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on Guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post 2021

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Glossary

Term or acronym	*Meaning or definition*
BAT	Best Available Technologies
CEP	Clean Energy Package
CHP	Combined Heat and Power
COVID-19	Coronavirus disease 2019
CWE	Central-Western Europe
EEA	European Economic Area
EEAG	Guidelines on State-aid for environmental protection and Energy
EED	Energy Efficiency Directive
EFTA	European Free Trade Association
EU	European Union
EU ETS	European Union Emission Trading System
EUA	Emission Unit Allowance
GHG	Greenhouse Gases
GVA	Gross Value Added
ICLI	Indirect Carbon Leakage Indicator = Trade Intensity * Indirect emission intensity
JRC	Joint Research Centre
NACE	Statistical classification of economic activities in the European Community (NACE = Nomenclature statistiques des Activités économiques dans la Communauté Européenne)
SMEs	Small and medium-sized enterprises
SWD	Staff Working Document
SWE	South-Western Europe
TFEU	Treaty on the Functioning of the European Union
TSO	Transmission system operators

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

The European Union is at the forefront of the fight against climate change. It has set ambitious energy and climate policies over the last decades. The EU has committed itself to cut greenhouse gas emissions by at least 40% below 1990 levels by 2030.

On 11 December 2019, the Commission published the European Green Deal Communication[1], outlining the policies to achieve climate-neutrality in Europe by 2050. The Commission had already set out a clear vision of how to achieve climate neutrality by 2050[2]. To deliver the European Green Deal, there is a need to rethink policies for clean energy supply across the economy, industry, production and consumption, large-scale infrastructure, transport, food and agriculture, construction, taxation and social benefits. While all of these areas for action are strongly interlinked and mutually reinforcing, careful attention is being paid by the Commission when there are potential trade-offs between economic, environmental and social objectives.

On 4 March 2020, the Commission adopted the proposal for a European Climate Law[3]. With the European Climate Law the Commission proposes a legally binding target of net zero greenhouse gas emissions by 2050. By summer 2020, the Commission will present an impact assessed plan to increase the EU's greenhouse gas emission reductions target for 2030 to at least 50% and towards 55% compared with 1990 levels in a responsible way. To deliver these additional greenhouse gas emission reductions, the Commission will, by June 2021, review and propose to revise where necessary, all relevant climate-related policy instruments.

On 10 March 2020, the Commission also published the New Industrial Strategy for Europe Communication[4]. The Communication stresses that all industrial value chains, including energy-intensive sectors, will have a key role to play in the European Green Deal. They will all have to work on reducing their own carbon footprints but also on accelerating the transition by providing affordable, clean technology solutions and by developing new business models. Energy-intensive industries are indispensable to Europe's economy and are relied on by other sectors. Modernising and decarbonising energy-intensive industries must therefore be a top priority.

The effects of these recent Commission policies on the initiative, as well as the impact of the COVID-19 outbreak are taken into account to the extent possible in this Staff Working Document (see also Sections 1.3 and 2.4).

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1 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, The European Green Deal, COM(2019) 640 final.

2 A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy COM (2018) 773.

3 COM(2020) 80 final.

4 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, A New Industrial Strategy for Europe, COM(2020) 102 final.

1.1. The EU ETS

In this context, the European Union Greenhouse Gas Emission Trading System (EU ETS) was introduced in 2005 to reduce CO_2 emissions in a cost-effective way and combat climate change. It was the first international system for trading Greenhouse Gases (GHG) emission allowances and it is covering more than 11 000 power stations and industrial plants in 31 countries (28 EU Member States and 3 EEA/EFTA States), as well as airlines. It covers around 45% of the EU's emissions.

The EU ETS is a "cap and trade" system: a cap is set on the total amount of greenhouse gas that can be emitted by factories, power plants and other installations in the system. The cap is reduced annually over time so that total emissions fall: in 2020, emissions from sectors covered by the EU ETS will be 21% lower than in 2005, and by 2030 43% lower. Within the cap, companies receive or buy emission allowances which they can trade with one another. After each year a company must surrender enough allowances to cover all its emissions, otherwise fines are imposed. If a company reduces its emissions, it can keep the spare allowances to cover its future needs or else sell them to another company that is short of allowances.

Directive 2009/29/EC[5] amending Directive 2003/87/EC[6] (ETS Directive) improved and extended the EU ETS in the third trading period 2013-2020 (Phase III). Phase III of the EU ETS is based on a stricter and single EU-wide cap, the allocation of allowances are made on transitional fully harmonised EU-wide basis and wider auctioning of allowances have been progressively introduced. Participation in the EU ETS is mandatory for companies operating in the sectors covered. The EU ETS thus creates a carbon price signal for businesses to reduce CO_2 emissions that contribute to climate change.

The ETS Directive has been revised for its next trading period 2021-2030 (Phase IV), with the adoption of Directive (EU) 2018/410[7], to enable it to achieve the EU's 2030 emission reduction targets.

There are two ways the carbon price affects companies covered by the EU ETS. On the one hand, these companies have to buy CO_2 certificates corresponding to their own industrial emissions (so-called "direct ETS costs"). Companies also pay more for the electricity they consume (so-called "indirect ETS costs"). Indirect ETS costs stem from the fact that the electricity producers pass the carbon price on to consumers via the electricity price.

The ETS Directive provides for the protection of EU sectors and sub-sectors "at significant **risk of carbon leakage**" due to "direct emission costs" resulting from the EU ETS.

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5 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, 5.6.2009, p.63.

6 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.

7 Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015 /1814, OJ L 76, 19.3.2018, p. 3-27.

Box 1: Carbon leakage

Carbon leakage refers to a situation where a unilateral climate regulation in a certain jurisdiction (e.g. the EU ETS) leads to a transfer of production to other jurisdictions that have less stringent climate regulations. It may result in undesirable environmental and economic consequences, namely a shift of production towards other regions outside the EU or reduction of the European market share globally. Carbon leakage also refers to investment plans that would not take place within the EU borders. Carbon leakage would eventually lead to the offset and neutralization of the CO_2 emission reductions in the EU. As long as this effect materializes in full, carbon leakage would result in an increase in global CO_2 emissions as a result of increased emissions outside the EU exceeding reduced emissions inside the EU. This effect may however only be partial, and hence carbon leakage would not necessarily lead to higher overall global emissions.

To address this risk of carbon leakage, the ETS Directive sets the possibility for certain sectors to receive allowances for free. The list of sectors eligible considered at risk of carbon leakage and therefore eligible for receiving free allowances is laid down in the Carbon Leakage List[8].

The revised ETS Directive has changed the methodology used to determine the sectors exposed to carbon leakage risk and eligible for free ETS allowances during Phase IV. Article 10 (b) - paragraph 1 of the ETS Directive defines sectors eligible on the basis of a quantitative analysis as those where the product exceeds 0.2 from multiplying their trade intensity by their emission intensity (measured in $kgCO_2/GVA$), whereas the current 2012 ETS Guidelines require that both indicators reach a certain threshold independently from each other. In particular, this new quantitative analysis consists in multiplying, for each sector, 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 European Economic Area (annual turnover plus total imports from third countries), by their emission intensity, measured in $kgCO_2$, divided by their gross value added (in euros). Article 10 (b) - paragraphs 2 and 3 of the ETS Directive defines sectors that may be eligible on the basis of a qualitative assessment as those whose product resulting from multiplying their intensity of trade with third countries by their emission intensity exceeds 0.15 (paragraph 2) and show an emission intensity divided by their GVA exceeding 1.5 (paragraph 3).

Article 10a (6) of the ETS Directive also foresees that Member States may adopt financial measures in favour of sectors exposed to carbon leakage risk due to "indirect ETS costs" provided that such measures comply with State aid rules. The revised ETS Directive states in its recitals that "[i]*t would be desirable that Member States partially compensate, in accordance with State aid rules, certain installations in sectors or subsectors which have been determined to be exposed to a significant risk of carbon leakage because of costs related to greenhouse gas emissions passed on in electricity prices* [...]."[9] Accordingly, the revised Article 10a (6) now

[8] Commission Delegated Decision (EU) 2019/708 of 15 February 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council concerning the determination of sectors and subsectors deemed at risk of carbon leakage for the period 2021 to 2030, OJ L 120, 8.5.2019, p. 20–26

[9] Recital 13 of Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 (Text with EEA relevance.) OJ L 76, 19.3.2018, p. 3–27

foresees that *"Member States should adopt financial measures […] in favour of sectors or subsectors which are exposed to a genuine risk of carbon leakage due to significant indirect emissions costs that are actually incurred from greenhouse gas emission costs passed on in electricity prices, provided that such financial measures are in accordance with State aid rules, and in particular do not cause undue distortions of competition in the internal market. Where the amount available for such financial measures exceeds 25% of the revenues generated from the auctioning of allowances, the Member State concerned shall set out the reasons for exceeding that amount. Member States shall also seek to use no more than 25% of the revenues generated from the auctioning of allowances for the financial measures referred to in the first subparagraph. […] Those measures shall be such as to ensure that there is adequate protection against the risk of carbon leakage, based on ex ante benchmarks for the indirect emissions of CO_2 per unit of production. Those ex ante benchmarks shall be calculated for a given sector or subsector as the product of the electricity consumption per unit of production corresponding to the most efficient available technologies and of the CO_2 emissions of the relevant European electricity production mix".*

The abovementioned provisions of the ETS Directive are based on the premise that financial support for indirect emissions costs can be highly distortive, if it is not properly targeted to sectors that are at significant risk of carbon leakage due to CO_2 costs passed on in electricity prices and limited to the additional cost stemming from the ETS for the most energy efficient firms. Otherwise, aid would introduce economic distortions within the EU economy and have a detrimental impact on the incentive effects and efficiency of the EU ETS.

Recital 13 of the Directive states that "*when reviewing its State aid guidelines on compensation for indirect emission costs, the Commission should consider* inter alia *the usefulness of upper limits on the compensation granted by Member States*." It is part of a broader context which is that, as set in Article 10a (6) of the revised ETS Directive, "*Member States shall also seek to use no more than 25% of the revenues generated from the auctioning of allowances*" for the financing of indirect ETS costs compensation measures. This Article further states that "*as from 2018, in any year in which a Member State uses more than 25% of the revenues generated from the auctioning of allowances for such purposes, it shall publish a report setting out the reasons for exceeding that amount. The report shall include relevant information on electricity prices for large industrial consumers benefitting from such financial measures, without prejudice to requirements regarding the protection of confidential information. The report shall also include information on whether due consideration has been given to other measures to sustainably lower indirect carbon costs in the medium to long term.*"

1.2. The 2012 ETS Guidelines

Title VII, Chapter I of the Treaty on the Functioning of the European Union ("TFEU") set the common rules on competition. In particular, Article 107 (1) of the TFEU set a general prohibition principle of State aid. Article 107 (2) and (3) of the TFEU then establish under which conditions State aid measures can be declared compatible with the internal market. To ensure that this prohibition principle is respected and that exemptions to this principle are applied equally across

the EU, Article 108 of the TFEU specifies that the Commission should be in charge of ensuring that State aid complies with EU rules.

The control of State aid rules is an exclusive competence of the Union. The Commission has adopted various State aid guidelines to explicit common principles for assessing the compatibility of aid with the internal market. These State aid guidelines are regularly reviewed over time to improve their efficiency and to respond to the European Council's calls for less but better targeted State aid to boost the European economy.

In light of Article 10a (6) of the ETS Directive, the Commission adopted in 2012 the Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 ("2012 ETS Guidelines")[10]. The 2012 ETS Guidelines allow Member States to compensate some electro-intensive undertakings active in a sector exposed to international trade, for part of the higher electricity costs expected to result from the EU ETS in the period 2013-2020.

The Guidelines provide that Member States can grant aid only in certain sectors deemed to be exposed to carbon leakage risk[11]. The list of eligible sectors is set in Annex I of the 2012 ETS Guidelines and comprises 13 sectors and 7 sub-sectors.

They also provide that such aid must be limited in size. The maximum aid amount is calculated through a formula, which is set at point 27 of the 2012 Guidelines. The formula is a tool allowing Member States to calculate the individual aid amount to be granted to a specific aid beneficiary.

Box 2: Formula - maximum aid amount pursuant to point 27 of the 2012 ETS Guidelines

Maximum Aid amount (EUR) =
Aid intensity (%) * CO_2 emission factor (t CO_2 /MWh)* EUA price (t-1) (EUR/ton)* Electricity consumption efficiency benchmark (MWh/ton) * Output (ton)

The formula aims at:

a) Estimating the indirect ETS costs faced by each undertaking: this calculation is based on the multiplication of carbon price with the carbon content of the electricity and with the amount of electricity used. The amount of electricity used is evaluated by multiplying the production (expressed in tons) by the quantity of electricity involved in the most efficient production process for this product – namely the efficiency benchmark.
    - The *CO_2 factor* (measured in tCO_2/MWh) measures the extent to which the price of the electricity consumed by the beneficiary is influenced by ETS costs. The price of carbon intensive electricity comprises a higher ETS component and

[10] Communication from the Commission — Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 (SWD (2012) 130 final) (SWD (2012) 131 final), OJ C 158, 5.6.2012, p. 4–22.

[11] The 2012 ETS Guidelines define carbon leakage as the prospect of an increase in global greenhouse gas emissions when companies shift production outside of the Union because they cannot pass on the cost increases induced by the EU ETS to their customers without significant loss of market share.

hence attracts a higher factor. As electricity prices are generated via the merit order, this factor measures the impact of certain technologies on price formation (not the overall generation mix in a given country).

- The *price of ETS allowances* (measured in EUR). The higher the ETS price the greater the resulting increase in electricity prices.
- The *benchmark for efficient electricity use* (expressed in MWh/t), reflects the fact that companies should not be compensated for electricity consumption which is due to their own operational inefficiencies. Compensation is therefore calculated based on the most energy efficient installation for a given product category in the EU. The use of such efficiency benchmarks is legally prescribed by the revised ETS Directive.
- The *production output* (in t) is company specific.

b) Defining the maximum aid amount: by applying an aid intensity to the estimation of indirect ETS costs- based on the most efficient production process, as defined above.
   - The *aid intensity* (percentage). In 2012 Guidelines, the aid intensity is declining during Phase III (also called the degressivity of the aid intensity). In particular, the aid intensity could not exceed 85 % of the eligible costs incurred in 2013, 2014 and 2015, 80 % of the eligible costs incurred in 2016, 2017 and 2018 and 75 % of the eligible costs incurred in 2019 and 2020.

Paragraph 56 of the 2012 ETS Guidelines sets that *"the Guidelines will be applicable until 31 December 2020. After consulting the Member States, the Commission may amend them before that date on the basis of important competition policy or environmental policy considerations or in order to take account of other Union policies or international commitments. Such amendments might in particular be necessary in the light of future international agreements in the area of climate change and future climate change's legislation in the Union. […]".*

As described in section 3.1. of the Annex 3 to this Report (Evaluation Report), twelve Member States (Germany, the Netherlands, Belgium (Flanders and Wallonia), Spain, Greece, Lithuania, Slovakia, France, Finland, Luxembourg, Poland, Romania), the United Kingdom, and Norway have implemented a scheme under the 2012 ETS Guidelines.

Following a referendum that took place in June 2016, the British government announced the country's withdrawal from the European Union in March 2017. At the time of writing, there is uncertainty regarding the shape of the future relationships between the European Union and the United Kingdom. At this stage, ETS State aid Guidelines will apply to the United Kingdom, at least until the end of the Transition period and possibly afterwards, depending on the outcome of the ongoing negotiations.

1.3. The ETS Guidelines in ETS Phase IV

The Green Deal Communication and the ambition to reach climate neutrality by 2050 will require the revision of all relevant climate-related policy instruments. Once the necessary changes will be known in summer 2021, the context of the present initiative will likely change. The present initiative could therefore become a stop-gap measure until legislative changes to the functioning

of the ETS resulting from the Green Deal are decided and introduced (see also section 2.4 below). Whether, and if so to what extent, those legislative changes to the EU ETS will trigger consequential changes to the future ETS Guidelines will have to be assessed once the nature and shape of these legislative initiatives becomes clear. The Commission will make sure that the ETS Guidelines remain consistent with, and contribute to all relevant climate related policy instruments that will be proposed in the context of the Green Deal to ensure effective carbon pricing throughout the economy, while respecting a level playing field.

1.4. Recent events

Recognising the COVID-19 outbreak as a major shock to the global and Union's economies and the need to mitigate these negative repercussions on the EU economy, on 19 March 2020, the Commission adopted a Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak.[12] The aim of the Temporary Framework is to tackle the severe liquidity needs of undertakings due to the exceptional circumstances created by the COVID-19 outbreak. In particular, the Temporary Framework allows for compatible aid under 107 (3) (b) TFEU to remedy a serious disturbance in the economy (while the ETS Guidelines are based on 107 (3) (c)). The Temporary Framework complements the existing State aid rules in this crisis.

2. PROBLEM DEFINITION

2.1. What is/are the problems?

The evaluation of the current 2012 ETS Guidelines conducted in parallel to this Impact Assessment concluded that the existence of a carbon leakage risk due to indirect ETS costs is difficult to demonstrate empirically, even if the economic literature generally conclude that such risk exists. The Green Deal Communication also acknowledges that, as long as many international partners do not share the same climate ambition as the EU, there is a risk of carbon leakage. The evaluation concludes that in the context of increased CO_2 prices since 2017, and the expectation for CO_2 price to remain high over the next trading period, it is relevant to maintain State aid rules for indirect ETS costs compensation for the future.

The evaluation also concluded that the effectiveness of the 2012 ETS Guidelines on the prevention of carbon leakage while minimising competition distortions in the internal market and preserving the incentives to decarbonise is also difficult to determine.

On the basis of the conclusions of the evaluation, the problems to be addressed are twofold.

The first problem to be addressed by this intervention stems from the **risk of carbon leakage** in the next trading period 2021-2030. Carbon leakage due to indirect ETS costs, should it materialize, risks to undermine on a global level the emission reduction objective pursued by the EU ETS. As such it would undermine the EU's contribution to the objectives of limiting the average temperature increase well below 2° Celsius while pursuing a limit of 1.5 °C above pre-

[12] Communication from the Commission Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak 2020/C 91 I/01 - C/2020/1863- *OJ C 91I , 20.3.2020, p. 1–9* and following amendments.

industrial level as defined by the 2015 Paris Agreement[13]. Carbon leakage presents a risk as to this objective that could be avoided in the next trading period thanks to pre-emptive action.

Second, the intervention addresses the **risk of competition distortions** stemming from the compensation of indirect ETS costs on national level. By granting aid to undertakings active in sectors that are not exposed to a significant risk of carbon leakage or by granting an inappropriate aid amount, Member States risk distorting competition between economic sectors that are substitutable as regards the product (inter-sector competition), resulting in encouraging the consumption of goods from eligible sectors to the detriment of goods from non-eligible sector. Next, the compensation of indirect ETS costs also risks distorting competition within the same sector active in several EU Member States (intra-sector competition). This is due to the fact that, as already mentioned in section 1.2 above, only some countries have a scheme in place: Germany, the Netherlands, Belgium (Flanders and Wallonia), Spain, Greece, Lithuania, Slovakia, France, Finland, Luxembourg, Poland, Romania, United Kingdom and Norway. Also, this second problem presents itself as a risk which can be mitigated by the design at EU level of the compensation granted to industries, i.e. by determining the maximum aid intensity during the next trading period as well as the CO_2 emission factor that allows to calculate the indirect ETS costs contained in the electricity consumption in the various European electricity markets.

