 | 0.439 | 0.433 | 0.457 | 0.447 | 0.443 | 0.399 |

*Source: Calculations by DG COMP based on data from the European Environment Agency*

**Table 14:**

**C02 per electricity output**

**(comparison with EU average)**

| Country | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 39% | 38% | 37% | 42% | 39% | 50% | 47% | 46% | 44% | 39% | 39% | 36% |
| Belgium | 68% | 60% | 64% | 63% | 65% | 65% | 67% | 68% | 64% | 61% | 61% | 62% |
| Bulgaria | 145% | 141% | 132% | 144% | 132% | 141% | 148% | 142% | 139% | 166% | 175% | 175% |
| Cyprus | 195% | 206% | 202% | 187% | 181% | 180% | 187% | 191% | 190% | 189% | 199% | 201% |
| Czech Republic | 184% | 182% | 182% | 178% | 167% | 171% | 174% | 182% | 177% | 177% | 185% | 183% |
| Denmark | 160% | 156% | 149% | 150% | 144% | 144% | 136% | 133% | 148% | 143% | 147% | 154% |
| Estonia | 334% | 345% | 323% | 317% | 304% | 292% | 296% | 286% | 284% | 267% | 291% | 309% |
| Finland | 67% | 68% | 64% | 77% | 83% | 92% | 81% | 64% | 87% | 81% | 69% | 81% |
| France | 22% | 20% | 19% | 16% | 18% | 19% | 18% | 21% | 20% | 20% | 20% | 21% |
| Germany | 126% | 127% | 128% | 132% | 131% | 130% | 130% | 129% | 127% | 130% | 130% | 136% |
| Greece | 228% | 224% | 224% | 226% | 218% | 207% | 215% | 218% | 205% | 209% | 213% | 217% |
| Hungary | 146% | 148% | 148% | 143% | 131% | 144% | 136% | 116% | 120% | 112% | 113% | 108% |
| Iceland | | | | | | | | | | | | |
| Ireland | 157% | 164% | 153% | 157% | 146% | 137% | 137% | 141% | 127% | 119% | 118% | 116% |
| Italy | 99% | 98% | 98% | 98% | 100% | 98% | 96% | 95% | 93% | 92% | 91% | 88% |
| Latvia | 119% | 150% | 127% | 127% | 130% | 125% | 100% | 97% | 99% | 96% | 89% | 86% |
| Lithuania | 80% | 89% | 83% | 67% | 52% | 45% | 47% | 64% | 73% | 58% | 55% | 54% |
| Luxembourg | 27% | 39% | 36% | 50% | 67% | 68% | 73% | 73% | 74% | 71% | 72% | 78% |
| Malta | 211% | 212% | 204% | 215% | 204% | 202% | 206% | 211% | 212% | 212% | 218% | 226% |
| Netherlands | 127% | 130% | 130% | 133% | 132% | 131% | 131% | 130% | 123% | 121% | 124% | 122% |
| Norway | | | | | | | | | | | | |
| Poland | 270% | 275% | 268% | 269% | 262% | 258% | 260% | 258% | 260% | 256% | 269% | 274% |
| Portugal | 92% | 119% | 100% | 96% | 112% | 87% | 101% | 115% | 96% | 89% | 93% | 91% |
| Romania | 223% | 214% | 211% | 216% | 215% | 218% | 206% | 188% | 188% | 190% | 186% | 178% |
| Slovakia | 75% | 72% | 69% | 72% | 68% | 73% | 72% | 67% | 64% | 63% | 67% | 67% |
| Slovenia | 95% | 91% | 94% | 99% | 102% | 102% | 98% | 100% | 102% | 106% | 99% | 97% |
| Spain | 80% | 96% | 94% | 83% | 93% | 80% | 85% | 90% | 82% | 85% | 74% | 67% |
| Sweden | 13% | 11% | 10% | 11% | 13% | 16% | 13% | 12% | 13% | 12% | 12% | 15% |
| Switzerland | | | | | | | | | | | | |
| Turkey | | | | | | | | | | | | |
| United Kingdom | 96% | 93% | 98% | 103% | 99% | 100% | 104% | 104% | 111% | 108% | 113% | 105% |

*Source: Calculations by DG COMP based on data from the European Environment Agency.*