A horizontal problem closely linked to the aforementioned problems relates to the risk that poorly designed compensation schemes may undermine the **incentive for a cost-effective decarbonisation of the economy**. The EU ETS creates a carbon price, which shall incentivise a cost-efficient reduction in CO_2 emissions in industrial processes. Excessive compensation would undermine that price signal.

2.2. Size of the problem and limitations

The evaluation of the 2012 ETS Guidelines also highlighted the difficulties in obtaining reliable empirical evidence about the impact of indirect ETS costs compensation on carbon leakage. As relocation decisions are multifactorial, it is difficult to isolate the impact of the compensation or the lack of compensation on the decision of undertakings to relocate outside the EEA to other jurisdictions that have less stringent climate regulations on GHG. That intrinsic characteristic of the concept of carbon leakage affects the assessment of the existence and size of such risk and therefore implies a certain degree of uncertainty. However, the evaluation demonstrated that the size of the risk of carbon leakage rises with the increase of carbon prices.

2.3. What are the problem drivers?

The aforementioned problems are driven by the fact that the 2012 ETS Guidelines are based on the data and assumptions which dates from 2011. It is therefore possible that 2012 ETS Guidelines no longer adequately address the problems described above during Phase IV of the EU ETS, because **there is a risk that the list of eligible sectors might be outdated** or because **the methodology to calculate the maximum aid amount might be outdated**.

[13] Paris Agreement, Paris, 12 December 2015 – UNFCCC https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

In particular, the evaluation of the 2012 ETS Guidelines noted that the revised ETS Directive has substantially reinforced the EU ETS. The cap on emissions will be subject to an increased linear reduction factor of 2.2% (compared to 1.74% during Phase III over 2012-2020) and a Market Stability Reserve has been introduced in order to remove the surplus of EUAs on the market. These two measures have coincided with a significant increase of the ETS price from around EUR 7 on average in 2012 to EUR 24.84 tCO_2 in 2019. At the same time, the evaluation noted that the sectors might have developed in terms of production technologies and processes and exposure to international trade. Consequently their exposure to the risk of carbon leakage might have changed over the past eight years.

The evaluation therefore concludes that the list of sectors eligible for indirect cost compensation during Phase III might not reflect the sectors most exposed to the risk of carbon leakage due to indirect ETS costs in Phase IV (over 2021-2030). In addition, the revised ETS Directive has modified the methodology for defining the sectors at risk of carbon leakage due to ETS costs. In fact, according to Article 10b (1) of the revised ETS Directive sectors and subsectors to which the product resulting from multiplying their trade intensity with third countries by their emission intensity exceeds 0.2 shall be deemed to be at risk of carbon leakage. Hereby, the revised ETS Directive deviates from the methodology applicable during Phase III. Under this methodology, a sector or subsector was deemed to be exposed to a significant risk of carbon leakage if the sum of direct and indirect additional costs induced by the ETS would lead to an increase of production costs of at least 5% and the intensity of trade with third countries was above 10%. The latter methodology had informed the list of sectors and subsectors eligible for indirect cost compensation under the 2012 ETS Guidelines.

Against the considerations above, it cannot be excluded that the **list of sectors** contained in the Annex II of the 2012 ETS Guidelines might no longer precisely reflect the sectors that will be exposed to a significant risk of carbon leakage due to indirect ETS costs in Phase IV.

Moreover, the evaluation concluded that the **parameters of the formula** to calculate the maximum aid amount might not be adequate to capture the indirect ETS costs passed on via the electricity price and faced by industrial sectors.

The revised ETS Directive may give rise to an increase in the CO_2 price during Phase IV. Both the linear reduction factor of 2.2% and the design of the Market Stability Reserve will progressively reduce the overall amount of available CO_2 certificates and thereby contribute to a price increase if undertakings are not reducing their emissions sufficiently. This potential CO_2 price increase could be passed on to industrial consumers via higher electricity prices, justifying the need to assess whether the initial formula still allows for an optimal level of compensation, in order to reduce carbon leakage risk due to indirect emissions costs.

The evaluation has also concluded that the European energy markets have developed since the adoption of the 2012 ETS Guidelines both in terms of market integration and energy mixes. This might have an effect on the indirect ETS costs passed on in electricity prices which is not adequately addressed by the 2012 ETS Guidelines and it might impact issues identified above. In light of recent changes in European energy markets (interconnection, large increase in renewables, etc.) a revision of the geographical regions and the corresponding CO_2 factors used in the formula to calculate the maximum aid amount might therefore be necessary.

2.4. How will the problem evolve?

Problems identified in section 2.1 are likely to persist throughout Phase IV of the ETS.

As described in section 1 above, the 2030 Climate Target Plan will provide insights into the required updates to the overall climate and energy framework and ensure overall coherence of the specific policy updates by June 2021, notably regarding the ETS Directive including its carbon leakage measures and possible alternatives.

At this stage, it is not yet entirely clear which level of ETS price would be necessary to achieve the decarbonisation ambitions of the European Green Deal. Also the precise shape of the policy measures and legislative initiatives to achieve these ambitions have not yet been established with a sufficient degree of certainty. Once proposed by the Commission, these policy initiatives will then be shaped in the legislative process.

An example of this is the future Carbon Border Adjustment Mechanism. The extent to which this mechanism can and will replace the protection against carbon leakage due to indirect ETS costs provided by the ETS State aid Guidelines will depend on various elements, most importantly:

a) whether this mechanism will include a border adjustment also in relation to indirect ETS cost (i.e. differences in electricity prices between the EU and other trading partners) or only in relation to direct ETS costs (i.e. the cost of CO_2 certificates to be purchased by EU producers); and
b) for what pilot sectors the border adjustment will be introduced.

These important policy choices concerning the future mechanism have not yet been made. In spite of this uncertainty, the revised ETS Guidelines – based on the provisions of the revised ETS Directive – have to enter into force already at the beginning of the fourth ETS trading period in January 2021. Therefore, until more profound legislative changes to the functioning of the ETS are decided and introduced, the identified problems and their described size are still valid.

Despite the uncertainties, the main factors possibly affecting the further evolution of problems described under section 2.1 can already be identified.

First, a further increase of the CO_2 price might increase the indirect ETS costs faced by electricity consumers in Europe and thus increase the risk of carbon leakage due to indirect ETS costs. Second, industries might continue to further electrify their production processes increasing thus their exposure to indirect ETS costs passed on in the electricity prices, despite the foreseen increase by 2030 of the share of renewable energy in EU's final energy consumption[14]. Third, the policy choices made by Member States in relation to their energy mix will affect the ETS costs passed on in electricity prices, while at the same time the decision of Member States to

[14] The target is to increase renewable energy to at least 32% of the EU's final energy consumption by 2030. By 2050, it is expected that more than 80% of electricity will be coming from renewable energy sources (see Communication from the Commission "A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy", COM (2018) 773).

implement national compensation schemes or not might continue to affect the risk of carbon leakage as well as the risk of competition distortions. Finally, the level of ambition of third countries in relation to their CO_2 emission reduction efforts will affect the risk of carbon leakage due to indirect ETS costs in Europe.

The first three potential evolutions should be addressed directly by the design of the compensation formula. The Guidelines should address the potential change of third countries ambition level by allowing adaptation of the Guidelines at any time, if this should be necessary for reasons associated with competition policy or in order to take account of other Union policies (such as a carbon border adjustment mechanism) or international commitments.

Finally, it is difficult at this stage to predict what impact the current COVID-19 crisis will have on the problem.

First of all, the crisis has a global dimension, which makes it difficult to estimate how it could impact possible carbon leakage decisions outside the EEA.

Secondly, the impact on EU carbon prices does not appear to affect the price estimates for the fourth trading period. At first, EU carbon prices have collapsed, dropping to around 15 EUR/ton on 18 March 2020, from as high as 25 EUR/ton mid-February 2020, thereby reducing the indirect CO_2 costs faced by European consumers, including beneficiaries of indirect ETS costs compensation. The carbon price then recovered and established at above 20 EUR/ton two weeks later. Those changes are still in line with the price estimates for Phase IV, which vary from a low price scenario of 15 €/tCO_2, a baseline scenario of 25 €/tCO_2 and a high price scenario of 35 €/tCO_2 and which are the basis for the analysis of this impact assessment (see also section 6 below). A number of economic forecasts recently published appear to confirm that the impact of the crisis on EU carbon prices does not appear to affect the price estimates for Phase IV. Already in April 2020 some carbon market watchers argued that the Market Stability Reserve (MSR) should bring the market back into balance in 2021[15]. In June 2020, the Centre for European Policy Studies (CEPS) argued that if COVID-19 leads to sustained low emissions, the current MSR will not be able to prevent the total number of allowances in circulation from growing fast, which may lead to price declines. In general, the effectiveness of the MSR to handle supply-demand imbalances will rely heavily on future emission trends. These forecasted price developments are also consistent with the empirical basis for this impact assessment.

Thirdly, the COVID-19 crisis could affect the output level produced by undertakings, in a context of economic slowdown. It is therefore important to design the compensation formula allowing for flexibility with regards to changes in both output level and CO_2 prices.

[15] Platts, "Why the next recession won't break the world's largest carbon market" in European Power Daily, Volume 22 / Issue 77 / April 21, 2020

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

Article 10a (6) of the revised ETS Directive encourages Member States to adopt financial measures in favour of sectors exposed to a genuine risk of carbon leakage due to significant indirect ETS costs, provided that such financial measures are in accordance with State aid rules. The Co-legislators thus require the Commission to adopt State aid rules which guide the design of national indirect cost compensation schemes. According to Article 3 (1) (b) of the TFEU, the Union has an exclusive competence as regards the establishment of the competition rules necessary for the functioning of the internal market. Article 108 TFEU entrusts the Commission with the review of aid schemes. The Commission may declare aid to be compatible with the internal market in the cases set out in Article 107 (3) TFEU. To this end, the Commission can set out in Guidelines the conditions, which would guide its compatibility assessment.

3.2. Subsidiarity: Necessity of EU action

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 therefore 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[16].

3.3. Subsidiarity: Added value of EU action

As the Treaty gives the EU an exclusive competence in the area of State aid control, the issue of subsidiarity does not arise. Nevertheless, the existence of revised ETS State aid Guidelines for Phase IV of the EU ETS has a distinct added value. The revised ETS State aid Guidelines will provide for uniform rules that will guide the Commission's assessment of national compensation schemes under EU State aid rules. The Guidelines will thus give guidance to Member States when designing such compensation schemes. Hereby, the Guidelines will help targeting the national compensation payments to the sectors most exposed to the risk of carbon leakage due to indirect ETS costs, while ensuring that the compensation is limited to the minimum necessary minimising thus possible distortions of competition in the Internal Market.

By setting the maximum aid amount that can be granted to beneficiaries, the ETS Guidelines aim at ensuring that no overcompensation will be granted to undertakings. According to the subsidiarity principle, it is for Member States to determine the adequate budget to allocate to State aid measures they implement. When doing so, they have to fulfil the obligation set under Article 10a (6) of the ETS Directive as well as the provisions of the ETS Guidelines setting the maximum aid amount that can be granted to beneficiaries. The revision of the ETS Guidelines

[16] Article 10a (14): "[…] *the Commission shall assess, at Community level*".

will therefore focus on determining the **maximum aid level** ensuring that sectors exposed to carbon leakage risk will receive the necessary compensation without creating undue competition distortion on the internal market and without undermining the incentive for a cost-effective decarbonisation of the economy.

In the absence of State aid Guidelines, the Commission would have to assess the compatibility with the internal market of schemes notified by Member States directly under the TFEU. That could give rise to higher administrative costs, as Member States would not have any *ex ante* guidance on how to design those schemes. The assessment would therefore be done on a case by case basis and would likely require several exchanges between the Commission services and Member States' authorities to gather the necessary data to determine eligibility and proportionality. A case by case assessment would also increase the risk of inconsistencies.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. General objective

The general objective pursued by this intervention is to ensure that indirect ETS costs compensation is limited to the minimum necessary **to avoid carbon leakage and undue competition distortions while preserving the incentives for a cost-effective decarbonisation of the economy**. Addressing the risk of carbon leakage, by assisting beneficiaries to reduce their exposure to this risk, serves an environmental objective, since the aid aims to avoid an increase in global greenhouse gas emissions due to shifts of production outside the Union, in the absence of a binding international agreement on reduction of greenhouse gas emissions. To this end, the intervention needs to define the rules governing the Commission's compatibility assessment under Article 107 (3) (c) TFEU of national schemes compensating sectors and subsectors exposed to a significant risk of carbon leakage for their indirect ETS costs.

4.2. Specific objectives

This general objective translates into two specific objectives pursued by this intervention. The ETS Guidelines are not self-executing, but set the conditions under which Member State can design indirect ETS costs compensation schemes – should they choose to do so – in compliance with EU State aid rules.

A first specific objective therefore is **to prevent the risk of carbon leakage due to indirect ETS costs**, by ensuring that the sectors which are most exposed to a risk of carbon leakage due to indirect ETS costs are eligible for indirect cost compensation. This should result in a list of sectors which therefore should be eligible for indirect ETS costs compensation during Phase IV of the EU ETS. At the same time, sectors that are not exposed to a risk of carbon leakage due to indirect ETS costs should not be eligible for indirect cost compensation. To this end, a methodology needs to be determined which allows to identify these sectors and subsectors.

The second specific objective is **to prevent the risk of unnecessary competition distortions in the internal market** by ensuring that the maximum aid amount is proportionate, meaning that it does not go beyond the minimum necessary to address the risk of carbon leakage due to indirect

ETS costs. To this end, the parameters that allow for the calculation of the maximum aid amount will need to be determined. These parameters will equally have to reflect market characteristics in Phase IV and the regulatory changes to the EU ETS triggered by the revised ETS Directive. Concretely, the intervention aims to define the aid intensity during Phase IV and a proxy to calculate the indirect ETS costs passed on in electricity prices.

By achieving those objectives, the intervention will also achieve the horizontal objective of maximising the incentives for a cost-effective decarbonisation of the economy.

There is a clear trade-off between the objectives. If the risk of carbon leakage due to indirect ETS costs is completely removed, by granting to all sectors potentially exposed to a minimum risk a full compensation of those indirect ETS costs, the competition distortions in the internal market would be very high and the incentives for a cost/effective decarbonisation of the economy created by the ETS system would be removed. On the other hand, if sectors exposed to a significant risk are not eligible to receive enough compensation despite their investments on energy efficiency, they will likely relocate to reduce that cost component and remain on the market.

As mentioned in section 2.2 above, the intrinsic characteristics of the concept of carbon leakage show that such trade-off is extremely difficult to quantify with reliable data.

The balancing between these objectives must also be in line with Article 107 (3) (c) TFEU and the relevant case-law of the Court of Justice of the European Union. According to that legal framework, to assess whether an aid measure can be considered compatible with the internal market, the Commission analyses whether the design of the aid measure ensures that the positive impact of the aid towards an **objective of common interest** exceeds its potential negative **effects on trade and competition**. In assessing the design of the measure, the Commission shall define the **need** for the State intervention, its **appropriateness**, **proportionality**, and the existence of an **incentive effect**[17].

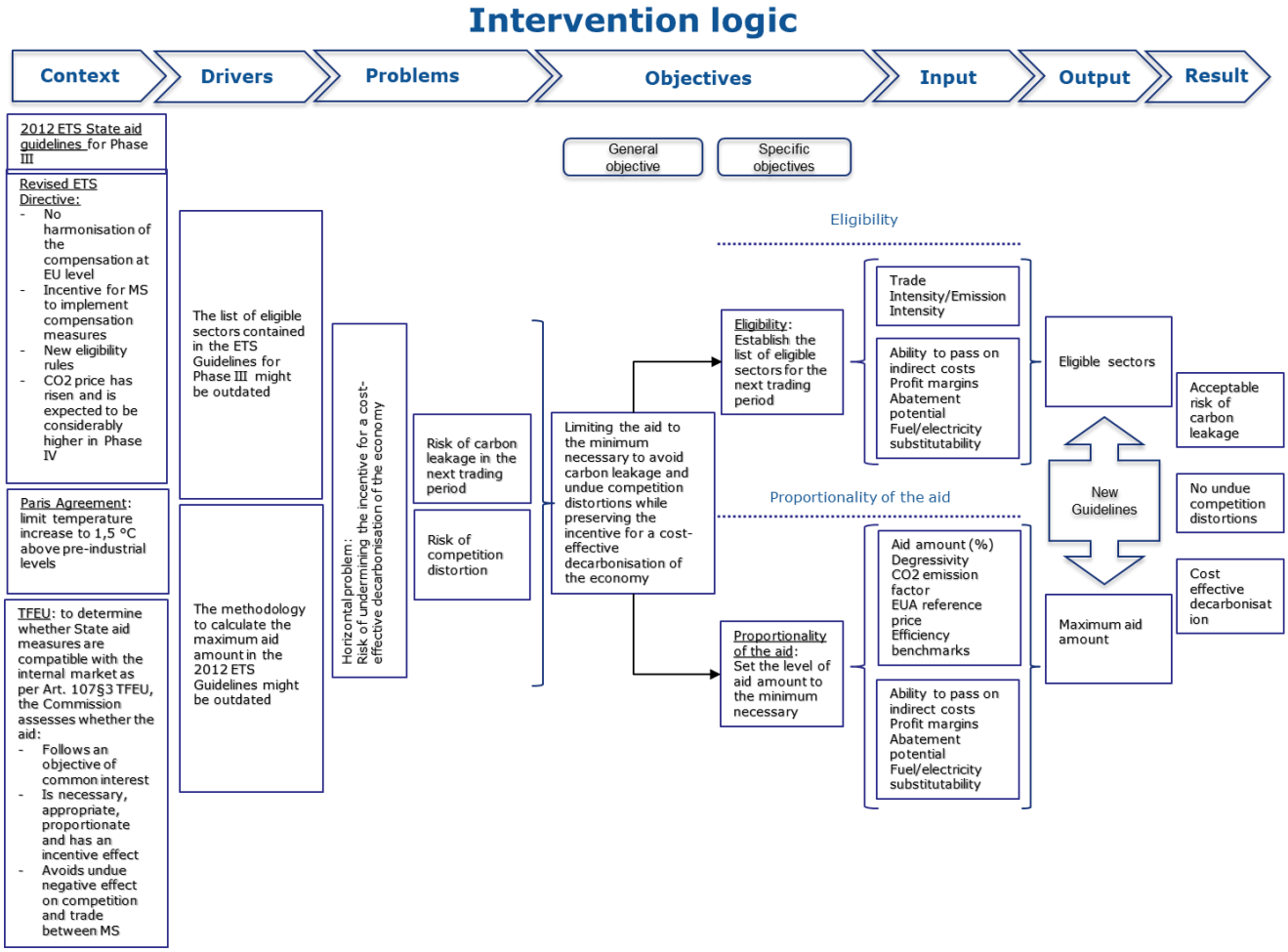
In this case, the objective of common interest consists in the prevention of the risk of carbon leakage due to indirect ETS costs only. To ensure that the potential negative effects on competition and trade are minimised, the aid measure must be **targeted** to those sectors that are at a significant risk, in line with Article 10a (6) of the ETS Directive, and the aid amount must be limited to the **minimum needed** to reduce that risk to an acceptable level.

The difficulties of measuring the trade-offs between those objectives highlight the importance of applying a very strict and cautious approach in terms of eligibility and proportionality of this type of aid. In addition, as the size of the risk of carbon leakage due to indirect ETS costs will change with the evolution of carbon prices, the potential for electrification, and the policy choices made by Member States in relation to their energy mix, that approach should also ensure future-proofing.

The impact assessment will follow this intervention logic:

[17] The Communication on State aid modernisation of 8 May 2012 called for the identification and definition of common principles applicable to the assessment of compatibility of all aid measures carried out by the Commission, COM(2012)0209 final of 8.5.2012.

Figure 1 : Intervention logic



4.3. Operational objective

The intrinsic characteristics of the concept of carbon leakage already highlighted in section 2.2 cannot be removed and will hence also affect the evaluation of the new guidelines at the end of the Phase IV. The fact that relocation decisions are multifactorial and the difficulty in isolating the impact of indirect ETS costs in those decisions will affect the possibility to verify the achievement of the operational objectives. Any assessment will therefore imply a certain degree of uncertainty. However, it cannot be excluded that a higher carbon price in Phase IV will allow to better isolate and assess the impact of the compensation and therefore developing more precise and refined evaluation methodologies. In that case, it cannot be excluded that operational objectives could be identified and measured.

To improve the data gathering that will support the evaluation, the reporting of Member States should be standardised to ensure consistency. The JRC[18] has provided suggestions of the development of a template that all Member States should use.

4.4. Consistency with other EU policies

The ETS Guidelines should be consistent with the Green Deal ambitions, including the climate neutrality objective to be reached by 2050. Within the Green Deal framework, the Commission has also adopted the European Industry Strategy, a plan for green and digital transformations of European industry. With a new Industrial Strategy, the Commission aims to make sure that European businesses remain fit to achieve their ambitions and cope with increasing global competition. In addition, the new EU Hydrogen Strategy will give a boost to clean hydrogen production in Europe.[19]

The ETS Guidelines are part of the instruments designed to address the risk of carbon leakage faced by certain companies as a result of the EU ETS. The risk of carbon leakage due to direct ETS costs – i.e. the obligation to purchase CO_2 certificates – is covered under the ETS Directive by the Carbon Leakage List for 2021-2030. These ETS Guidelines should therefore be consistent with the methodology used in order to establish this carbon leakage list due to direct ETS costs.

The Energy Efficiency Directive (EED) of 2012 established a common framework of measures across Member States to ensure the achievement of the EU's 20% headline target on energy efficiency by 2020, and paved the way for further energy efficiency improvements beyond this date. The impact of the conditionality of the compensation under ETS Guidelines on the consistency with the requirements under the Energy Efficiency Directive will be analysed.

To implement the Energy Union Strategy, the "Clean Energy for All Europeans" package (also known as "Clean Energy Package, CEP") was adopted in 2019 as a package consisting of eight legislative acts. All have been formally adopted and are in force, but the Directives still need to be implemented by the EU Member States.

- Electricity Market Directive 2019/944/EU and Electricity Market Regulation 2019/943/EU ACER Regulation 2019/942/EU;
- Regulation on Risk-Preparedness in the Electricity Sector Regulation 2019/941/EU and Repealing the Security of Supply Directive;
- Renewable Energy Directive 2018/2001/EU (RED II);
- Energy Efficiency Directive 2018/2002/EU (EED II);
- Energy Performance of Buildings Directive 2018/844/EU (EPBD);

[18] Ferrara, A. and Giua, L., The Effects of EU ETS Indirect Cost Compensation on Firms Outcomes, EUR 30241 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19283-1, doi:10.2760/910907, JRC119837.

[19] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A hydrogen strategy for a climate-neutral Europe. COM(2020) 301 final

- Regulation 2018/1999/EU on the Governance of the Energy Union.

Under the Energy Union Strategy and the CEP, the EU has EU-wide headline targets for 2030 to cut CO_2 emissions by at least 40% from 1990 levels, increase the share of renewable energy to at least 32% and foster energy efficiency (EE) by at least 32.5% (compared to 2007 business-as-usual projection for 2030), while increasing the interconnectivity to 15% and reducing emissions from cars, vans and trucks.

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1. What is the baseline from which options are assessed?

The baseline from which options are assessed is a "no policy change" scenario. The current 2012 ETS Guidelines will be applicable until 31 December 2020. Therefore the "no policy change" scenario consists of the continuation of the 2012 ETS Guidelines by way of prolongation. The baseline would allow Member States to grant indirect ETS costs compensation to undertakings in the 13 sectors and 7 subsectors listed in Annex II of the 2012 ETS Guidelines. The calculation of the maximum aid amount would continue to follow the formula set out in the 2012 Guidelines. The relevant CO_2 emission factors would correspond to the values defined in Annex IV of the 2012 ETS Guidelines, which groups Member States together in geographical regions based on the status of market coupling and the degree of price convergence at the time when the 2012 ETS Guidelines were adopted. The aid intensity would remain at a level of 75%. The baseline output would continue to be determined by reference to the average product at a given installation over the reference period 2005-2011. The calculation would continue to use the EUA forward price defined as the simple average of the daily one-year forward EUA prices (closing offer prices) for delivery in December of the year for which the aid is granted, as observed in a given EU carbon exchange from 1 January to 31 December of the year preceding the year for which the aid is granted. No State aid could be granted in case of electricity supply contracts that do not include any CO_2 costs. Moreover, the compensation would not be conditional on the participation in energy management systems or the implementation of energy efficiency investments.

Under the baseline scenario, which would cover the Phase IV trading period 2021-2030, Member States would need to notify a prolongation of their existing compensation schemes or the implementation of new compensation schemes, which the Commission would assess in light of the criteria set out in the 2012 ETS Guidelines.

5.2. Description of the policy options

In line with the above described problem drivers and specific objectives, several policy options which concern the different elements of the formula (see section 1.2) have been identified complementing the baseline scenario described above.

a) Eligibility

- A first set of options (Options A0, A1, A2, A3 and A4) contains criteria to define sectors or subsectors eligible for compensation. The criteria are proxies to assess significant risks of carbon leakage due to indirect ETS costs.

b) Estimation of indirect ETS costs

- A second set of options (Options B0 and B1) presents two possibilities related to the determination of the geographical CO_2 factor
- A third set of options (Options C0 and C1) presents two possibilities related to the determination of the output of an installation

c) Maximum aid amount

- A fourth set of options (Options D0, D1, D2 and D3) concerns the aid intensity, meaning the proportion of indirect ETS costs that would be compensated.
- A fifth set of options (Options E0, E1 and E2) presents several possibilities related to the evolution of the aid intensity, also called the degressivity of the aid intensity

d) Conditionality

- A sixth set of options (Options F0, F1, F2 and F3) refers to conditionality, meaning providing the aid only if certain actions are undertaken by the beneficiary.

Any combination of the options under A, B, C, D, E and F is in principle possible.

5.2.1. Sector eligibility

A first set of options regards the criteria to define eligible sectors, i.e. the sectors most at risk of carbon leakage due to indirect ETS costs. This set of options has evolved during the process, based on the results of an external study and on the submissions received during the consultation activities.

5.2.1.1. Option A0 (Baseline Option): The same sector and subsector eligibility as in the 2012 ETS Guidelines

Under the baseline option, the 2012 ETS Guidelines would be prolonged. Accordingly, under option A0 the same **13 sectors and 7 subsectors** listed in Annex II of the 2012 ETS Guidelines would continue to be eligible during Phase IV[20].

[20] See Appendix 2: Eligibility under option A.

5.2.1.2. *Option A1: The same sector and subsector eligibility as in the 2021-2030 Carbon Leakage Decision*[21]

Option A1 is fully based on the method used in the context of compensation for direct CO_2 costs (the 2021-2030 Carbon Leakage Decision) i.e. all sectors in the Carbon Leakage List 2021-2030 would be eligible for indirect cost compensation. The Carbon Leakage List 2021-2030 adopted by the Commission for the ETS Phase IV amounts to **50 sectors and 13 subsectors**[22] and takes into account the risk of carbon leakage of sectors due to both direct and indirect ETS costs.

5.2.1.3. *Option A2: Eligibility of sectors based on the methodology used in the Carbon Leakage List 2021-2030, but calculated based on indirect emission intensity only*

Under Option A2, a sector would be deemed to be at risk of carbon leakage due to indirect ETS costs, where its indirect carbon leakage indicator (ICLI) has value of at least 0.2. Option A2 is an adaptation of the methodology used for the 2021-2030 Carbon Leakage Decision taking into account the indirect ETS costs only. It is based on the relation of a sector's trade intensity and indirect emission intensity[23] (i.e. the ratio of indirect emissions over GVA), as expressed by the "Indirect Carbon Leakage Indicator" (ICLI). Under option A2, **24 sectors** would be eligible, as their trade intensity multiplied by their indirect emission intensity exceeds 0.2[24].

5.2.1.4. *Option A3: Eligibility of sectors based on a strict adaptation of the methodology used in the Carbon Leakage List 2021-2030*

Option A3 is based on a strict adaptation of option A2, in order to further restrict the eligible sectors to the ones with the highest carbon leakage risk due to indirect ETS costs. Under this option, in addition to presenting an "indirect carbon leakage indicator" above 0.2 as in option A2, the following minimum thresholds as regards both a sector's level of trade intensity and its indirect emission intensity are applied:

- a trade intensity of at least 20%
- an indirect emission intensity of at least 1 $kgCO_2$/EUR

These thresholds were set on the basis of the findings of an external study from Roques and Laroche[25], that all sectors with a "high" or "medium-high" risk of carbon leakage due to emission

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21 See **Error! Reference source not found.Error! Reference source not found.**Commission delegated cision (EU) 2019/708 of 15 February 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council concerning the determination of sectors and subsectors deemed at risk of carbon leakage for the period 2021-2030 – OJ L 120 (8.5.2019, p.20).

22 See Appendix 2: Eligibility under option A.

23 Indirect Emission is obtained by multiplying electricity consumption data by sector (obtained from Member States) with an EU wide emission factor. Indirect Emission intensity is then obtained by dividing indirect emissions by the sector GVA. These data come from the same database used to establish the Carbon Leakage List 2020-2030.

24 See Appendix 2: Eligibility under option A.

25 F. Roques, H. Laroche, Combined retrospective evaluation and prospective impact assessment support study on Emission Trading System (ETS) State Aid Guidelines, Luxembourg: Publications Office of the European Union, 2020 ISBN 978-92-76-15043-5

costs showed a trade intensity above 20% and an indirect emission intensity above 1kg CO_2/EUR, confirming the relevance of these thresholds for eligibility.

By applying those minimum thresholds, **10 sectors** would be eligible: *14.11 Manufacture of leather clothes, 24.42 Aluminium production, 20.13 Manufacture of other inorganic basic chemicals, 24.43 Lead, zinc and tin production, 17.11 Manufacture of pulp, 17.12 Manufacture of paper and paperboard, 24.10 Manufacture of basic iron and steel and of ferro-alloys* and *19.20 Manufacture of refined petroleum products.*

According to the same study, four sectors would be borderline: *24.51 casting of iron, 24.44 Copper production, 20.16 Manufacture of plastics in primary forms and 24.45 other non-ferrous metal production* have all been defined as being at "medium" risk of carbon leakage due to indirect ETS costs. Under option A3, **2 of these 4 sectors**: *24.44 Copper production* and *24.45 other non-ferrous metal production* would also be eligible.

Indeed, the quantitative parameters exclude sectors which do not meet the 1kg CO_2/EUR threshold of indirect emission intensity but which have an ICLI above 0.2. However, *24.44 Copper production* and *24.45 Other non-ferrous metals production* have specific characteristics that distinguish them from other borderline sectors. The specificities of these two sectors are assessed in detail in section 6.1.2 below.

5.2.1.5. Option A4: Eligibility of sectors based on a strict adaptation of the methodology used in the Carbon Leakage List 2021-2030 and subsectors presenting a high level of fuel and electricity substitutability

Option A4 is based on the methodology for sector eligibility in Option A3, but extends the eligibility at subsector level. This extension is limited to subsectors presenting an ICLI above 0.2 and with fuel and electricity substitutability as determined in the Commission's list on fuel electricity substitutability[26].

Under Option A4, **10 sectors** (*14.11 Manufacture of leather clothes, 24.42 Aluminium production, 20.13 Manufacture of other inorganic basic chemicals, 24.43 Lead, zinc and tin production, 17.11 Manufacture of pulp, 17.12 Manufacture of paper and paperboard, 24.10 Manufacture of basic iron and steel and of ferro-alloys, 19.20 Manufacture of refined petroleum products, 24.44 Copper production* and *24.45 Other non-ferrous metal production*) and 20 subsectors (*20.16.40.1*5 *polyethylene in primary forms*; all 15 product categories in the *24.51 casting of iron sector; 23.14.12.10 glass fibre mats and 23.14.12.30 glass fibre voiles;* and *20.11.11.50 hydrogen and 20.11.12.90 inorganic oxygen compounds of non-metals*) would be eligible.

Option A4 builds upon the same reasoning and underlying analysis of Option A3, both in terms of quantitative parameters (ICLI, trade intensity, emission intensity), and in terms of qualitative considerations (ability to pass on indirect ETS costs, profit margins, abatement potential and fuel/electricity substitutability). All sectors that would be included under Option A3 would therefore also be included in Option A4. It also targets the problem of future electrification,

[26] See **Error! Reference source not found.** C/2018/8664 - OJ L 59, 27.2.2019, p. 8–69

which could be discouraged in the absence of compensation for indirect ETS costs. It therefore foresees the addition of subsectors based on their ICLI and their fuel and electricity substitutability.

5.2.2. Estimation of indirect ETS costs

As stated in section 1.2, the compensation formula is made of a parameter that defines the calculation of the compensation amount (aid intensity and its evolution over time) and several parameters that estimate indirect ETS costs (output, CO_2 factor, EUA price).

In order to avoid under or over-compensation, it is crucial to estimate as correctly as possible the indirect ETS costs affecting undertakings. Indirect ETS costs can be estimated by combining the carbon content of electricity and the production level:

- A second set of options (B0 and B1) relates to the calculation of the CO_2 factor.
- A third set of options (C0 and C1) concerns the calculation of an undertaking's output.

5.2.2.1. CO_2 emission factor

As stated above, the maximum amount of aid depends on the CO_2 emission factor, which reflects for a given geographical area the average amount of CO_2 (in tonnes) emitted for the production of one MWh of electricity setting the marginal price. In the formula, the CO_2 emission factor has the effect of modulating the maximum amount of aid depending on the energy mix in the area where the installation receiving the aid is established. Such regional differentiation reflects the significance of fossil fuel plants for the final price set on the wholesale market and their role as marginal plants in the merit order. Under the current ETS Guidelines, the areas were defined as geographic zones (a) which consist of submarkets coupled through power exchanges, or (b) within which no declared congestion exists and, in both cases, hourly day-ahead power exchange prices within the zones showing price divergence in euros (using daily ECB exchange rates) of maximum 1% in significant number of all hours in a year.

a) Option B0 (Baseline Option): CO_2 factors defined at regional level as set out in Annex IV of the 2012 ETS Guidelines

Under the baseline option B0, the CO_2 factors listed in Annex IV of the 2012 ETS Guidelines continue to be applicable for the same regions: Nordic (Denmark, Sweden, Finland and Norway), Central-Western Europe (Austria, Belgium, Luxembourg, France, Germany and Netherlands), Iberia (Portugal, Spain), Central-Eastern Europe (Czechia and Slovakia) and all other Member States separately.

b) Option B1: Updated regions based on recent data on price convergence

Under Option B1, differentiated regional CO_2 emission factors would apply, until a Midterm update of the CO_2 factors. The relevant geographic areas would be updated by applying the same methodology as under the 2012 ETS Guidelines, i.e. on the basis of the development of market coupling and the degree of price convergence. These criteria would result in the following geographic areas:

A revised Nordic zone (Sweden and Finland), a revised Central-Western Europe zone (Austria, Germany and Luxembourg), Iberia (Portugal, Spain), Central-Eastern Europe (Czechia and Slovakia), a new Adriatic zone (Slovenia and Croatia) and a new Baltic zone (Lithuania, Latvia, Estonia). For all other Member States, a national emission factor would apply. The calculation of the CO_2 factors per region[27] would be based on the most updated methodology, as described in section **Error! Reference source not found.**.

5.2.2.2. The installation's output

The installation's output value used for the calculation of indirect ETS costs per undertaking means the average production at a given installation over a reference period, expressed in tonnes per year.

a) Option C0 (Baseline Option): Historical output with reference year 2005-2011

Under the baseline option C0, the output used in the compensation formula would be determined by reference to the average production at a given installation over the reference period 2005-2011 ("baseline output"). Changes in production capacity (either upward or downward) between the reference period and the year of compensation would trigger a change in the baseline output used in the compensation formula, similar to the provisions laid out in the 2012 ETS Guidelines[28].

b) Option C1: Actual output

Under option C1, the aid amount would be calculated taking into account the installation's actual production in year t-1, determined *ex post* in year t.

5.2.3. Maximum aid amount

As stated in section 1.2, the compensation formula is made of parameters estimating indirect ETS costs (output, CO_2 factor, EUA price) and a parameter defining the calculation of the compensation amount (aid intensity and its evolution over time).

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[27] See **Error! Reference source not found.**

[28] Annex 1 of the 2012 ETS Guidelines provides that: "*If the installation did not operate for at least one year from 2005 to 2011, then the baseline output will be defined as yearly production until there are four years of operation on record, and afterwards it will be the average of the preceding three years of that period. If, over the aid granting period, production capacity at an installation is significantly extended within the meaning of these Guidelines, the baseline output can be increased in proportion to that capacity extension. If an installation reduces its production level in a given calendar year by 50 % to 75 % compared to the baseline output, the installation will only receive half of the aid amount corresponding to the baseline output. If an installation reduces its production level in a given calendar year by 75 % to 90 % compared to the baseline output, the installation will only receive 25 % of the aid amount corresponding to the baseline output. If an installation reduces its production level in a given calendar year by 90 % or more compared to the baseline output, the installation will receive no aid*".

The aid intensity describes the maximum share of indirect ETS costs that a Member State can compensate. The aid intensity and the degressivity of the aid are key elements determining the proportionality of the aid to be granted for compensation of indirect ETS costs.

A fourth set of options (D0, D1, D2 and D3) relates to the aid intensity set at the start of the trading period 2021-2030.

A fifth set of option (E0, E1 and E2) concern the evolution of the aid intensity over time.