## Table 15:

**Table 20. Impact of the proposed package on different economic sectors for EU 27 in 2020 in percentage difference from base)**

| SECTOR | Output | | | Employment | | | Wages | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2010 | 2015 | 2020 | 2010 | 2015 | 2020 |
| 1 Agriculture etc | 0 | 0.15 | 0.41 | 0 | 0.05 | 0.46 | 0 | 0.77 | 0.85 |
| 2 Coal | 0 | -0.93 | -1.39 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 Oil & Gas etc | 0 | -0.15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 Other Mining | 0 | -0.23 | -0.36 | 0 | -0.49 | -1.4 | 0 | 0.88 | 1.7 |
| 5 Food, Drink & Tob. | 0 | 0.71 | 1.74 | 0 | 0.06 | 0.39 | 0 | 0.6 | 1.22 |
| 6 Text., Cloth. & Leath | 0 | 0.29 | 0.82 | 0 | -0.02 | 0.07 | 0 | 0.85 | 1.19 |
| 7 Wood & Paper | 0 | 0.07 | 0.31 | 0 | 0.63 | 1.12 | 0 | 0.33 | 0.81 |
| 8 Printing & Publishing | 0 | 0.46 | 0.7 | 0 | 0.14 | 0.61 | 0 | 0.66 | 0.58 |
| 9 Manuf. Fuels | 0 | -2.49 | -4.06 | 0 | -0.84 | -1 | 0 | 0.88 | 1.75 |
| 10 Pharmaceuticals | 0 | 0.44 | 0.14 | 0 | -0.22 | 0.49 | 0 | 0.32 | 0.45 |
| 11 Chemicals nes | 0 | 0.31 | 0.58 | 0 | 0.73 | 1.34 | 0 | 0.03 | 0.23 |
| 12 Rubber & Plastics | 0 | 0.75 | 1.18 | 0 | 0.93 | 1.52 | 0 | 0.42 | 0.52 |
| 13 Non-Met. Min. Prods. | 0 | 0.06 | -0.28 | 0 | 0.54 | 1.28 | 0 | 0.46 | 0.31 |
| 14 Basic Metals | 0 | 0.24 | 0.15 | 0 | 0.56 | 1.32 | 0 | 0.33 | 0.61 |
| 15 Metal Goods | 0 | 0.71 | 0.93 | 0 | 0.29 | 0.58 | 0 | 0.53 | 0.8 |
| 16 Mech. Engineering | 0 | 0.76 | 0.95 | 0 | 0.2 | 0.44 | 0 | 0.19 | 0.52 |
| 17 Electronics | 0 | 2.27 | 3.14 | 0 | 1.06 | 0.93 | 0 | 0.73 | 1.07 |
| 18 Elec. Eng. & Instrum. | 0 | -0.01 | -0.15 | 0 | 0.16 | 0.21 | 0 | 0.22 | 0.8 |
| 19 Motor Vehicles | 0 | 0.25 | 0.11 | 0 | 0.25 | 0.46 | 0 | 0.41 | 0.76 |
| 20 Oth. Transp. Equip. | 0 | -0.08 | -0.19 | 0 | 0.05 | 0.05 | 0 | 0.78 | 1.63 |
| 21 Manuf. nes | 0 | 0.43 | 0.58 | 0 | 0.17 | 0.45 | 0 | 0.24 | 0.83 |
| 22 Electricity | 0 | 0.75 | 0.5 | 0 | 0 | 0 | 0 | 1.49 | 2.89 |
| 23 Gas Supply | 0 | -4.29 | -6.05 | 0 | 0 | 0 | 0 | 1.55 | 2.86 |
| 24 Water Supply | 0 | 0.07 | 0.28 | 0 | 0 | 0 | 0 | 1.67 | 3.08 |
| 25 Construction | 0 | 1.42 | 1.81 | 0 | 0.58 | 0.2 | 0 | 1.64 | 3.08 |
| 26 Distribution | 0 | -0.03 | -0.08 | 0 | -0.1 | -0.08 | 0 | 0.37 | 0.73 |
| 27 Retailing | 0 | 0.5 | 0.98 | 0 | 0.05 | 0.34 | 0 | 0.26 | 0.79 |
| 28 Hotels & Catering | 0 | 0.58 | 0.75 | 0 | -0.02 | 0.04 | 0 | 0.95 | 2.03 |
| 29 Land Transport etc | 0 | -0.11 | -0.27 | 0 | 0.42 | 0.55 | 0 | 1.17 | 1.85 |
| 30 Water Transport | 0 | -0.01 | 0.33 | 0 | 0.32 | 1.6 | 0 | 1.18 | 2.12 |
| 31 Air Transport | 0 | -0.73 | -1.42 | 0 | 0.74 | 0.04 | 0 | 0.76 | 0.69 |
| 32 Communications | 0 | 0.25 | 0.5 | 0 | 2.28 | 2.69 | 0 | -1.23 | -0.98 |
| 33 Banking & Finance | 0 | 0.45 | 0.7 | 0 | -0.01 | 0.06 | 0 | 0.24 | 0.49 |
| 34 Insurance | 0 | 0.66 | 1.52 | 0 | 0.06 | 0.29 | 0 | 0.18 | 1.15 |
| 35 Computing Services | 0 | 0.58 | 0.84 | 0 | 0.39 | 0.28 | 0 | 0.28 | 1.12 |
| 36 Prof. Services | 0 | 0.2 | 0.3 | 0 | -0.03 | 0.1 | 0 | 0.25 | 1.2 |
| 37 Other Bus. Services | 0 | 0.31 | 0.43 | 0 | 0.09 | 0.17 | 0 | -0.03 | 0.63 |
| 38 Public Admin. & Def. | 0 | 0.02 | 0.01 | 0 | 0 | 0 | 0 | 1.47 | 2.83 |
| 39 Education | 0 | -0.03 | -0.06 | 0 | 0 | 0 | 0 | 1.51 | 2.86 |
| 40 Health & Social Work | 0 | 0.07 | 0.08 | 0 | 0 | 0 | 0 | 1.34 | 2.64 |
| 41 Misc. Services | 0 | 0.4 | 0.57 | 0 | -0.42 | -0.79 | 0 | 1.16 | 2.34 |
| **Total** | **0** | **0.29** | **0.42** | **0** | **0.11** | **0.18** | **0** | **n/a** | **n/a** |