5.2.3.1. Aid intensity

a) Option D0 (Baseline Option): Aid intensity of 75%

Under the baseline option, the 2012 ETS State aid Guidelines would be prolonged. Accordingly, option D0 would result in an aid intensity of 75% at the start of Phase IV.

b) Option D1: Aid intensity higher than 75%

Under Option D2, the aid intensity at the start of the trading period 2021-2030 would be set at a level higher than 75%.

c) Option D2: Aid intensity lower than 75%

Under Option D2, the aid intensity at the start of the trading period 2021-2030 would be set at a level lower than 75%.

d) Option D3: aid intensity of 75% combined with the possibility of a GVA cap

Under Option D3, Member States would have the possibility to combine an aid intensity of 75% with the introduction of a cap on the total amount of the indirect ETS costs that beneficiaries would have to support as a percentage of the undertaking's gross value added ("GVA"). This further modulation aims at better capturing sector specificities.

5.2.3.2. Degressivity

The following options relate to the evolution of the level of aid intensity over time to capture potential reductions of the electricity consumption of the eligible sectors. In the formula, the compensation is calculated on the basis of the product-specific electricity consumption per tonne of output achieved by the most electricity-efficient methods of production for the product considered. The electricity consumption efficiency benchmarks will be updated at the beginning of the fourth ETS trading period. In that context, the methodology will be aligned with Article 10a (2) of the EU ETS Directive. Under this methodology, the Commission would extrapolate an annual reduction rate for each benchmark based on past efficiency improvements.

a) Option E0: Stable aid intensity

Under the baseline option, the 2012 ETS Guidelines would be prolonged. Accordingly, option E0 would result in a stable aid intensity throughout Phase IV.

b) Option E1: Stable aid intensity with mid-term update of efficiency benchmarks

Option E1 would not set any degressivity of the aid intensity. The aid intensity would remain stable at a defined level. A stable aid intensity would be correlated with a mid-term update of the efficiency benchmarks after five years, to capture the actual reduction of electricity consumption of eligible sectors over time.

c) Option E2: Degressive aid intensity

Under Option E2, the aid intensity would be degressive. While the aid intensity as defined at the start of the fourth trading period would remain at that level for the years 2021-2024, it would decrease by 5 percentage points in 2024 and by an additional 5 percentage points in 2027, to capture theoretical reduction of electricity consumption of eligible sectors over time.

5.2.4. Conditionality

This impact assessment also addresses the possibility of making the compensation conditional upon certain activities that could reduce the size of the problem. By making the aid conditional upon decarbonisation efforts, the initiative may contribute to reaching the horizontal objective of maximising the incentives for a cost-effective decarbonisation of the economy.

a) Baseline Option F0: No Conditionality

Under the baseline option F0, the 2012 ETS Guidelines would be prolonged. Indirect ETS cost compensation would not be conditional.

b) Option F1: Limited conditionality

Under Option F1, the indirect ETS costs compensation would be conditional upon the demonstration that the beneficiary complies with the obligation to conduct an energy audit under Article 8(4) of the Energy Efficiency Directive (EED), only if applicable, either as a stand-alone energy audits or within the framework of certified Energy Management System or Environmental Management System.

c) Option F2: Extended conditionality

Under Option F2, the indirect ETS costs compensation would be conditional upon the demonstration that the beneficiary complies with the obligation to conduct an energy audit under Article 8 (4) of the Energy Efficiency Directive (EED), including undertakings not covered by that obligation under the EED (SMEs).

In addition, an undertaking covered by the obligation to conduct an energy audit under Article 8 (4) of the Energy Efficiency Directive (i.e. large undertaking) would also have to demonstrate that it implements the recommendations made in the framework of the energy audit, to the extent that the payback time for the relevant investments does not exceed 5 years and that

the costs of their investments is proportionate. Alternatively, the beneficiary would have to demonstrate that it has reduced the carbon footprint of their electricity consumption, for example, through installing an on-site renewable energy generation facility (covering at least 50% of their electricity needs), through a carbon-free power purchase agreement; or alternatively that it has invested a significant share of at least 80% of the aid amount in projects that lead to substantial reductions of the installation's greenhouse gas emissions and well below the applicable benchmark used for free allocation in the EU Emissions Trading System.

d) Option F3: Intermediate conditionality

Under Option F3, an undertaking covered by the obligation to conduct an energy audit under Article 8 (4) of the Energy Efficiency Directive (i.e. large undertaking) would have to demonstrate that it implements the recommendations made in the framework of the energy audit, to the extent that the payback time for the relevant investments does not exceed 3 years and that the costs of their investments is proportionate. Alternatively, the beneficiary would have to reduce the carbon footprint of their electricity consumption so as to cover at least 30% of their electricity consumption from carbon-free sources; or alternatively that it has invested a significant share of at least 50% of the aid amount in projects that lead to substantial reductions of the installation's greenhouse gas emissions and well below the applicable benchmark used for free allocation in the EU Emissions Trading System.

5.3. Options discarded at an early stage

5.3.1. Discontinuation of the ETS Guidelines

An option discarded at an early stage is the discontinuation of the ETS Guidelines. Under this option no State aid Guidelines for indirect ETS cost compensation would exist during Phase IV. Consequently, the Commission would assess the compatibility of national compensation schemes directly under Article 107 (3) (c) TFEU. The evaluation of the 2012 ETS Guidelines conducted in parallel to this Impact Assessment however has confirmed the relevance of the ETS Guidelines as a means to give guidance to Member States when designing their compensation schemes and to ensure thereby that national compensation schemes tackle the risk of carbon leakage due to indirect ETS costs, while at the same time limit to necessary in order to the risk of competition distortions in the internal market. Finally, such option would have been contrary to the revised ETS Directive, which in its Article 10a (6) states that national compensation schemes should be applied in accordance with State aid rules and therefore assumes the existence of State aid Guidelines during Phase IV.

5.3.2. CO_2 factors

As presented in the options, the Commission reflected on whether national or EU-wide CO_2 factors would be more appropriate than the regional approach as in 2012 Guidelines.

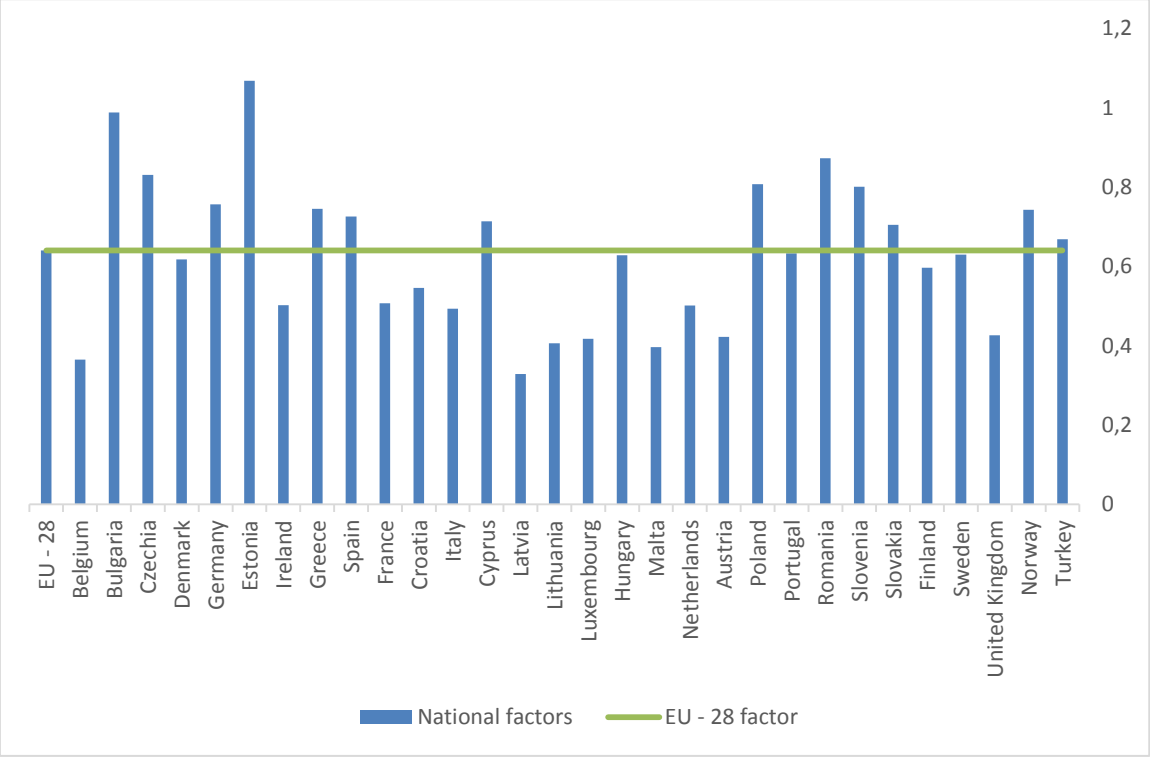
a) EU-wide CO_2 factor

An EU-wide CO_2 emission factor would not differentiate between markets depending on their energy mix. As illustrated by Figure 2 below, a European emission factor would, only for a few Member States (in particular Denmark and Finland), reflect the national carbon content of the electricity consumed. The average EU wide CO_2 emission factor for Member States and Norway for 2018 is 0.67 tCO_2/MWh.

As illustrated by Figure 2 below, such European emission factor would have an impact for most countries, as it would deviate in most cases from the national emission factor observed for the respective Member States. Whether the European emission factor is higher or lower than the current emission factor, depends on the energy mix of the relevant Member State.

EU wide emission factor would either overestimate or underestimate the carbon content of the respective national electricity production. As regards States for which the EU wide emission factor significantly falls short of the national emission factor, this option increases the risk of carbon leakage to the extent that the EU wide emission factor may underestimate the carbon content of the electricity consumed. As regards States for which the EU wide emission factor is significantly higher than the national emission factor, this option increases the risk of competition distortion by compensating undertakings with an amount higher than the actual indirect ETS costs.

Figure 2: Comparison of national emission factors and EU-wide emission factor – 2018 data (t/MWh)



Source: Eurostat, Compass Lexecon calculations

b) National CO_2 factor

National emission factors reflect the production mix of fossil fuels generation plants in a given Member State. It is the result of the division of the CO_2 equivalent emission data of the energy industry divided by the gross electricity generation based on fossil fuels in TWh. The national emission factor therefore serves as a proxy of the carbon intensity of the electricity consumed in each Member State. They thus allow a calculation of the indirect ETS costs passed on via the electricity prices in a given Member State.

Prima facie, national emission factors seem to be well targeting the actual carbon leakage risk that sectors face in a given Member State due to their exposure to indirect ETS costs. However, the indirect ETS costs supported by electricity consumers in a given Member State not only depend on the production mix of this Member State but can also depend on the production mix of neighbouring Member States and the degree of cross-border capacity. Where cross-border capacity is not limited, the electricity price is set by the marginal fossil-fuel plant of both the relevant area. The level of price convergence between Member States serves as an indicator of the extent to which the production mix of one Member State is capable of influencing the electricity price of another. Solely relying on purely national emission factors does not allow to take these cross-border effects into account. This entails the risk that a national emission factor might not adequately reflect the indirect ETS costs actually passed on *via* the electricity price.

This is particular true where the Member State in question has a high level of price convergence with a neighbouring Member State. To the extent that national emission factors thus underestimate the carbon content of the electricity consumed in a given Member State, this option might contribute to an increase of the risk of carbon leakage compared to an option where the cross-border effects described are captured.

c) Options discarded regarding CO_2 factors

In response to the public consultation, slightly more than 10% of respondent would favour the use a national factor. Also, only a minority argued that an EU-wide factor would be adequate to address the risk of carbon leakage due to indirect ETS costs (12.10%). More than 50% of respondents to the public consultation favoured regional CO_2 factors.

In reply to the targeted consultation to Member States, some of the Member States already having a national CO_2 factor under the 2012 ETS Guidelines stressed the importance of maintaining it at national level for their own country (Greece, Spain, Hungary, Poland, Romania, and Slovakia). This can be explained by the fact that, in those Member States, the electricity mix is rather carbon intensive. Only two Member States (France and Czechia) argued in favour of an EU-wide CO_2 factor. While for France, that factor would positively address the risk of carbon leakage, for Czechia it would be the opposite case.

As explained above, both the national and the EU-wide factors would risk not reflecting properly the carbon content of the electricity consumed. National CO_2 factors would not address properly the carbon-content of electricity consumed in Member States strongly interconnected with each other and could result in both under or over-estimation of indirect ETS costs. An EU-wide factor would also result in both under and over-estimation of indirect ETS costs, depending on the Member States considered – as shown by Figure 2**Error! Reference source not found.**.

Any potential under-compensation could would risk not to be sufficient to address the actual risk of carbon leakage due to indirect ETS costs and would increase the risk for a shift of CO_2 emissions to less carbon-restricted areas outside of the EU. Any potential over-compensation would result in higher competition distortions and could reduce incentives for energy efficiency.

In the light of the findings above, the Commission has discarded these options and has decided to focus the policy choices on regional factors, in order to better reflect indirect ETS costs and avoid under or over-compensation.

5.3.3. Output

The Commission also reflected on using historical data calculated over 2013-2020, with similar adjustments to the baseline output as envisaged in the 2012 ETS Guidelines (historical output), or a combination of these historical data with a cap set at the actual output (historical output, but capped by actual output).

However, even though the aid amount would then be determined on a more recent timeframe compared to the baseline approach, it would suffer from similar shortcomings, i.e. not fully reflect actual changes in production of undertakings.

By using historical data with a cap set at the actual output level, the risk of undercompensation remains since compensation can be delivered based on a baseline output below the actual output in year *n-1*. Potential overcompensation would however be addressed since the minimum between actual output and baseline output is taken to compute the aid amount.

Therefore, the use of historical output data risks not fully addressing carbon leakage risks by potentially compensating undertakings below the necessary level to prevent carbon leakage. Also, small changes in production that would not trigger capacity changes would not be accounted for, thus not removing entirely the risk for distortions.

For these reasons, the Commission has discarded these options by not including the use of output data based on historical output in the packages considered.

5.4. From options to packages

Two different packages of policy options have been created for the purpose of the analysis.

5.4.1. Packages of policy options to determine the indirect ETS costs

Any combination of the options B and C is theoretically possible. To facilitate the comparison of the options, this report sets out two Option Packages relevant in view of the wide range of stakeholder input.

Under the **Baseline Approach,** the indirect ETS costs are estimated based on CO_2 factors defined at regional level as set out in Annex IV of the 2012 ETS Guidelines comprises (option B0) and based on historical output with reference year 2005-2011 (option C0).

Under the **Updated Approach**, the indirect ETS costs are estimated based on updated CO_2 factors defined at regional level (option B1) and based on updated output data (option C1).

5.4.2. Packages of policy options to determine the maximum aid amount

Any combination of the options D and E 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).

A **Baseline Package** corresponds to the prolongation of the existing Guidelines and comprises a stable (option E0) aid intensity at 75% (option D0).

A **Minimalist Package** aims at maximising the ETS efficiency objective. It combines an aid intensity < 75% (option D2) with a degressive evolution of the aid intensity (option E2).

A **Maximalist Package** aimed at preventing carbon leakage risks to the maximum extent. It comprises a stable (option E0) aid intensity > 75% (option D1).

A Flexible Package is a combination of stable aid intensity with update of efficiency benchmarks (option E1) and an aid intensity at 75% with GVA-cap (option D3).

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

In this section the impacts of the implementation options are compared to the 'Baseline' and assessed in terms of achieving the general and specific objectives. Each set of options is assessed separately.

Table 1: Impacts of policy options

Impact	Description
Economic and social impact – carbon leakage	Should the Guidelines be excessively strict as regards which sectors are eligible for compensation or as regards the maximum compensation amounts, this could result in carbon leakage (e.g. via the relocation of economic activity outside the scope of the EU ETS or via investment plans that would not take place within the EU borders). Carbon leakage, should it materialise, would entail lower economic activity and employment in the EU. The impact of the options therefore depends: (i) on the probability of relocation outside the scope of the EU ETS of sectors at significant risk; and (ii) the impact on employment and GVA that would be lost in case such relocation materialises. The environmental, economic and social impacts of carbon leakage are inextricably tied together.
Economic and social impact – competition distortion	In any eligible sector, companies that do not receive compensation, e.g. because not all Member States grant compensation, compete with companies that benefit from it (intra-sector competition). Moreover, competition between companies active in sectors producing substitutable products

	might be distorted by the measure (inter-sector competition).
Environmental impacts	Carbon leakage, if it occurs, would shift direct and indirect CO_2 emission to less carbon-restricted areas outside the EU, undermining the effectiveness of the EU ETS. At the same time, a too generous compensation system would have a negative impact on the incentives for industries to further decarbonise their production process by reducing their electricity consumption, i.e. by implementing energy efficiency measures. Also, if sectors/subsectors eligible for direct costs compensation are able to switch production from fuel to electricity, their non-eligibility for indirect ETS costs compensation could result in the unintended behaviour of companies maintaining their fuel consumption to get compensation for direct costs while they could have electrified their production process and decreased overall CO_2 emissions. Climate policies, energy efficiency and deployment of renewable energy such as wind and solar is generally correlated with air quality improvements[29] and bring also co-benefits on human health[30]. Measures to reduce energy consumption, reduce GHG emissions and leakages are therefore positive for air quality and human health.
Impacts on SMEs	The assessment of the policy options will be detailed when they have a specific impact for SMEs.

For each option related to eligibility (see section 6.1 below) and aid intensity (see section 6.3 below), the compensation budget, the corresponding indirect emissions and electricity consumption has been estimated based on several assumptions. The methodology used for those estimates is described in Appendix 7: Quantification of options. The Appendix also shows the full overview of those estimates.

It should however be stressed that the overall compensation budget only very partially describes the impact on the risk of carbon leakage of the different policy choices made. This is because these overall amounts hide the distribution of the compensation among sectors and among Member States. The distributional effects of an excessively long sector list in terms of the resulting carbon leakage risk cannot be outweighed by a strict calculation of the aid intensity. The resulting overall combination may indeed lead to the same overall total compensation budget; but this would be achieved by withholding compensation from some sectors with a higher risk whilst granting unnecessary compensation to other sectors at lower risk. For this reason, the assessment of the impact of those options and packages on the risk of carbon leakage is mostly based on a qualitative analysis.

[29] More information available in the briefing "Renewable energy in Europe: key for climate objectives, but air pollution needs attention" : https://www.eea.europa.eu/themes/energy/renewable-energy/renewable-energy-in-europe-key

[30] More information available at : https://ec.europa.eu/jrc/en/geco/climate-policy-and-air-quality

6.1. Impacts of the options on sector eligibility

6.1.1. Methodology

6.1.1.1. Screening based on quantitative criteria

The Commission first created a list of sectors which could potentially be subject to a carbon leakage risk due to indirect ETS costs. This list was the basis for identifying the sectors on which further work to quantify the actual carbon leakage risk was carried out.

The starting point for creating this list was the "Indirect Carbon Leakage Indicator" (ICLI) of the sectors concerned, obtained as the product of a sector's trade intensity and its indirect emission intensity. The calculation of the indirect carbon leakage indicator was performed based on the same data collected for the creation of the Carbon Leakage List for 2021-2030. In order to assess carbon leakage risk due to indirect ETS costs, all relevant sectors have been ranked according to their ICLI.

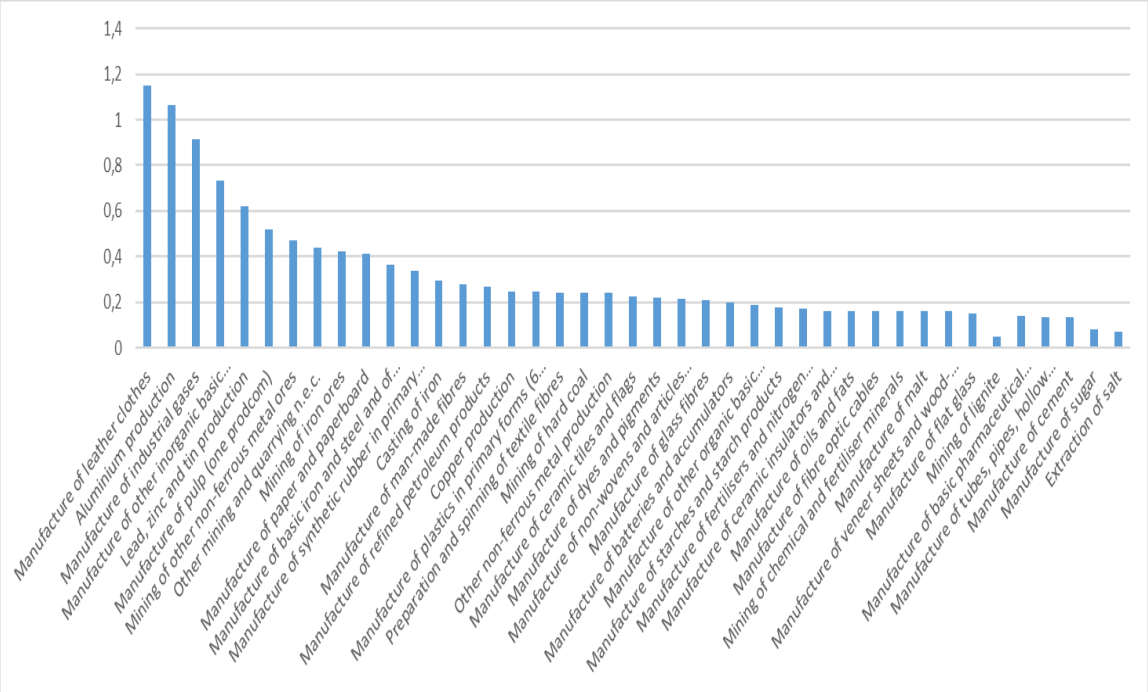
The ICLI is a relevant metric for this pre-selection as it is determined by the sectors' trade intensity (which has an impact on how easy and likely it is to shift production) and indirect emission intensity (which reflects the impact which indirect ETS costs have on the sectors' business). At the same time, the ICLI has limitations. In particular, being a function of two different parameters, a high ICLI does not necessarily indicate that companies in that sector will relocate due to significant indirect ETS costs. In particular, as noted by Roques and Laroche, the ICLI metric tends to overestimate the risk of the sectors with high trade intensity (which could sometimes be related to exports and not imports) but with low exposure to indirect carbon costs.

All sectors with an ICLI above 0.15 have been preselected. The threshold of 0.15 corresponds to the threshold used for eligibility for qualitative assessment used for the Carbon Leakage List 2021-2030. In addition, the Commission preselected one sector (*05.20 Mining of lignite*) which had an Indirect Emission Intensity above 1.5 and five more sectors[31] meeting the following two objective requirements: (i) they should have participated by sending a contribution to the targeted consultation to sectors; and (ii) they should have been included in the sectors in the Carbon Leakage List 2021-2030.

In total, 41 sectors were preselected and ranked according to their ICLI.

[31] *08.93 Extraction of salt; 10.81 Manufacture of sugar; 21.10 Manufacture of basic pharmaceutical products; 23.51 Manufacture of cement; and 24.20 Manufacture of tubes, pipes, hollow profiles*

Figure 3: Indirect Carbon Leakage Indicator (ICLI) of the 41 sectors



6.1.1.2. Qualitative assessment

As a second step, the Commission has analysed from a qualitative perspective the potential carbon leakage risk due to indirect emission costs for these preselected sectors. This assessment was conducted using a wide range of sources, including external studies[32], the conclusions of the evaluation, evidence and opinions gathered by literature review, public and targeted consultation of stakeholders, and official Eurostat data.

The assessment was based on three criteria – market characteristics, profit margins and abatement potential. This assessment has been supplemented by an evaluation of the sector's potential for shifting production processes from fuel to electricity consumption ("electrification") in order to determine whether the sector should be granted a compensation not to dissuade such shift when it already receives compensation for direct ETS costs (free allowances). These four parameters have been characterized as representing a low/medium/high risk of carbon leakage due to indirect ETS costs; a classification Red / Amber / Green has been used to illustrate the carbon leakage risk. These four parameters are assessed based on the current situation, but also on the basis of forward looking parameters, as explained below.

[32] See footnote 25 above

Box 3: Details on the four qualitative assessment criteria[33]

Market characteristics: This criterion examines the extent to which producers can pass on cost increases to customers, and in particular the ability to pass on higher electricity costs to customers. To this end, several criteria have been assessed for each sector: the bargaining position of the sector, the price taker position, the level of concentration/competition in the market (intensively competing producers vs monopolistic position, intensively competing clients), and existing and future trading patterns (including domestic demand, import penetration, import prices – in absolute levels and trends). The assessment takes into account both the current ability to pass on costs as well as the future outlook. Based on this criteria, a sector is deemed to be at high risk of carbon leakage, where it cannot pass-on the indirect ETS costs to its customers, at medium risk when it has some ability to pass through indirect ETS costs and at low risk when it can fully pass through all the indirect ETS costs to its customers.

Profit margins: This criterion concerns the incentives of a sector for long-term investment in the EU ETS, the current and future profitability of the sector in the EU ETS taking into account the current and future profit margins in the zone covered by ETS. To this end, parameters such as the current and future demand, output price, costs, investment, business demography of the sector, substitutability with other products and the feasibility of relocation for the sector have been assessed. If profit margins are positive and sustained, then the risk of relocation due to indirect ETS costs can be considered to be low. Whereas if profit margins are low or margins are higher in third countries outside the EU ETS zone, and the indirect ETS costs related to the ETS are a significant share of the profit margins, then the risk of relocation due to indirect ETS costs is high.

Abatement potential: The abatement potential of a sector relates to a sector's ability to mitigate the risk of carbon leakage when incorporating new technologies. This criterion assesses the scope for energy efficiency investments in order to reduce electricity consumption in the sector. To this end, parameters such as the current electricity consumption, international benchmarks and the current and future adoption of future Best Available Technologies ("BAT") are used. For sectors where there is little scope for further reduction of electricity consumption, and hence exposure to indirect ETS costs, the risk of carbon leakage will be higher than for sectors that can still adopt the best existing technologies to reduce their electricity consumption.

Fuel and electricity substitutability: Some production processes can, to a certain extent, shift from fuel to electricity consumption in their production processes. However, the increase in electricity costs related to the EU ETS means that certain sectors might not shift their consumption to electricity in the absence of compensation for indirect ETS costs, as they prefer maintaining their compensation for direct emissions costs linked to their fuel consumption. Against this background, this criterion assesses the ability of the sector to shift from fossil fuel energies to electricity and whether there is a risk that difference in treatment between direct and indirect cost compensation hinders the energy-efficient electrification of the sector.

[33] The exhaustive list of metrics and data sources used for this qualitative assessment is presented in Appendix 1 – methodology for qualitative analysis of carbon leakage risk due to indirect emission costs.

The qualitative assessment of each sector was complemented with sensitivities to carbon price under a low price scenario of 15 €/tCO_2, a baseline scenario of 25 €/tCO_2 and a high price scenario of 35€/tCO_2.

The assessment was based on the assumption that the same countries that have implemented an ETS indirect cost compensation scheme during Phase III will also implement such scheme during Phase IV. The evaluation has shown that 12 Member States and Norway have decided to implement compensations schemes. All schemes cover all eligible sectors and with the exception of Finland, all compensation schemes aim at granting the maximum aid amount as foreseen by the 2012 ETS Guidelines within the budgetary limits that Member States and Norway may establish. The assessment assumed that Member States and Norway will continue to grant maximum aid to all eligible sectors.

The overall risk rating of a sector is established on the basis of the risk rating of each of the four criteria described above (market characteristics, profit margins, abatement potential, and fuel and electricity substitutability). The conclusion of the carbon leakage risk's assessment for each of the sectors by Roques and Laroche is presented in Appendix 3: Assessment of carbon leakage risk for each sector.

The key assumption for the calculation of the overall risk of a sector is the higher weight given to the market characteristics criterion as it is considered that a sector which can fully pass through its indirect ETS costs can manage the risk of carbon leakage. Therefore, the market characteristics criterion bears a weight of 2 and both profit margins and abatement potential a weight of 1, i.e. the last two criteria combined have the same importance as the first one in the final rating. The fuel and electricity substitutability criterion is treated differently: if the risk rating on the fuel and electricity substitutability criterion is high, the overall risk rating of the sector will be increased (see Appendix 4 - last column in Table 5)

6.1.1.3. Data availability, consultation activities and data limitations

First, as the analysis is based on **data collected for the purpose of the establishment of the Carbon Leakage List 2021-2030** covering the period 2013-2015, it shares the same limitations. In particular, electricity consumption data at sectoral level (NACE-4) used under ETS Directive in the context of the carbon leakage is not officially available at Eurostat and has therefore been collected from Member States and EEA via a data collection exercise. In that context, 17 Member States submitted the relevant electricity data (NACE-4 level) by the deadline. The coverage of the data collection resulted in ca. 70% of total indirect emissions covered. Some stakeholders located in Member States that have not participated to the data collection complained during the consultation that the dataset did not include data from all Member States in the context of the consultation activities. However, as explained in the impact assessment on the Carbon Leakage List 2021-2030[34], that dataset was subject to several robustness checks,

[34] Commission Staff Working Document Impact Assessment Accompanying the document Commission Delegated Decision supplementing Directive 2003/87/EC of the European Parliament and of the Council concerning the determination of sectors and subsectors deemed at risk of carbon leakage for the period 2021 to 2030 - SWD (2019)22

including analysis of previous Carbon Leakage List exercise, comparing with other data sources, Member States clarifications, aiming to get the highest possible accuracy.

Second, the assessment is based on **Eurostat statistics** at sector level, corresponding to a NACE-4[35] level. NACE is the nomenclature of economic activities in the EU. NACE is a four-digit classification providing the framework for collecting and presenting a large range of statistical data according to economic activity in the fields of economic statistics. A frequent feedback received during the public and targeted consultations is that relying on NACE-4 level data means that the assessment includes all subsectors – with disparities among them in terms of electro-intensity and hence, does not take into account the specificities of different economic activities within the same sector. However, the NACE-4 nomenclature is the basis for Eurostat to develop and certify official statistics. Carrying out an analysis at NACE-4 level is therefore a guarantee for a sector analysis on a credible and uniform factual basis, which does not rely on unverified data. In addition, data regarding employment and economic activity are also available at NACE-4 level only.

Besides these data, the assessment relies on various sector specific reports from independent sources as well as the responses submitted to the **consultation activities**. In particular, a very important source of data came from the replies to the sector targeted consultation launched by the Commission on 13 February 2019 until 09 April 2019. That questionnaire listed the quality criteria for data submission in terms of representativeness, robustness, consistency of the data, and traceability of the calculations, as well as it specified the time period to ensure consistency with the data available for the establishment of the Carbon Leakage List (2014-2016). Roques and Laroche[36] use various sources of evidence to test the reliability of feedbacks collected and gain additional insights. In order to keep a critical view, this study has reported for each sector the feedback received, evidence from the literature and his own assessment, in order to reach a conclusion in terms of carbon leakage risk due to indirect ETS costs.

Several sectors did not participate to that targeted consultation and were contacted on an ad hoc basis (for more information, see Annex 2). Moreover, for several sectors no evidence could be found on the potential for implementing more energy-efficiency technologies during Phase IV, preventing from concluding on the risk of carbon leakage on the basis of the sector's abatement potential.

In general, the available data allows for an assessment of the economic situation of a sector, the impact of indirect ETS costs on the sector and thus the sector's risk exposure to carbon leakage due to indirect ETS costs. However, these economic data only serve as indicators to determine a risk level. They in particular do not allow for conclusion on the actual occurrence of carbon leakage due to indirect ETS costs.

[35] According to NACE rev.1.1: Europa - RAMON - Classifications Download List

[36] See footnote 32 above

6.1.1.4. Methodology adjustments

As no sectors with an ICLI below 0.2 has a risk of carbon leakage due to indirect ETS costs above Low-Medium[37], this confirmed that the choice of 41 sectors for the qualitative assessment was well calibrated.

By setting additional quantitative parameters on trade intensity and indirect emission intensity, it would be possible to capture all sectors with a "high" or "medium-high" risk of carbon leakage due to indirect ETS costs. Indeed, all sectors with a "high" or "medium-high" risk of carbon leakage due to emission costs showed a trade intensity above 20% and an indirect emission intensity above 1kg CO_2/EUR, confirming the relevance of these thresholds for eligibility.

The Commission therefore tested option A3 in the targeted consultation on draft Guidelines. The Commission then verified that the additional feedback and evidence received in the targeted consultation on the draft Guidelines in the first quarter of 2020 did not contradict the assessment of Roques and Laroche[38], in particular for sectors with an intermediate rating.

In that context, a frequent argument presented by sectors[39] and some Member States[40] is the need to electrify production process in order to reach the Green Deal ambitions. As explained in section 6.1.1.2 above, sectors benefitting of ETS free allowances and being able to produce using fuel or electricity in an interchangeable manner should not be discouraged to electrify their production processes. Therefore, the Commission has taken into account this feedback by relying on the Commission's list of fuel electricity substitutability[41] to identify the product categories affected. This list, which is used to define the product benchmarks for the purposes of free allowances, contains products which can be produced using fuel or electricity in an interchangeable manner. In other words, the list represents the products with the highest potential for electrification of production processes. The Commission therefore created option A4 in order to incorporate this feedback.

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37 See Appendix 3

38 See footnote 25 above

39 *13.10 Preparation and spinning of textile fibres, 20.11 Manufacture of industrial gases, 20.13 Manufacture of other inorganic basic chemicals, 20.14 Manufacture of other organic basic chemicals, 20.15 Manufacture of fertilisers and nitrogen compounds, 20.16 Manufacture of plastics in primary forms, 23.51 Manufacture of cement* (as part of Industry consumer association UNICEN), *24.10 Manufacture of basic iron and steel and of ferro-alloys, 24.44 Copper production, 24.45 Other non-ferrous metal production.*

40 Czechia, Germany, Spain

41 **Error! Reference source not found.** C/2018/8664 - OJ L 59, 27.2.2019, p. 8–69

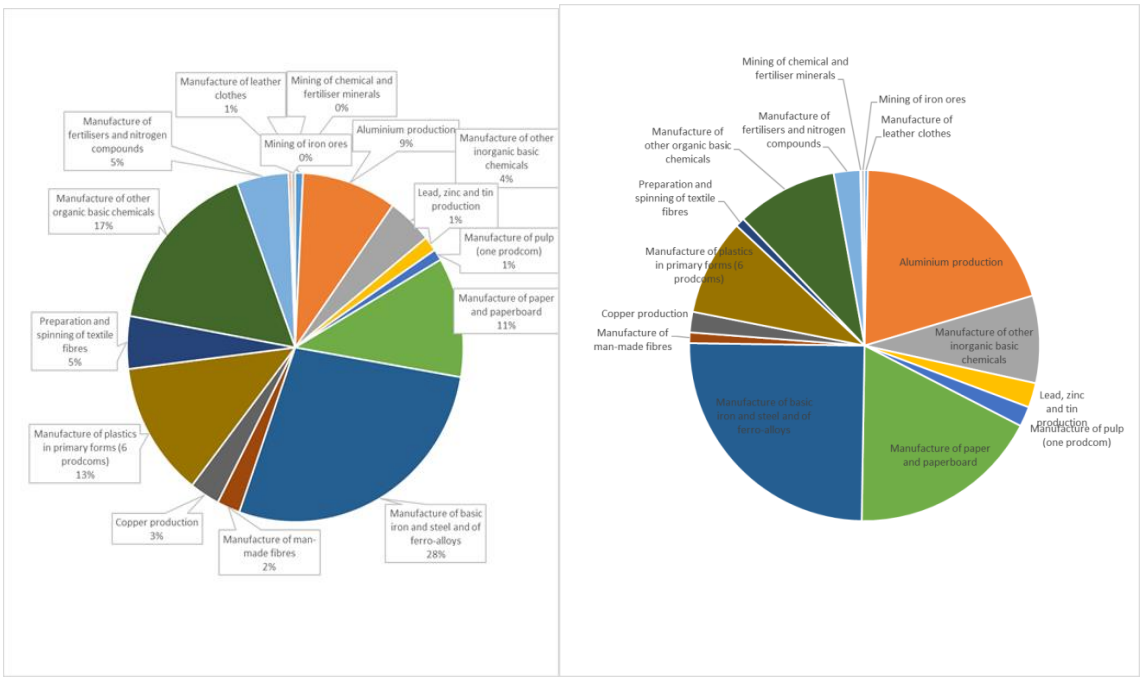
For ease of reference, the table below summarises the main options related to eligibility.

A0	A1	A2	A3	A4
Same as 2012 Guidelines (13 sectors + 7 subsectors)	Same as in 2021-2030 carbon leakage decision (50 sectors + 13 subsectors)	Based on same methodology as 2021-2030 carbon leakage decision (ICLI of 0.2), but applied to indirect ETS costs only (24 sectors)	Strict adaptation of the methodology used in the Carbon Leakage List 2021-2030 (10 sectors)	Option A3 + assessment at subsector level of fuel and electricity substitutability (10 sectors + 20 subsectors)

6.1.2. Economic and social impact – carbon leakage

Eligibility under **Option A0** would be based on a dataset developed in 2011. The eligible sectors under this option employed 1.063 million people in the EU in 2016[42] and generated an annual GVA of EUR 114 Billion in the period 2013-2015. The budget spent under Option A0 would be estimated at EUR 1.45 Billion, under the assumption of a carbon price at 25 EUR and that all other parameters are set at the baseline[43] (for more details, see also Appendix 7: Quantification of options).