Source(s): E3ME, Cambridge Econometrics

*Source: European Commission (SEC(2011) 779).*

## Table 16:

Table 4: Sources of global refinery $CO_2$ emissions

| Source | Fraction |
|---|---|
| Oil and gas fuel firing of furnaces and boilers | 65% |
| Regeneration of cracker catalyst | 16% |
| Flares | < 3% |
| Methane steam reforming to make hydrogen | 2% |
| Incineration and effluent processes | 1% |
| Power[26] | 13% |

Source: Gale and Freund (2001)

*Source: Barron et al (2008) (footnote 26: On average 55% of electricity needs from grid. (so very high degree of autogeneration)*

## Table 17:

Table 4 *Annual electricity cost savings from the IFIEC method according to equation [3]. Cost savings are calculated by multiplying columns A, B and C.*

| | Electricity use industry 2020[1)] (TWh) | Electricity use househ. & services 2020 (TWh) | Electricity use total 2020 (TWh) | Benchmark ($*10^6$ ton $CO_2$/TWh) | $CO_2$ price (€/ton) | Cost savings industry (billion €/yr) | Cost savings househ. & services (billion €/yr) | Cost savings users total (billion €/yr) |
|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | B | C | A1*B*C | A2*B*C | A3*B*C |
| EU-27 | 1127 | 1554 | 2682 | 0.515 | 40 | 23.2 | 32.0 | 55.2 |
| EU-25 | 1094 | 1525 | 2619 | 0.515 | 40 | 22.5 | 31.4 | 54.0 |
| EU-15 | 994 | 1386 | 2380 | 0.515 | 40 | 20.5 | 28.5 | 49.0 |
| Belgium | 39 | 39 | 79 | 0.515 | 40 | 0.8 | 0.8 | 1.6 |
| Bulgaria | 10 | 15 | 25 | 0.515 | 40 | 0.2 | 0.3 | 0.5 |
| Czech Republic | 23 | 30 | 53 | 0.515 | 40 | 0.5 | 0.6 | 1.1 |
| Denmark | 10 | 23 | 33 | 0.515 | 40 | 0.2 | 0.5 | 0.7 |
| Germany | 232 | 269 | 501 | 0.515 | 40 | 4.8 | 5.5 | 10.3 |
| Estonia | 2 | 4 | 6 | 0.515 | 40 | 0.04 | 0.08 | 0.12 |
| Ireland | 8 | 17 | 24 | 0.515 | 40 | 0.2 | 0.3 | 0.5 |
| Greece | 14 | 36 | 51 | 0.515 | 40 | 0.3 | 0.7 | 1.0 |
| Spain | 105 | 132 | 237 | 0.515 | 40 | 2.2 | 2.7 | 4.9 |
| France | 134 | 276 | 410 | 0.515 | 40 | 2.8 | 5.7 | 8.5 |
| Italy | 145 | 146 | 291 | 0.515 | 40 | 3.0 | 3.0 | 6.0 |
| Cyprus | 1 | 3 | 4 | 0.515 | 40 | 0.01 | 0.07 | 0.08 |
| Latvia | 2 | 4 | 6 | 0.515 | 40 | 0.04 | 0.08 | 0.11 |
| Lithuania | 3 | 5 | 8 | 0.515 | 40 | 0.06 | 0.10 | 0.16 |
| Luxemburg | 4 | 2 | 6 | 0.515 | 40 | 0.08 | 0.04 | 0.12 |
| Hungary | 9 | 22 | 31 | 0.515 | 40 | 0.19 | 0.5 | 0.6 |
| Maltha | 1 | 1 | 2 | 0.515 | 40 | 0.01 | 0.02 | 0.04 |
| Netherlands | 42 | 61 | 103 | 0.515 | 40 | 0.9 | 1.3 | 2.1 |
| Austria | 24 | 29 | 54 | 0.515 | 40 | 0.5 | 0.6 | 1.1 |
| Poland | 41 | 54 | 95 | 0.515 | 40 | 0.9 | 1.1 | 2.0 |
| Portugal | 17 | 29 | 46 | 0.515 | 40 | 0.4 | 0.6 | 0.9 |
| Romania | 24 | 14 | 37 | 0.515 | 40 | 0.5 | 0.3 | 0.8 |
| Slovenia | 7 | 5 | 13 | 0.515 | 40 | 0.15 | 0.11 | 0.26 |
| Slovakia | 11 | 11 | 22 | 0.515 | 40 | 0.23 | 0.23 | 0.46 |
| Finland | 43 | 37 | 80 | 0.515 | 40 | 0.9 | 0.8 | 1.7 |
| Sweden | 58 | 71 | 129 | 0.515 | 40 | 1.2 | 1.5 | 2.6 |
| United Kingdom | 119 | 218 | 337 | 0.515 | 40 | 2.4 | 4.5 | 6.9 |