Figure 4: Repartition of employment and Gross Value Added (GVA) among the sectors eligible under Option A0



Source: Eurostat

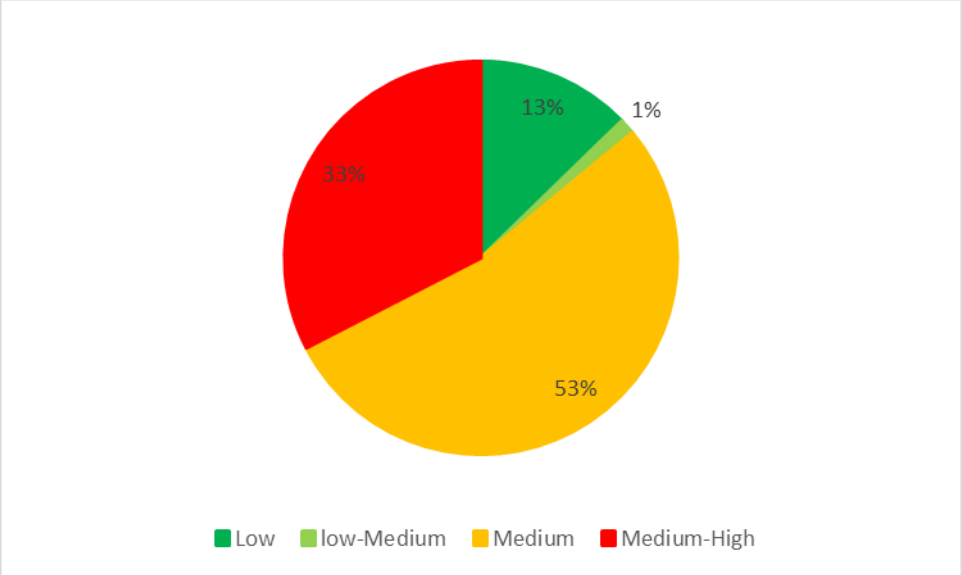
[42] Eurostat data
[43] In particular, based on a stable aid intensity at 75%

Eligibility under Option A0 does not fully correspond to the sectors most at risk based on today's statistics and the qualitative analysis by Roques and Laroche[44], as illustrated by Figure 5.

12 sectors with an ICLI above 0.2 would be eligible. Of those, 5 sectors have a very high ICLI, above 0.5. In addition, all 5 sectors[45] at medium-high risk of carbon leakage would be eligible for indirect cost compensation.

However, this option would also include 3 sectors with an ICLI below 0.2, while sectors with a higher ICLI are excluded. Similarly, two sectors[46] at low-medium risk and 4 sectors[47] at low risk of carbon leakage would also be eligible.

Figure 5: Repartition of indirect costs by carbon leakage risk for sectors eligible under Option A0



In addition, this option does not cover one of the sectors with an ICLI above 0.5 (*Manufacture of Industrial gases*). That sector however is very different than the other sectors with an ICLI above 0.5 from a quantitative perspective, as it has a very low trade intensity, considerably lower than 20%. The sector is also ranked at low-medium risk (see Appendix 3: Assessment of carbon leakage risk for each sector), mostly due to the very low exposure to international trade of the sector thus confirming the quantitative indicator.

Finally, this option might in principle lead to a situation where Member States would be allowed to allocate the budget earmarked for indirect cost compensation also to sectors with low or low-medium risk, potentially reducing thereby the available budget to target effectively the sectors

[44] See footnote 25 above

[45] *14.11 Manufacture of leather clothes; 24.42 Aluminium production; 20.13 Manufacture of other inorganic basic chemicals; 24.43 Lead, zinc, tin production and 17.11 Manufacture of pulp.*

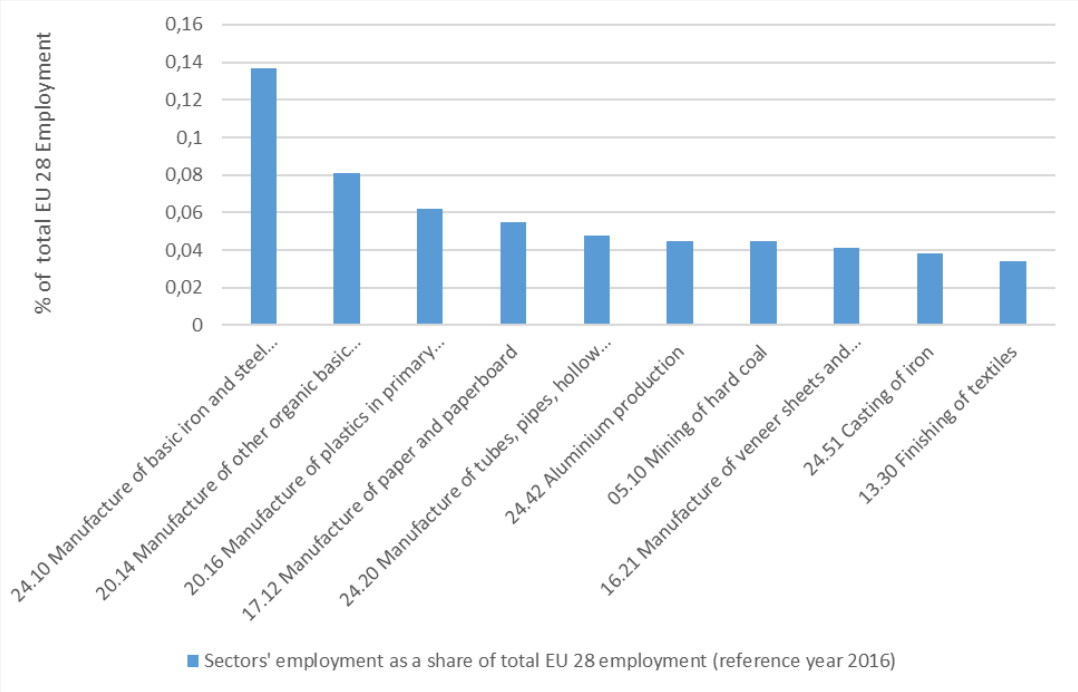
[46] *20.60 Manufacture of man-made fibres; 07.10 Mining of iron ores.*

[47] *13.10 Preparation and spinning of textile fibres; 20.14 Manufacture of other organic basic chemicals; 20.15 Manufacture of fertilisers and nitrogen compounds; 08.91 Mining of chemical and fertiliser minerals.*

most exposed to a risk of carbon leakage. This risk is however limited by the fact that the total number of sectors is quite limited.

In terms of impact on employment, this option covers half of the ten most labour intensive NACE-4 sectors (notably *24.10 Manufacture of basic iron and steel and of ferro-alloys, 20.14 Manufacture of other organic basic chemicals, 20.16 Manufacture of plastics in primary forms, 17.12 Manufacture of paper and paperboard and 24.42 Aluminium production*) (see Figure 6 below). It is however very difficult to assess any impact of carbon leakage on the labour market.

Figure 6 : Sectors with the highest employment as a share of total employment



Source: *Eurostat*

Under **Option A1**, the 50 sectors eligible employ together around 2.6 million people across the EU and generating an annual GVA of EUR 304 billion. It is however difficult to evaluate the number of employees and the GVA of the additional 13 subsectors eligible, as these data are only available at sector level. The budget spent under Option A1 would be estimated at 3.352 Billion EUR[48], under the assumption of a carbon price at 25 EUR.

The Option A1 provides the most generous eligibility system which hence offers strong protection against carbon leakage. It would limit to a large extent the risk of carbon leakage and thus the risk of production shifts to outside of the EU for a large part of the European manufacturing industries or the risk of investment plans not taking place within the EU borders.

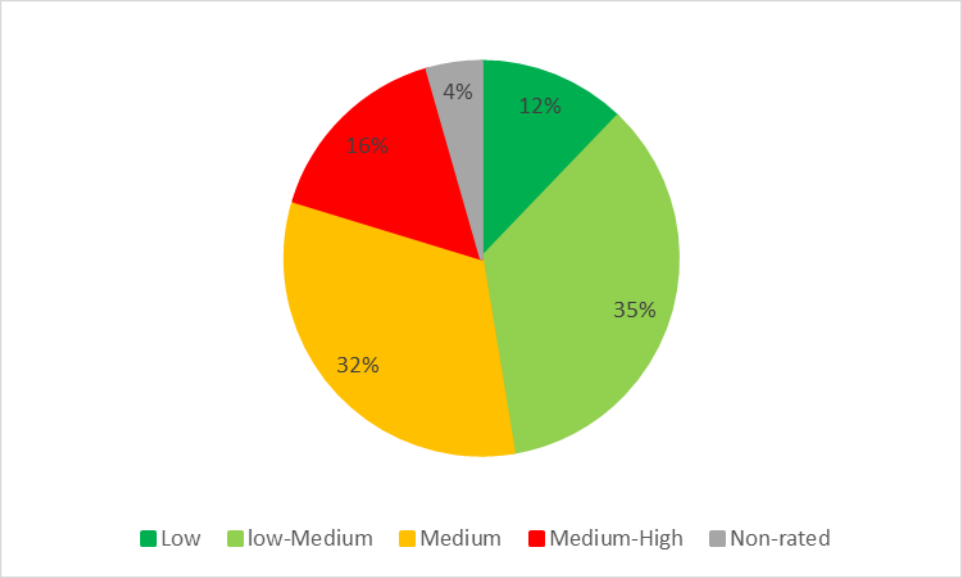
[48] Prodcoms were not included in this estimation, due to a lack of data – see Appendix 7 for more information on the assumptions.

All sectors deemed at risk of carbon leakage due to both direct and indirect ETS costs would be eligible for indirect cost compensation. The option would cover a significant number of manufacturing sectors.

This option would also cover all of the ten most labour intensive NACE-4 (see Figure 6 above). Around 25% of the industrial stakeholders responding to the public consultation argued that this is the best option to protect the EU industry from carbon leakage.

At the same time, this option however would cover 20 sectors at low and 9 sectors at low-medium risk of carbon leakage, and 18 sectors with an ICLI below 0.15. It would therefore cover a very large number of sectors with a very limited risk of carbon leakage due to indirect ETS costs. Compared to the Baseline, this option is more likely to push Member States in a situation that allocate the funds available under the budget earmarked for indirect cost compensation among a significant number of installations, reducing thereby the available budget to target effectively the sectors most exposed to a risk of carbon leakage. In such a scenario involving dilution of the aid (as illustrated by the graph below), the sectors that are in reality at the greatest risk of carbon leakage may not receive sufficient aid to stave off that risk.

Figure 7: Repartition of indirect costs by carbon leakage risk for sectors eligible under Option A1



Under **Option A2**, the 24 eligible sectors employ 1.44 million people in the EU and generate an annual GVA about EUR 121 Billion. The budget spent under Option A2 would be estimated at EUR 2.68 Billion[49], under the assumption of a carbon price at 25 EUR.

All sectors with an ICLI above 0.2 would be covered. Of those, all 5 sectors at medium-high risk of carbon leakage due to indirect ETS costs and all (7 sectors[50]) at medium risk would be eligible for compensation.

[49] Prodcoms were not included in this estimation, due to a lack of data.

Consequently, this option would limit to a very large extent the risk of carbon leakage and thus the risk of production shifts or investment not taking place within the EU borders and the resulting job losses to outside of the EU. In terms of impact on employment, this option covers all of the most labour intensive NACE-4 except three (notably *20.14 Manufacture of other organic basic chemicals, 16.21 Manufacture of veneer sheets and wood-based panels and 13.30 Finishing of textiles* would be excluded) (see Figure 6 above).

This option presents itself as more targeted to the sectors most at risk than Option A1, as no sectors with an ICLI below 0.2 would be covered and as the major part of the compensation budget would be allocated to sectors at medium-high or at medium risk. In addition, only 5 sectors[51] at low risk and 6 sectors[52] at low-medium risk would be eligible. Consequently, this option ensures that the budget earmarked by Member States for indirect cost compensation is distributed among a more limited number of sectors, of which at least half are considered to be at medium or medium-high risk of carbon leakage. The use of the available funds therefore appears to be more targeted and effective compared to Option A1. Compared to the Baseline, this option would cover the same sectors and additional 12 sectors, and would therefore limit to a large extent the risk of carbon leakage. In the public consultation, one NGO and around 25% of industrial stakeholders supported this option. However, the feedback received by a larger number of NGOs to the targeted consultation showed that this category of stakeholders believed that the stricter approach would be sufficient, in the absence of any evidence of the risk of carbon leakage due to indirect ETS costs.

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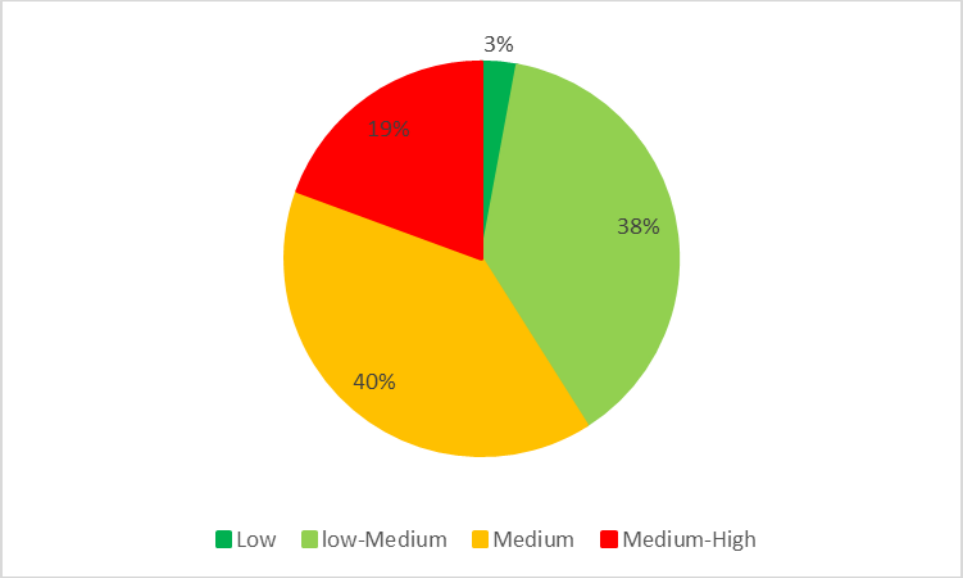
[50] *17.12 Manufacture of paper and paperboard, 24.10 Manufacture of basic iron and steel and of ferro-alloys, 24.51 casting of iron, 19.20 Manufacture of refined petroleum products, 24.44 copper production, 20.16 Manufacture of plastics in primary forms and 24.45 other non-ferrous metal production.*

[51] *13.10 Preparation and spinning of textile fibres; 23.31 Manufacture of ceramic tiles and flags; 20.12 Manufacture of dyes and pigments; 13.92 Manufacture of non-wovens and articles made from non-wovens, except apparel;* and *23.14 Manufacture of glass fibres.*

[52] *20.11 Manufacture of industrial gases; 07.29 Mining of other non-ferrous metal ores; 08.99 Other mining and quarrying n.e.c.; 20.17 Manufacture of synthetic rubber in primary forms; 20.60 Manufacture of man-made fibres;* and *05.10 Mining of hard coal.*

Figure 8: Repartition of indirect costs by carbon leakage risk for sectors eligible under Option A2



Under **Option A3**, the sectors eligible under this option employ around 833 000 people[53] in the EU and generate an annual GVA of EUR 72 billion. The budget spent under Option A3 would be estimated at EUR 1.41 Billion[54], under the assumption of a carbon price at 25 EUR.

As in the baseline option, 5 sectors[55] with a very high ICLI (above 0.5) are covered. In addition, the 5 sectors at medium-high risk of carbon leakage and 5 of the sectors[56] deemed at medium risk would be eligible for indirect cost compensation.

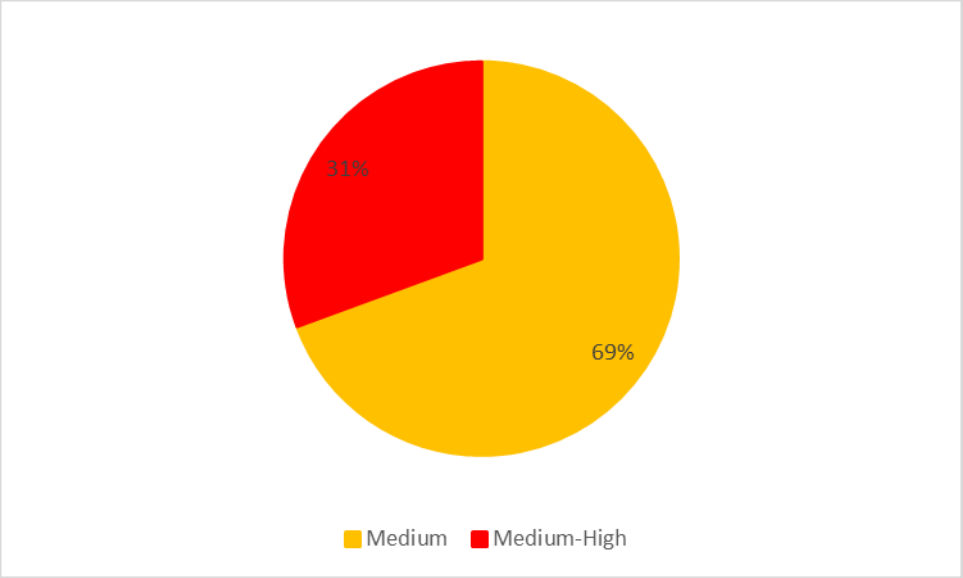
[53] Source : Eurostat data - 2016

[54] Prodcoms were not included in this estimation, due to a lack of data.

[55] *14.11 Manufacture of leather clothes, 24.42 Aluminium production, 20.13 Manufacture of other inorganic basic chemicals, 24.43 Lead, zinc and tin production and 17.11 Manufacture of pulp.*

[56] *17.12 Manufacture of paper and paperboard, 24.10 Manufacture of basic iron and steel and of ferro-alloys, 19.20 Manufacture of refined petroleum products, 24.44 Copper production and 24.45 - Other non-ferrous metals production.*

Figure 9: Repartition of indirect costs by carbon leakage risk for sectors eligible under Option A3



This option therefore entails a higher risk of carbon leakage compared to the baseline and the other options. In particular, compared to the baseline, 6 sectors and 6 subsectors[57] would not be eligible. Those sectors generate an annual GVA of EUR 56 Billion.

Of the non-eligible sectors, two sectors have been evaluated at medium risk. Those sectors employ 55.000 people and generate an annual GVA of EUR 5 Billion. As already observed, this data is only useful as an indicator, as it is very difficult to estimate the impact of this risk on the economy and the labour market.

However, this option is more targeted to the sectors most at risk due to indirect ETS costs (see Appendix 3: Assessment of carbon leakage risk for each sector). In terms of impact on employment, it covers three of the ten most labour intensive NACE-4 (notably *24.10 Manufacture of basic iron and steel and of ferro-alloys, 24.42 Aluminium production, 17.12 Manufacture of paper and paperboard*), covering 40% of the total employment in those ten most labour intensive sectors (see Figure 6 above).

A version of this option limited to quantitative parameters was presented to stakeholders in the targeted consultation on the draft Guidelines[58].

A majority of Member States[59] and industrial stakeholders (including BusinessEurope and EuroChambers) argued in favour of the inclusion of specific sectors[60] or sub-sectors[61] (i.e. at

[57] *20.60 Manufacture of man-made fibres, 13.10 preparation and spinning of textile fibres, 20.14 Manufacture of other organic basic chemicals, 20.15 manufacture of fertilisers and nitrogen compounds, 07.10 Mining of iron ores, 08.91 Mining of chemical and fertilizer minerals* and 6 subsectors from *20.16 Manufacture of plastics in primary forms.*

[58] See Annex II: synopsis report.

Prodcom level)[62] often on the basis of regional specificities. Similarly, sectors associations and large consumers associations concerned by the exclusion of some sectors from the list of eligible sectors concentrated their input on providing arguments on the risk of carbon leakage of the relevant sector. Finally, a large number of citizens employed in sectors not eligible under this option and local authorities, mostly located in Poland, also plead for the inclusion of some specific sectors (in particular, *24.44 Copper production*). One of the main reasons mentioned in the consultation in favour of a longer list, is however the need to ensure the sectors decarbonisation through electrification, which would be discouraged if the sector receives free allowances for direct emissions.