1) See main text, electricity consumption in 2020 is set at 2005 values.
2) The Commission assumes a carbon price of 39 €/t-$CO_2$ in its impact assessment that accompanies the final 2008 climate package proposal (EC, 2008b).

*Source: IFIEC (2008)*

## Table 18:

Table 11 *Benchmark values at different $CO_2$ reduction and electricity production scenarios. Summary data of Table 5.*

| **Benchmark values (Mt-$CO_2$/ TWh)** | **-21% $CO_2$ emission 2020 compared to 2005** | **-30% $CO_2$ emission 2020 compared to 2005** | **-40% $CO_2$ emission 2020 compared to 2005** |
|---|---|---|---|
| High TWh scenario (baseline) | 0.44 | 0.39 | 0.33 |
| Low TWh scenario | 0.59 | 0.52 | 0.45 |
| Uncertainty | 0.14 | 0.13 | 0.12 |
| Average benchmark value[a] | 0.515 | 0.455 | 0.39 |

a) these values are used for the costs savings calculations in paragraph 3.4

*Source: IFIEC (2008)*

## Table 19:

Table 5 *Some illustrative calculations of $CO_2$ price required for coal-gas fuel shift.*

| | | 2005 fuel price indication | | | |
|---|---|---|---|---|---|
| | | **Gas** | **Coal** | **Gas** | **Coal** |
| Emission factor | t-$CO_2$/MWh | 0.4 | 0.9 | 0.4 | 0.9 |
| Fuel price at plant | €/GJ | 7.0 | 2.8 | 7.0 | 2.8 |
| Efficiency | % | 0.49 | 0.37 | 0.49 | 0.37 |
| Fuel costs | €/MWh | 51.4 | 27.2 | 51.4 | 27.2 |
| Mark-up[a] | €/MWh | 7.0 | 15.0 | 0.0 | 0.0 |
| Short run marginal costs | €/MWh | 58.4 | 42.2 | 51.4 | 27.2 |
| $CO_2$ price - fuel shift | Euro/ton $CO_2$ | **32** | | **48**[b] | |
| $CO_2$ costs | €/MWh | 12.9 | 29.1 | 19.3 | 43.5 |
| Overall marginal costs | €/MWh | 71.4 | 71.4 | 70.8 | 70.8 |
| | | **2007 fuel price indication** | | | |
| | | **Gas** | **Coal** | **Gas** | **Coal** |
| Emission factor | t-CO2/MWh | 0.4 | 0.9 | 0.4 | 0.9 |
| Fuel price at plant | €/GJ | 5.0 | 1.8 | 5.0 | 1.8 |
| Efficiency | % | 0.49 | 0.37 | 0.49 | 0.37 |
| Fuel costs | €/MWh | 36.7 | 17.5 | 36.7 | 17.5 |
| Mark-up[a] | €/MWh | 7.0 | 15.0 | 0.0 | 0.0 |
| Short run marginal costs | €/MWh | 43.7 | 32.5 | 36.7 | 17.5 |
| $CO_2$ price - fuel shift | €/ton CO2 | **22**[b] | | **38** | |
| $CO_2$ costs | €/MWh | 9.0 | 20.2 | 15.4 | 34.6 |
| Overall marginal costs | €/MWh | 52.7 | 52.7 | 52.1 | 52.1 |

[a] for explanation, see main text, [b] variants used in Figure 13

[12] Data refer to so called carbon-adjusted spreads
[13] Note, that in our simple illustrative model , we did not consider updating (also called 'moving baseline'), i.e. renewed grandfathering at the start of trading period based on a more recent (set of) base year(s). According to Matthes et al. (2007) such updating undermines incentives for a shift from coal to gas.

*Source: IFIEC (2008)*

## Table 20:

Table 8 *Price elasticity of export and import of raw materials in Western Europe (CPB, 2000; CBP/RIVM, 2001)[a].*

| | Export | Import |
|---|---|---|
| Steel | -4[b] | 2 |
| Aluminum | -3 | 2 |
| Petrochemicals (monomers) | -5 | 4 |
| Petrochemicals (polymers) | -5 | 2 |
| Paper | -2 | 2 |
| Nitrogen fertilizer | -4 | 4 |
| Phosphorous fertilizer | -4 | 4 |

a) data for Western Europe do not necessarily extrapolate to the EU-27.
b) example calculation: a 5% increase of cost of steel production in Western Europe (relative to other regions) leas to a decrease of export to a level of 100/(100+5*4)=83%, so a decrease in export of 17%.

Table 9 *Consequences of electricity price increase of 6.5% on production levels in basic industries (CPB, 2003)[a].*

| | Total production | Primary production | Secondary production | Energy use |
|---|---|---|---|---|
| Steel | -2.5 | -5 | 0.5 | -5 |
| Aluminum | -2 | -4 | 0.5 | -6 |
| Plastic | -2 | -2 | n.a. | -4 |
| Paper | -0.25 | -0.5 | 0.25 | -5 |
| Nitrogen | -2 | -0.4 | n.a. | -4 |

a) calculations were made on the scale of Western Europe, which compared probably to the EU-10. Calculations on the EU-27 scale would result in lower reductions of production levels in response to ET ETS-induced increases in electricity prices.

*Source: IFIEC (2008)*

## Table 21:

Table 10 *Electricity production (fossil fuelled), $CO_2$ and benchmark scenarios for the EU25. For explanation, see main text.*

| **Base line** | **1990** | **2000** | **2005** | **2020** |
|---|---|---|---|---|
| TWh (fossil fuelled) base line | 1403 | 1620 | 1791 | 2436 |
| $CO_2$ (Mton) | 1363 | 1295 | 1342 | 1333 |
| Benchmark (Mton $CO_2$/TWh) | 0.97 | 0.80 | 0.75 | **0.55*** |
| **-21% $CO_2$ in 2020 compared to 2005** | | | | |
| TWh (fossil fuelled) base line | 1403 | 1620 | 1791 | 2436 |
| $CO_2$ (Mton) | 1363 | 1295 | 1342 | 1060 |
| Benchmark (Mton $CO_2$/TWh) | 0.97 | 0.80 | 0.75 | **0.44** |
| TWh (fossil fuelled) –lower bound | 1403 | 1620 | 1791 | 1791 |
| $CO_2$ (Mton of $CO_2$) | 1363 | 1295 | 1342 | 1060 |
| Benchmark (Mton $CO_2$/TWh) | 0.97 | 0.80 | 0.75 | **0.59** |
| **-30% $CO_2$ in 2020 compared to 2005** | | | | |
| TWh (fossil fuelled) base line | 1403 | 1620 | 1791 | 2436 |
| $CO_2$ (Mton of $CO_2$) | 1363 | 1295 | 1342 | 939 |
| Benchmark (Mton $CO_2$/TWh) | 0.97 | 0.80 | 0.75 | **0.39** |
| TWh (fossil fuelled) –lower bound | 1403 | 1620 | 1791 | 1791 |
| $CO_2$ (Mton of $CO_2$) | 1363 | 1295 | 1342 | 939 |
| Benchmark (Mton CO2/TWh) | 0.97 | 0.80 | 0.75 | **0.52** |
| **-40% $CO_2$ in 2020 compared to 2005** | | | | |
| TWh (fossil fuelled) base line | 1403 | 1620 | 1791 | 2436 |
| $CO_2$ (Mton of $CO_2$) | 1363 | 1295 | 1342 | 805 |
| Benchmark (Mton $CO_2$/TWh) | 0.97 | 0.80 | 0.75 | **0.33** |
| TWh (fossil fuelled) –lower bound | 1403 | 1620 | 1791 | 1791 |
| $CO_2$ (Mton of $CO_2$) | 1363 | 1295 | 1342 | 805 |
| Benchmark (Mton $CO_2$/TWh) | 0.97 | 0.80 | 0.75 | **0.45** |

* the reduction in the benchmark value, compared to 2005, in the base line scenario results from the PRIMES assumptions on further 'gasification', see main text.