On the other side of the spectrum, a few Member States argued that the list of eligible sectors was appropriate to address the risk[63] and one Member State asked for one sector to be removed. Several environmental NGOs also claim that, in the absence of any evidence of carbon leakage, indirect cost compensation should not be granted as it reduces the incentives to perform energy efficiency investments.

On balance, it appears from the results of the consultation summarised above, that Option A3 sufficiently protects from the risk of carbon leakage specifically induced by indirect ETS cost. In particular, it emerged from the replies of some Member States, industrial stakeholders and citizens that many sectors would be exposed to a certain degree of relocation risk due to international competition. However, it often could not be demonstrated that this risk was due to indirect ETS costs, which is the purpose of these Guidelines. For all sectors, the feedback and data provided by industrial stakeholders appeared in line with the information and data used by Roques and Laroche for their assessment. That assessment was therefore reinforced by the results of the consultation.

However, the quantitative requirements under Option A3 (in particular the requirement to have an indirect emission intensity above 1 $kgCO_2$/EUR), exclude a number of sector which are potentially facing a not insignificant carbon leakage risk. This is also the reason why the Commission, when consulting publically on this option, explicitly referred to the borderline natures of certain sectors and showed its openness to analyse additional economic information they may have wished to put forward. Whilst sector *24.51 Casting of iron* did not provide feedback to the consultation, all other sectors responded.

As regards *20.16 Manufacture of plastics in primary forms*, the additional data and considerations were in line with the analysis of Roques and Laroche. In particular, that analysis

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59 Belgium, Bulgaria, Czechia, France, Germany, Greece, Spain, Hungary, Croatia, Italy, Lithuania, Poland, Portugal, Romania, Sweden.

60 For example, the following sectors were mentioned: *Copper, Cement, Ceramic industry, Manufacture of fertilisers and nitrogen compounds, Industrial gases, Other basic organic chemicals, Other non ferrous metals production, Mining of other non-ferrous metal ores, Mining of Iron ores, Glass industry, Plastics, Spinning of textiles, Man-made fibers, Casting of Iron.*

61 For example, the following products were mentioned: Steel tubes, Nickel, Ammonia, Potash, Crackers.

62 Prodcom provides statistics on the production of manufactured goods carried out by enterprises on the national territory of the reporting countries. The term comes from the French "PRODuction COMmunautaire" (Community Production).

63 Finland, Denmark and Netherlands.

and the contributions received converge that the domestic demand and the imports will increase. Indeed, Roques and Laroche observe that exports are increasing in value showing that the European industry is exporting high value goods. They also identified high profit margins, which are confirmed by the replies to the consultation, which however claim a decrease as from 2019. The feedback from the consultation generically claims a possibility of substitution of plastics by alternative materials, without providing evidence. The feedback from the consultation also raises the question of electrification for the plastics sector, which is a valid concern that is addressed under Option A4.

The sectors *24.44 - Copper production* and *24.45 - Other non-ferrous metals production* present a particular situation that justify a separate analysis. These sectors are "price-takers" since the relevant commodities are traded internationally, which involves that they have very limited ability to pass on the increase in electricity prices to their customers[64]. The arguments and data provided by both the copper sector and the one subsector within the "other non-ferrous metals production" (nickel) in the public consultation have sought to address the different aspects of the assessment performed by Roques and Laroche. That analysis on the profit margin sensitivity to carbon prices concluded that the profitability of the sectors might not be significantly degraded by the indirect ETS costs. However, a low pre-existing profitability may result in proportionally larger impact of indirect ETS costs compared to a higher pre-existing profitability. These sectors are also heterogeneous, with some sub activities in the sector particularly exposed to indirect costs. In addition, the price taker characteristic of the sectors leads to increasing the risk that increase in costs lead to the decision to relocate or to invest outside the EU, leading to an increase in greenhouse gas emissions. The analysis had also pointed to the fact that the demand for copper and nickel had been increasing[65] and is expected to continue to increase in the future, also due to the importance of those materials in the context of the Green Deal. In its assessment of carbon leakage of the *24.44 Copper production sector*, Roques and Laroche noted that imports into the EU have been stable. For the sector *24.45 Other non-ferrous metals production* they also reported import penetration has been stable in the last years. However, the assessment did not exclude that increases in domestic demand may be served by imports, thus impacting negatively the profit margins of these sectors. The EU's import reliance of nickel, as an example, is 59% and the largest supplier of nickel of the EU have set restrictions on exports of nickel alloys and nickel related products.

Eligibility under **Option A4** complements option A3 by adding 20 subsectors with a high fuel to electricity interchangeability. This option covers all sectors that would be covered under Option A3. Therefore, the impacts described under Option A3 also apply in Option A4. This is also the case as regards the impacts on the two borderline sectors: *24.44 Production of copper* and *24.45 Other non-ferrous metals production*. This option also addresses most of the comments received in the context of the targeted consultation on the draft Guidelines from both Member States and

[64] Price taker status means the raw price is set at global level, for instance on the London Metal Exchange. Regional premia and quality premia may then be added to this raw price.

[65] See Commission press release: https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6305 - "Demand for copper is likely to increase, notably also due to the growing importance of electric cars."

industrial stakeholders. The budget spent under Option A4 would be estimated at 1.455 Billion[66] EUR, under the assumption of a carbon price at 25 EUR.

Similar to Option A3, Option A4 appears to be more targeted to the actual carbon leakage risk than the previous options. The sectors *17.12 Manufacture of paper and paperboard, 24.10 Manufacture of basic iron and steel and of ferro-alloys* and *19.20 Manufacture of refined petroleum products* would be eligible, which appear to be at a medium risk of carbon leakage. In addition, being more generous than Option A3, Option A4 would better protect against the risk of carbon leakage. In fact, 15 of the additional subsectors belong to sector *24.51 Casting of Iron*, and 1 subsector belongs to sector *20.16 Manufacture of plastics in primary forms*, which are both sectors at medium risk, thereby partly reducing the residual risks of carbon leakage in Option A3.

6.1.3. Economic and social impact – competition distortions:

Option A0 creates the risk of compensating sectors at low-medium and low risk of carbon leakage. Hereby, this option risks creating competition distortions to the extent that these sectors produce products that are substitutable with products manufactured in sectors that are not eligible for indirect ETS costs compensation[67]. This option also leads to an intra-sector distortive effect for some sectors at low or low-medium risk of carbon leakage due to indirect ETS costs, in case some Member States do not implement a compensation scheme.

Therefore, for the sectors at low or low-medium risk of carbon leakage, the disadvantage in terms of competition distortion – both intra and inter sector – probably outweigh the advantage of a compensation to avoid a potential carbon leakage risk which is very unlikely to materialise.

Since under **Option A1** a significant number of manufacturing sectors would be eligible, the risk of distortions of inter-sector competition is very limited. However, the evaluation has shown that only 12 Member States and Norway have actually decided to implement a compensation scheme. Under the assumption that the same countries that have implemented an ETS indirect cost compensation scheme during Phase III will also implement such scheme during Phase IV, the large number of eligible sectors creates the risk of distorting intra-sector competition within a high number of sectors. This impact on intra-sector competition is intensified by the fact that this option would declare 29 sectors to be eligible, which are only at a low or low-medium risk of carbon leakage. These sectors would risk to be overcompensated.

Option A2 would slightly increase the risk of inter-sector competition distortion, as the eligible sectors produce products that are substitutable with products manufactured in sectors that are not eligible for indirect cost compensation (for example *20.17 Manufacture of synthetic rubber in primary forms* can be partially substituted by natural rubber; *23.31 Manufacture of ceramic tiles and flags* compete with other floor covering such as carpet, resilient, laminates and parquet; and *23.14 Manufacture of glass fiber* compete with other insulation materials). Compared to Option

[66] Prodcoms were not included in this estimation, due to a lack of data.

[67] For instance *14.11 Manufacture of leather clothes produces products substitutable with synthetic products; 24.42 Aluminium production* is competing among others with plastic, paper and glass products in the packaging market, and with composites, wood and steel products for the construction sector; and *24.43 Lead, zinc and tin production* covers, among others, products that can be substituted by cadmium and plastic coatings for the purpose of corrosion protection

A1, the risk of distortions of both intra-sector competition and inter-sector competition would be however reduced as fewer sectors are eligible.

The risk of competition distortions under **Options A3 and A4** is very limited, as these options are targeting the sectors most exposed to a risk of carbon leakage compared to all options and target much fewer sectors than Options A1 and A2. Nevertheless, these options risk creating competition distortions to the extent that products of certain eligible sectors compete with products manufactured in sectors that are not eligible for indirect cost compensation[68]. Industrial stakeholders often refer to the need to ensure that substitutable products are equally eligible in their replies to the targeted consultation on the draft Guidelines, as well as products essential for certain value chains. In this respect, one common misunderstanding in stakeholders' replies is that undertakings active in sectors eligible for compensation could be compensated also for the electricity consumption used for the production of secondary sub-products belonging to a different non eligible NACE-4 code. That situation was not possible under point 29 of the 2012 ETS Guidelines and will continue to not being possible in the future. Stakeholders' concerns on distortions of inter-sector competition under Option A3 appear more limited once put in this context. As regards *20.16 Manufacture of plastics in primary forms*, the reply to the consultation mentions that plastics could be substituted by other materials (e.g. glass, aluminium, steel, paper/cardboard, etc.), particularly in packaging or automotive applications. If so, there could be inter-sector competition distortions. However the allegations were rather generic.

Being restrictive, the eligibility list under Option A3 and A4 leads to a lower level of intra-sector competition distortion resulting from the fact that many Member States do not have a compensation scheme in place.

6.1.4. Environmental impact

Under O**ption A0**, sectors eligible for indirect cost compensation account together for 123 Million tonnes of CO_2 annual indirect emissions and 263.5 TWh of annual electricity consumption when considering the sectors as a whole. The compensation would cover 58 Million tons CO_2 annually (or 3.2% of annual emissions covered by EU ETS) when considering only the proportion of eligible sectors present in Member States with a scheme. This represents 5.5% of annual emissions from the European power generation sector.

In the absence of compensation, sectors would face the full indirect ETS costs, which means that abatement possibilities would be at a maximum as decentralised decision-making would enable undertakings to continuously search for the cheapest abatement option. However, carbon leakage,

[68] For instance *14.11 Manufacture of leather clothes* produces products substitutable with synthetic products*; 24.42 Aluminium production* is competing with steel products for the automotive industry, with plastic, paper and glass products in the packaging market, and with composites, wood and steel products for the construction sector; *19.20 Manufacture of refined petroleum products* covers, among others, products that can be substituted by biofuels, electricity, e-fuels and H2; *24.43 Lead, zinc and tin production* covers, among others, products that can be substituted by aluminium alloys, cadmium and plastic coatings for the purpose of corrosion protection.

if it occurs, would shift direct and indirect CO_2 emission to less carbon-restricted areas outside the EU, undermining the effectiveness of the EU ETS.

This option reduces the risk of a shift of production of these sectors to outside the EU, which would lead to increased indirect CO_2 emissions outside the EU.

However, as some sectors and subsectors at low or low-medium risk would be eligible, the aid would relieve the beneficiaries in those sectors of the cost of their indirect emissions thereby limiting the incentives for emission reductions and innovation in the sector. Reductions of CO_2 emissions are also correlated to reductions of other air pollutants, which would contribute to improved air quality. By overcompensating sectors at low and low-medium risk of carbon leakage, this option will remove some incentives to become more electricity consumption efficient for undertakings which are at little or no risk of carbon leakage. Moreover, this option does not address the particular situation of subsectors which could electrify their production process but might prefer to keep consuming fuel since they are compensated for direct emissions costs and not for indirect emission costs.

Under **Option A1**, sectors eligible for indirect cost compensation accounts together for 252 Million tonnes of CO_2 annual indirect emissions and 542 TWh of annual electricity consumption when considering the entire sectors. The compensation would cover 134 Million tons CO_2 annually (or 7.3% of annual emissions covered by EU ETS) when considering only the proportion of eligible sectors present in Member States with a scheme. This represents 12.6% of annual emissions from the European power generation sector.

Provided that Member States implement a compensation mechanism and grant the maximum aid amount, this option would therefore significantly reduce the risk of a shift of production of these sectors to outside the EU. Such shift of production would lead to increased indirect CO_2 emissions outside the EU. At the same time however, as 25 sectors for which only a low or low-medium risk of carbon leakage together with 13 sectors and 13 subsectors with an ICLI below 0.15 can be identified, this option would lead to overcompensation for these sectors and thus weaken the incentives for a cost-efficient decarbonisation. Also, this option would compensate for a significant part of emissions, which risks undermining the effectiveness of the EU ETS. On balance, this option seems to entail a higher risk of distortions of the ETS price signals as compared to the baseline.

The Option A2 would cover all sectors at medium or medium-high risk of carbon leakage. Sectors eligible for indirect cost compensation under this option account together for 206 Million tonnes of CO_2 annual indirect emissions and 443 TWh of annual electricity consumption when considering entire sectors. The compensation would cover 107 Million tons CO_2 annually (or 5.8% of annual emissions covered by EU ETS) when considering only the proportion of eligible sectors present in Member States with a scheme. This represents 10.1% of annual emissions from the European power generation sector.

Provided that Member States implement a compensation mechanism and grant the maximum aid amount, this option would significantly reduce the risk of a shift of production of these sectors to outside the EU leading to increased indirect CO_2 emissions outside the EU. At the same time, however, as 11 sectors for which only a low or low-medium risk of carbon leakage can be identified, would remain eligible, this option would lead to overcompensation for these sectors

and thus weaken incentives for a cost-efficient decarbonisation. The fact that this option would compensate for a larger part of emissions from the EU ETS risks undermining the effectiveness of the EU ETS.

The sectors[69] eligible under **Options A3 and A4** amount for 107 Million tons CO_2 of indirect CO_2 emissions and for 231 TWh of electricity consumption from the entire sectors for which the risk of a shift to outside the EU ETS would be addressed. The compensation would cover 56 Million tons CO_2 annually (or 3.1% of annual emissions covered by EU ETS) when considering only the proportion of eligible sectors present in Member States with a scheme. This represents 5.3% of annual emissions from the European power generation sector.

By being targeted to the sectors most exposed to the risk of carbon leakage, these options would not create overcompensation and thereby would not weaken incentives for further energy efficiency in all other sectors not at risk of carbon leakage. These options also minimise the risk of distortions to the effectiveness of the EU ETS by compensating only for a relatively small part of total emissions covered by the EU ETS.

Furthermore, **Option A4** deals with the particular situation for subsectors with fuel to electricity substitutability for which the absence of indirect cost compensation for electricity can deter companies which are eligible for free allowances from electrifying. As regards *20.16 Manufacture of plastics in primary forms*, the reply to the consultation stressed that under the Commission's Plastics strategy the plastics industry is expected to shift more from a direct cost base to an indirect cost base in comparison with current energy supplies, as a result of further electrifying our processes technologies. By recognising eligibility of the subsector with fuel-electricity substitutability, Option A4 addresses the concern raised by the sector in the targeted consultation on the draft Guidelines.

6.1.5. Impact on SMEs

The number of SMEs differs depending on the sector (see

[69] For Option A4, these figures do not include subsectors eligible on a stand-alone basis, due to a lack of data at subsector level.

Appendix 5: number of undertakings with less than 250 employees).

Regarding SMEs, the Guidelines do not introduce any minimum condition related to the size of the beneficiaries. However, the evaluation of the 2012 ETS Guidelines show that some Member States[70] have introduced minimum electricity consumption thresholds, limiting the possibility to benefit from indirect ETS costs compensation to undertakings consuming at least a certain volume of electricity per year (usually 1 GWh). The reason given to justify such threshold is that below a certain volume of electricity consumption, the administrative costs implied for benefiting from the compensation would be higher than the actual amount of compensation. It is the fact both for the undertakings concerned that would spend time and money to prepare their request for compensation and for the administration of the national authorities that would have to assess more requests and among them some that would lead to a limited amount of compensation.

The aim of the threshold is indeed to avoid a situation where administrative costs both for potential beneficiaries and the State are disproportionally high compared with the aid amount corresponding to that level of electricity consumption (1 GW)[71]. In practice, this means that SMEs consuming less than 1 GW of electricity per year are *de facto* excluded from the scope of the compensation scheme in several countries.

The described impact on SMEs does not however depend on the ETS Guidelines. No option creates specific costs on SMEs. In fact, the decision to introduce eligibility threshold of the kind observed merely depends on Member States' decision and can only be allowed to the extent it is objective and non-discriminatory.

6.2. Impacts of the packages estimating indirect ETS costs

6.2.1. Methodology to determine the CO_2 factors

The CO_2 emission factor used in the compensation calculation intends to estimate the carbon content of the electricity consumed by eligible undertakings.

The merit order ranks the sources of power generation by ascending order of marginal price, the last technology in this ranking being the one setting the overall electricity price. Historically, fossil-fuelled power generation had the highest marginal price and ranked as latest in the merit order, therefore setting the overall electricity price. In order to estimate the carbon content of the marginal price-setting technology, CO_2 factors have therefore been calculated based on the CO_2 intensity of electricity produced from fossil fuels.

It is expected that indirect ETS costs supported by customers located in a given Member State will not only depend on the production mix of this Member State but also on the production mixes of neighbouring Member States as well as the levels of cross-border capacity. If there were no cross-border transmission capacity limitation, two neighbouring Member States would have

[70] The following Member States have introduced a minimum consumption threshold of 1 GW: Germany, Netherlands, Belgium (Flanders), Slovakia, Finland, Poland.

[71] As stated in the evaluation report, that hypothetical aid amount has been estimated between 8,333 EUR per beneficiary in Poland, 4,200 EUR in Germany and Slovakia, 4,000 EUR in the Netherlands and Belgium Flanders), and 2,520 EUR per year in Finland (which only compensate for 50% of the maximum aid amount).