*Source: IFIEC (2008)*

## Table 22:

*Tabella 1 – Tassi di crescita della domanda di materie plastiche per area geografica e tasso di crescita del PIL*

| | 2000-2008 | 2008-2009 | 2009-2010 | 2010-2015 | 2015-2025 |
|---|---|---|---|---|---|
| By Region | | | | | |
| *North America* | *-0.8* | *-6.9* | *4.3* | *2.6* | *1.9* |
| *Latin America* | *4.6* | *-0.3* | *5.1* | *4.9* | *4.3* |
| *Europe* | *1.7* | *-7.2* | *2.9* | *2.9* | *2.5* |
| *Former USSR* | *16.5* | *-10.5* | *7.4* | *7.5* | *6.1* |
| *Africa* | *7.2* | *6.0* | *6.5* | *6.1* | *5.2* |
| *Middle East* | *8.1* | *5.7* | *6.6* | *6.0* | *4.9* |
| *North East Asia* | *5.3* | *12.6* | *7.9* | *5.5* | *4.0* |
| *Asia & Pacific* | *6.1* | *7.0* | *7.3* | *6.7* | *6.1* |
| Total World | 3.4 | 2.0 | 5.9 | 4.7 | 3.9 |
| GDP Growth | 2.9 | -2.0 | 3.3 | 3.4 | 3.1 |

*Fonte: Parpinelli Tecnon*

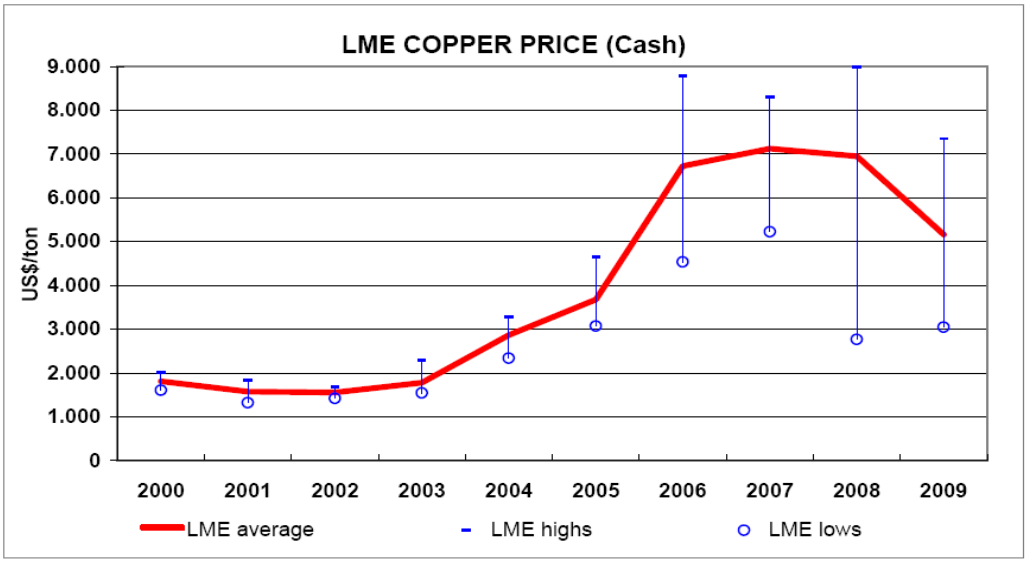
*Source: IFIEC (2008)*

**Table 24:**

**TABLE 9. LME, COMEX AND U.S. PRODUCER PRICES**

Currency in U.S. Dollars

| PERIOD | LME Grade A, Cash $/metric tonne | LME Grade A, Cash Cents/pound | COMEX HG, 1st Pos. $/metric tonne | COMEX HG, 1st Pos. Cents/pound | U.S. Producer Price Cents/pound |
|---|---|---|---|---|---|
| **ANNUAL AVERAGES** | | | | | |
| 2000 | 1.814,3 | 82,29 | 1.851,2 | 83,97 | 88,16 |
| 2001 | 1.577,8 | 71,57 | 1.599,8 | 72,57 | 76,85 |
| 2002 | 1.557,5 | 70,65 | 1.580,4 | 71,69 | 75,82 |
| 2003 | 1.779,9 | 80,73 | 1.785,5 | 80,99 | 85,17 |
| 2004 | 2.868,3 | 130,11 | 2.847,7 | 129,17 | 134,20 |
| 2005 | 3.683,6 | 167,09 | 3.710,5 | 168,31 | 173,57 |
| 2006 | 6.727,2 | 305,14 | 6.821,5 | 309,42 | 315,59 |
| 2007 | 7.126,35 | 323,25 | 7.117,39 | 322,84 | 328,67 |
| 2008 | 6.951,52 | 315,32 | 6.904,48 | 313,18 | 318,87 |
| 2009 | 5.163,59 | 234,22 | 5.214,71 | 236,54 | 242,36 |
| **ANNUAL HIGHS** | | | | | |
| 2000 | 2.009,0 | 91,13 | 2046,99 | 92,85 | 97,17 |
| 2001 | 1.837,0 | 83,33 | 1911,41 | 86,70 | 91,02 |
| 2002 | 1.689,5 | 76,63 | 1727,32 | 78,35 | 82,51 |
| 2003 | 2.293,0 | 104,01 | 2297,21 | 104,20 | 108,39 |
| 2004 | 3.287,0 | 149,10 | 3400,63 | 154,25 | 159,52 |
| 2005 | 4.650,0 | 210,92 | 5026,53 | 228,00 | 233,27 |
| 2006 | 8.788,0 | 398,62 | 8984,93 | 407,55 | 413,38 |
| 2007 | 8.301,00 | 376,53 | 8.276,14 | 375,40 | 381,23 |
| 2008 | 8.985,00 | 407,55 | 8.989,34 | 407,75 | 413,58 |
| 2009 | 7.346,00 | 333,21 | 7.335,87 | 332,75 | 338,58 |
| **ANNUAL LOWS** | | | | | |
| 2000 | 1.607,0 | 72,89 | 1635,83 | 74,20 | 78,26 |
| 2001 | 1.319,0 | 59,83 | 1331,59 | 60,40 | 64,62 |
| 2002 | 1.421,0 | 64,46 | 1438,51 | 65,25 | 69,41 |
| 2003 | 1.544,5 | 70,06 | 1563,08 | 70,90 | 75,09 |
| 2004 | 2.337,0 | 106,00 | 2342,41 | 106,25 | 110,44 |
| 2005 | 3.072,0 | 139,34 | 3075,44 | 139,50 | 144,77 |
| 2006 | 4.537,0 | 205,80 | 4695,84 | 213,00 | 218,83 |
| 2007 | 5.225,50 | 237,02 | 5.301,01 | 240,45 | 246,28 |
| 2008 | 2.770,00 | 125,65 | 2.750,04 | 124,74 | 130,58 |
| 2009 | 3.050,50 | 138,37 | 3.044,58 | 138,10 | 143,93 |




*Source: ICSG 2010 S TATISTICAL YEARBOOK (2000-2009) Vol. 7 – International Copper Study Group*

**Table 25:**

| TABLE 2.1 COMPARISON OF ESTIMATES OF ARMINGTON ELASTICITIES IN ENERGY-INTENSIVE INDUSTRIES | | | |
|---|---|---|---|
| **Sectors** | **Long-run** | **Short-run** | **Others** |
| | | | |
| **NACE C Mining and quarrying** | | | |
| | | | |
| Mining and quarrying (NACE C) | | | 1.04[5]<br>2.07[6] |
| | | | |
| **NACE 11 Extraction of crude petroleum and natural gas** | | | |
| | | | |
| Crude petroleum and natural gas (NACE 11.1) | | | 0.31[1] |
| | | | |
| **NACE 13 Mining and quarrying, except of energy producing materials** | | | |
| | | | |
| Iron and ferroalloy ores mining (NACE 13.1) | | | 1.22[1] |
| | | | |
| **NACE 14 Other mining and quarrying** | | | |
| | | | |
| Stone, sand and gravel (NACE 14.1 and 14.2) | | | 0.97[1] |
| Chemical and fertilizer mineral mining (NACE 14.3) | | | 1.13[1] |
| | | | |
| **NACE 20 Manufacture of wood and of products ...** | | | |
| | | | |
| Wood (NACE 20) | | | 3.13[4] |
| | | | |
| **NACE 21 Manufacture of pulp, paper and paper products** | | | |
| | | | |
| Manufacturing of paper and paper products (NACE 21) | | | 2.01[5]<br>0.72[6] |
| Paper (NACE 21.12) | | | 1.52[4] |
| Paper mills, except building paper (NACE 21.12) | | 1.055[2] | 0.97[1] |
| Paperboard mills (NACE 21.12) | | 0.89[2] | 1.50[1] |
| Sanitary paper products (NACE 21.22) | | 0.39[2] | 1.42[1] |
| Building paper and board mills (NACE 21.12) | | | 0.97[1] |
| Paper coating and glazing (NACE 17.12) | | | 1.68[1] |

| TABLE 2.1 COMPARISON OF ESTIMATES OF ARMINGTON ELASTICITIES IN ENERGY-INTENSIVE INDUSTRIES | | | |
|---|---|---|---|
| **Sectors** | **Long-run** | **Short-run** | **Others** |
| Paperboard containers and boxes (NACE 21.21) | | | 1.48[1] |
| Setup paperboard boxes (NACE 21.21) | | 0.76[2] | |
| Corrugated, solid fiber boxes (NACE 21.21) | | 1.50[2] | |
| | | | |
| **NACE 23 Manufacture of coke, refined petroleum & nuclear** | | | |
| | | | |
| Coal & Coke (NACE 23.1) | | | 4.40[3] |
| Petroleum (NACE 23.2) | | | 5.61[3] |
| | | | |
| **NACE 24 Manufacture of chemicals and chemical products** | | | |
| | | | |
| Manufacturing of chemicals etc (NACE 24) | | | 1.16[5]<br>2.30[6] |
| Chemicals (NACE 24) | | | 1.31[4] |
| Chemical nec (NACE 24) | | | 4.16[4] |
| Industrial organic and inorganic chemicals (NACE 24.11-24.14) | | | 0.48[1] |
| Inorganic chemicals (NACE 24.11-24.14) | | | 1.41[3] |
| Organic chemicals (NACE 24.11-24.14) | | | 7.50[3] |
| Industrial gases (NACE 24.11) | 1.05[2] | 0.96[2] | |
| Inorganic pigments (NACE 24.12) | 1.15[2] | 0.48[2] | |
| Alkali and chlorine (NACE 24.13) | | 0.76[2] | |
| Agriculture chemicals (NACE 24.2) | 1.62[2] | 1.03[2] | 0.31[1] |
| Phosphatic fertilizers (NACE 24.15) | | 1.21[2] | |
| Fertilizers (NACE 24.15) | | | 1.34[3] |
| Adhesive and sealants (NACE 24.62) | 1.87[2] | 1.18[2] | |
| Explosives (NACE 24.61) | | 0.92[2] | |
| Printing ink (NACE 24.66) | | 0.70[2] | |
| Carbon black (NACE 24.66) | | -0.24[2] | |
| Plastic materials and raisins (NACE 24.16) | 4.83[2] | 0.87[2] | 1.71[1] |
| Plastic in primary (NACE 24.16) | | | 6.06[3] |
| Chemical material nes (NACE 24.6) | | | 6.75[3] |
| Chemical preparations | 1.81[2] | 1.11[2] | 0.96[1] |
| Dyeing, tanning | | | 6.73[3] |
| | | | |
| **NACE 25 Manufacture of rubber and plastic products** | | | |
| | | | |
| Plastic in non-primary (NACE 25.2) | | | 5.54[3]<br>1.45[4] |
| | | | |
| **NACE 26 Manufacture of other non-metallic mineral products** | | | |
| | | | |
| Manufacture of non-metallic mineral products (NACE 26) | | | 0.56[5]<br>1.14[6] |
| Glass and glass products, except containers (NACE 26.1) | | | 0.36[1] |

| TABLE 2.1 COMPARISON OF ESTIMATES OF ARMINGTON ELASTICITIES IN ENERGY-INTENSIVE INDUSTRIES | | | |
|---|---|---|---|
| **Sectors** | **Long-run** | **Short-run** | **Others** |
| | | | 1.03[4] |
| Flat glass (NACE 26.11) | | 0.89[2] | |
| Pressed and blown glass (NACE 26.13 and NACE 26.15) | | 4.85[2] | |
| Glass produced from pur.glass (NACE 26.15) | | 1.11[2] | |
| Ceramic wall and floor tiles (NACE 26.3) | | 0.53[2] | 0.88[1] |
| Ceramic plumbing and electrical supplies (NACE 26.24) | | | 0.84[1] |
| Vitreous plumbing fixtures (NACE 26.24) | | 0.78[2] | |
| Porcelain electrical supplies (NACE 26.24) | 1.02[2] | 0.95[2] | |
| China and earthenware products (NACE 26.21) | | | 1.45[1]<br>3.78[4] |
| Stone and non-metallic mineral products (NACE 26.7 and 26.8) | | | 0.82[1] |
| Non-metallic mineral products (NACE 26.8) | | 1.21[2] | 2.65[3]<br>6.62[4] |
| Cement, hydraulic (NACE 26.51) | | 0.73[2] | 1.09[1] |
| Brick and structural clay tile (NACE 26.4) | | | 1.04[1] |
| Clay refractories (NACE 26.4) | 1.46[2] | 0.95[2] | |
| | | | |
| **NACE 27 Manufacture of basic metals** | | | |
| | | | |
| Basic metals (NACE 27) | | | 0.71[5]<br>2.60[6] |
| Metal | | | 1.01[4] |
| Primary steel (NACE 27.1) | | | 0.76[1] |
| Iron and steel foundries (NACE 27.51 and 27.52) | | | 3.06[1]<br>3.53[3] |
| Metal heat treating and primary metal | | | 0.69[1] |
| Primary copper (NACE 27.44) | | | 0.91[1] |
| Nonferrous metals (NACE 25.42-27.45) | | | 6.66[3]<br>1.52[4] |
| Manufacture of metal nes (NACE 27.41) | | | 4.85[3] |
| | | | |

Note(s): 1 Reinert & Roland Host, 1992
2 Gallaway et all, 2003
3 Hummels, 1999
4 Erkel-Rousse and Mirza, 2002, TLS-IV
5 Saito, 2004, bilateral trade data
6 Saito, 2004, multilateral trade data

NACE Rev1.1 codes reported in brackets show where the industry can be included.

*Source: Cambridge Econometrics et al (2009)*