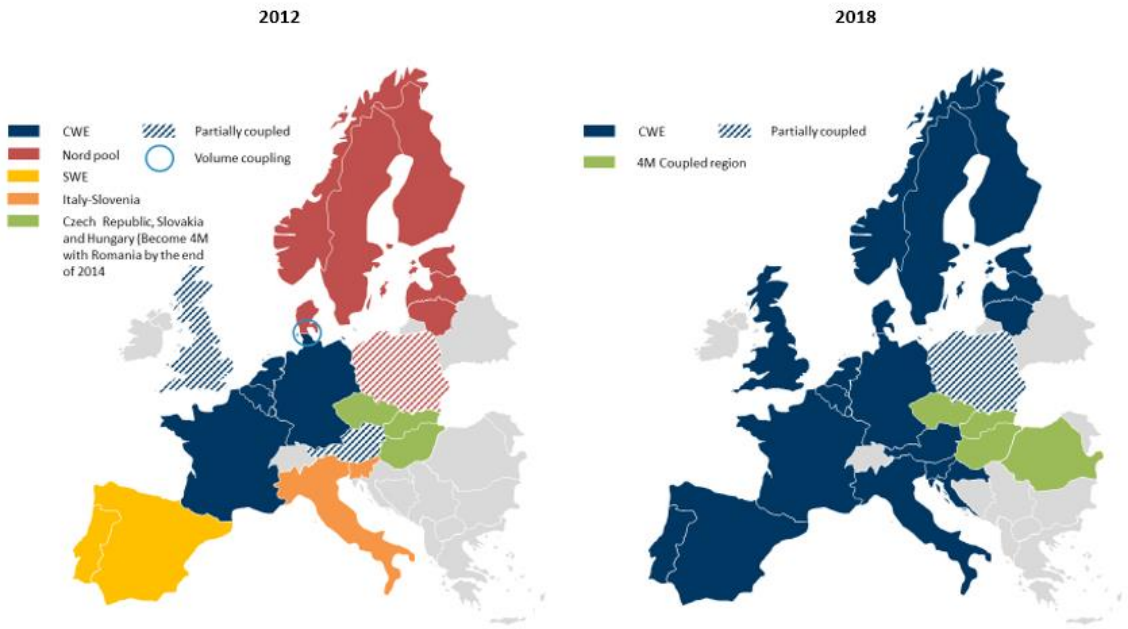
the same electricity price. The electricity price would be set at the generation costs of the marginal technology in the zone. The emission factor should thus reflect the CO_2 intensity of electricity produced from fossil fuels in the zone. On the contrary, if cross-border transmission capacities were not to be sufficient, congestions would occur. The two Member States would end up having two distinct electricity prices. In each Member State, the electricity price would be set at the generation costs of the marginal technology. In this case, emission factors would vary from one Member State to the other, just as electricity prices would.

6.3.1.1 Update of the underlying data

Accordingly, the 2012 ETS Guidelines have defined the CO_2 emission factor for geographic areas: a) which consisted of submarkets coupled through power exchanges, or (b) within which no declared congestion existed, and, in both cases, hourly day-ahead power exchange prices within the zones showed price divergence in Euros of maximum 1% in a significant number of hours in a year[72].

As regards the first criterion a) above, the evolution of market coupling in Europe since 2012 has been analysed. **Error! Reference source not found.** illustrates the changes occurred in the market in the period 2012-2018.

Figure 10: Evolution of the coupled markets in Europe since 2012



[72] The Commission considers the 1% deviation margin (in euro terms) provides relevant insights on price convergence and therefore should remain the appropriate criteria to determine CO_2 factors geographic areas. This relative measure ensures the price convergence criteria is not limited to absolute price convergence, which would be too restrictive as regards the underlying economic impact, while limiting the degree of deviation.

Notes: *4M coupled region (or 4M coupled market) is a Day-ahead ATC based price coupling covering Czech-Slovak-Hungarian-Romanian market areas*
Source: *FTI-CL analysis*

In a market without interconnection constraints, market coupling is expected to enable generators to compete with each other to offer electricity at the cheapest cost in the entire coupled area. It would in turn lead to a common electricity price across coupled markets, and a common CO_2 factor. Accordingly, there is a presumption that coupled markets are good candidates for ETS geographic zones.

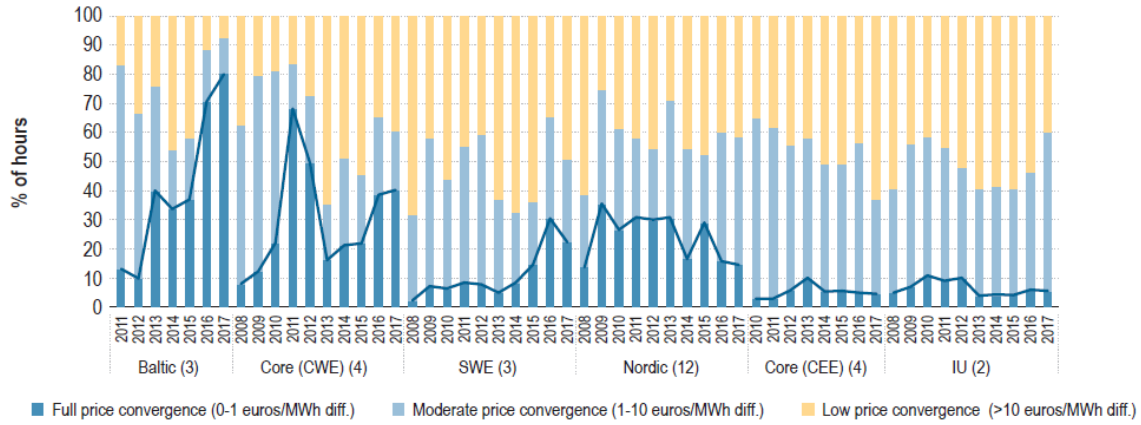
The merging of the coupled markets in Europe resulting in the larger coupled regions in 2018 as illustrated in **Error! Reference source not found.** above, could be an argument for broader ETS geographic zones than the ones defined in 2012 Guidelines. One could thus consider merging the existing Nordic regions, Central-Western Europe ("CWE"), Iberia, "Czechia and Slovakia" within one broader ETS geographic zone for the purpose of establishing the new CO_2 regions in the revised Guidelines. However, the mere fact that electricity is traded between coupled markets does not automatically imply full price convergence. Several factors may limit price convergence despite market coupling. These include: the physical interconnection capacity; the available cross-border capacity on the day-ahead market; and the national specificities: energy mix and internal bottlenecks.

Against this background, an analysis of criterion b) above was also carried out. This analysis consisted in an assessment of the actual level of price convergence, expressed as a percentage of hours over the year showing a price divergence of less than 1% in euro terms, within the coupled areas has been carried out in order to assess the impacts of the various policy options. This assessment was based on hourly day-ahead prices for all Member States and Norway between 2011 and 2017.

Overall, the degree of price convergence within the regions as defined in Annex IV of the 2012 ETS Guidelines has decreased since 2012, as illustrated by**Error! Reference source not found.** below. In particular, this figure shows that:

- The share of hours of full convergence has tended to decrease in the Nordic region since 2012. It reached about 15% in 2017, compared with about 30% in 2012.
- The share of hours of full convergence has significantly increased in CWE (made of France, Belgium, the Netherlands, Germany, Luxembourg and Austria) since 2013. It reached about 40% in 2017. However, it remains below the 2012 level (50%).
- The share of hours of full convergence has significantly increased in the Baltic region since 2012. It reached a little more than 80% in 2017, compared with about 10% in 2012.

Figure 11: % of hours with convergence of electricity prices



Source: Eurostat, Compass Lexecon calculations

6.3.1.2 Consultation activities

In the third trading period emission factors were calculated by dividing the total amount of emissions produced by fossil-fuel generation plants by the amount of electricity they generated. This method assumes fossil-fuel plants are always the marginal unit in the merit order curve. In this case, ETS costs are directly observable in the electricity price as the marginal unit, i.e. the production plant setting the price, is bearing ETS costs due to its production technology.

While in 2012 the underlying assumption to this methodology was correct, changing electricity markets may justify a revision of this calculation method. In particular, the increasing share of renewable generation may have had the effect of changing the typology of price-setting generation plants. The calculation method of the third trading period may have the effect of overestimating emission factors if non fossil-fuel generation plants are marginal in some hours. For this reason, the Commission included specific questions in the public consultation to test the feasibility of alternative approaches.

In particular an alternative approach, already mentioned in the 2012 ETS Guidelines impact assessment, would consist in running a counterfactual scenario without an ETS market to determine the impact of the ETS on electricity prices. This approach would need to be run at the EU level and not at the national or intermediate geographic area level, using historical data provided by transmission system operators (TSOs) and/or energy regulators on price-setting plants or complex dispatch models to determine the marginal plant at time *t* and hence the ETS costs embedded in electricity prices. The results of the consultations show that 30% of the respondents believe that such an approach would be appropriate, while only 13% argued it would not be appropriate nor feasible (the remaining share did not reply).

However, the necessary information to implement this methodology appears, at the moment, to be scarce and lacking homogenous treatment between national regulators or TSOs. This was confirmed by the results of the public consultation, as less than 25% of the respondents reply on the feasibility of the approach, and the results vary depending on the location of the respondent.

As a result this methodology is not feasible and the existing methodology will therefore continue to be used for the purpose of determining emission factors in the fourth trading period. However, in 2025, the Commission will assess whether additional data is available allowing to improve and revise the methodology used to calculate the CO_2 emission factors, i.e. to take into account the increasingly important price-setting role of low-carbon technologies in EU electricity markets.

6.3.1.3 Internal analysis

As stated in the evaluation report, the emission factors for the regions as defined in Annex IV of the 2012 ETS Guidelines have generally been on a slightly downward trend over the last years.

For the purpose of these revised Guidelines, the methodology to calculate the CO_2 factors could be adapted in order to reflect the specificity of cogeneration (also called combined heat and power "CHP"). This new methodology would allocate the CO_2 emissions between the power and the heat production for the purpose of establishing the CO_2 factors. In order to do so, the Commission would apply the so-called "Finnish method" that uses fixed factors for efficiency of electricity and heat, as used in the Energy Efficiency Directive (EED)[73].

Regarding the design of geographic regions, based on the Commission's quarterly report on European electricity market[74] the Commission concluded that two more zones meet the criteria of price convergence: the Adriatic zone (made of Slovenia and Croatia) and the Baltic zone (made of Lithuania, Estonia and Latvia). Also, two existing zones would need to be reduced to reach a significant price convergence level: the new CWE zone would be reduced to three countries only (Germany, Luxembourg and Austria) and the new Nordic zone would only include Sweden and Finland.

A second conclusion stems from recent evolution of respective prices for gas, coal and CO_2 in 2019, which have resulted in a switch from coal to gas in the merit order for electricity generation. Gas-fired power generation emitting much less CO_2 than coal-fired power generation, this results in 2019 CO_2 intensity being significantly lower than in 2018. The Commission will update the Annex of the Guidelines in order to reflect 2019 data for CO_2factors, once these data will be made available (indicative timing: around April 2021).

6.2.2. Methodology to determine the output data

The baseline output expressed in tonnes per year together with the efficiency benchmarks expressed in MWh/t allows to determine the benchmark electricity consumption of an individual installation. As such, the baseline output is an essential parameter when calculating the indirect ETS costs faced by that undertaking.

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73 The method was confirmed by the Impact assessment for the new Directive 2018/2002, i.e. SWD (2016) 405, see part III pages 166-167.

74 Quarterly report on European electricity markets - https://ec.europa.eu/energy/sites/ener/files/quarterly_report_on_european_electricity_markets_q_4_2019_final.pdf

The main question concerns the reference output to be used in the formula. A fixed reference parameter calculated on past production data presents the advantage of not influencing directly the marginal cost of production, and therefore avoiding potential incentives to increase production when reference data is calculated. However, it is crucial that the reference output used in the compensation formula is not based on outdated data, and reflect best the actual indirect ETS costs supported by the undertakings to properly address carbon leakage risk and minimise competition distortions due to over or undercompensation.

This trade-off between the two approaches was also reflected in contributions to the targeted consultation on the draft Guidelines, with some Member States (Finland and the Netherlands) and industrial stakeholders in favour of the change towards actual output, while two Member States (France and Norway) requested to keep the historical output, as actual output could reduce the incentives to energy efficiency.

From the public consultation, on the question related to the reference for output in the compensation formula, a small majority of respondents would like the actual output to be taken in to account in the compensation formula, either by using directly this measure (around 25%), or by using historical output corrected by the average over the past 2 years (around 20%). Other participants (9.68%) favoured the use of historical output determined *ex ante* over a sufficiently long and representative period of time.

For ease of reference, the two approaches assessed with regards to the estimation of indirect ETS costs are:

- Under the **Baseline Approach,** the indirect ETS costs are estimated based on CO_2 factors defined at regional level as set out in Annex IV of the 2012 ETS Guidelines comprises (Option B0) and based on historical output with reference year 2005-2011 (Option C0).

- Under the **Updated Approach**, the indirect ETS costs are estimated based on updated CO_2 factors defined at regional level (Option B1) and based on updated output data (Option C1).

6.2.3. Economic and social impact – carbon leakage

Under the Baseline approach, the regions would remain as defined in the 2012 ETS Guidelines and the baseline output would be assessed based on production data with reference years 2005-2011.

It follows from the analysis conducted that some geographic areas as defined in Annex IV of the 2012 ETS Guidelines show only a low level of price convergence, especially in comparison to the level of price convergence at the time the 2012 ETS Guidelines were adopted. This points to the direction that the geographic areas defined at the time are no longer relevant when approximating the indirect ETS costs passed on *via* the electricity price. As a consequence, the

indirect ETS costs actually faced by undertakings is not adequately calculated, which undermines the impact of the compensation on the risk of carbon leakage.

Regarding production data, the output used in the compensation formula would be determined by reference to the average production at a given installation over the reference period 2005-2011 ("baseline output"). Changes in production capacity (either upward or downward) between the reference period and the year of compensation would trigger a change in the baseline output used in the compensation formula, similar to the provisions laid out in the 2012 ETS Guidelines[75].

However, although some adjustments would be made with changes in capacity, these adjustments would not appropriately reflect changes in production for the past 10 years for the following reasons. First, reductions in capacity would not change the baseline output in proportion to these changes since a 70% reduction in capacity would only reduce the baseline output by 50%. Second, and more importantly, small but significant changes in production that would not trigger capacity changes would not be addressed with this option. Changes in capacity typically occur in the long-run but changes in output that do not trigger capacity adjustments are also of relevance to assess carbon leakage risk. This option is therefore not capable of properly addressing today's carbon leakage risk of the undertakings.

Under the Updated approach, the indirect ETS costs would be estimated based on differentiated regional CO_2 emission factors (calculated based on recent data on price convergence), and on actual output data.

Regarding output, the aid amount would be calculated taking into account the installation's actual production in year *n-1*, determined *ex post* in year n. Relying on the actual output would allow to capture the actual indirect ETS costs faced by an individual undertaking, when calculating the maximum aid amount. The option would thus best address the actual risk of carbon leakage due to indirect ETS costs.

Regarding the CO_2 factor, the relevant geographical zones will be reviewed to reflect the current reality in terms of electricity market integration in the EU, i.e. reflecting the development of market coupling and price convergence. As can be derived from the price convergence assessment carried out following the same methodology as used for 2012 Guidelines, only the following geographic areas demonstrate convergence of the hourly power prices during a significant number of hours per year based on the 2016-2018 data:

[75] Annex 1 of the 2012 ETS Guidelines provides that: "*If the installation did not operate for at least one year from 2005 to 2011, then the baseline output will be defined as yearly production until there are four years of operation on record, and afterwards it will be the average of the preceding three years of that period. If, over the aid granting period, production capacity at an installation is significantly extended within the meaning of these Guidelines, the baseline output can be increased in proportion to that capacity extension. If an installation reduces its production level in a given calendar year by 50 % to 75 % compared to the baseline output, the installation will only receive half of the aid amount corresponding to the baseline output. If an installation reduces its production level in a given calendar year by 75 % to 90 % compared to the baseline output, the installation will only receive 25 % of the aid amount corresponding to the baseline output. If an installation reduces its production level in a given calendar year by 90 % or more compared to the baseline output, the installation will receive no aid*".

Table 2: Level of power price convergence and CO_2 factor for the new geographic regions

Geographical area	**Level of price convergence (over 2016-2018)**	**CO_2 emission factor 2018 (**Gg CO_2/GWh)
Central-Western Europe (Germany + Luxembourg + Austria)	98.1% (2019 data) [76]	0.75
Central Eastern (Czechia + Slovakia)	84.8%	0.82
Iberia (Spain + Portugal)	93.9%	0.70
Baltics (Lithuania + Latvia + Estonia)	73.7%	0.88
Nordic (Sweden + Finland)	68.1%	0.61
Adriatic (Slovenia + Croatia)	98.1% (2019 data)[77]	0.70

For all remaining Member States and Norway, a national emission factor would thus apply. During the targeted consultation on the draft Guidelines this option attracted criticisms from some Member States (Belgium, Finland, France, Sweden) and Norway, and industrial stakeholders located in the former Central Western European region (mainly from Belgium and France) and in the former Nordic region (mainly from Norway), willing to keep the regions as currently designed[78]. It is however interesting to note that the Netherlands stressed the importance of ensuring the affordability of the compensation scheme in the light of the rising carbon price.

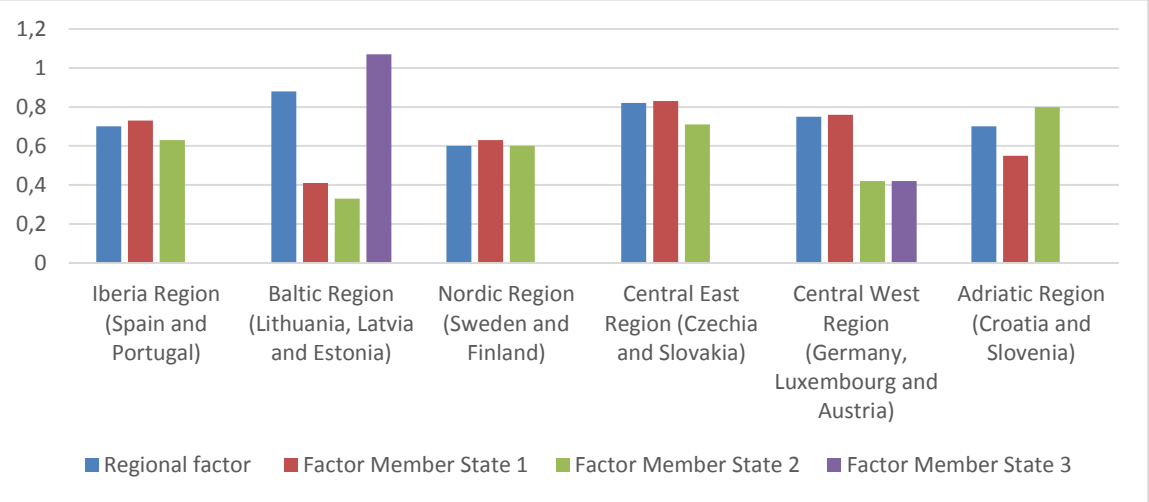
This approach takes due account of the cross-border effects described above. The criterion of price convergence between Member States in a significant number of hours serves as a proxy to determine the likelihood that the carbon content of the electricity mix in one Member State influences the indirect cost of the electricity consumed in the neighbouring Member State despite a lower national emission factor. In this sense, the reference to areas with a high level price convergence allows a more concise representation of the indirect ETS costs in the respective Member States. As shown by **Error! Reference source not found.**, this in particular is valid for the Member States forming the Baltic region, where the national emission factor between Latvia and Estonia vary significantly. Because of the high level of price convergence in 73.6% hours of the year it can be assumed that indirect ETS costs passed to electricity consumers in Latvia is higher than suggested by its national emission factor.

[76] Since Germany and Austria had a common bidding zone until October 2018, the price convergence for the new Central-Western Europe zone (Germany, Austria and Luxembourg) has been assessed based on 2019 data.

[77] Use of 2019 data since this region has witnessed a strong increase in price convergence recently (55.7% in 2018 vs 98.1% in 2019).

[78] The industrial stakeholders were mainly active in the following sectors: steel and metal industries, energy and power industries, aluminium, pulp and paper, vinyl, chemical industries.

Figure 12: Comparison regional emission factor to national emission factor



Source: Eurostat, Compass Lexecon calculations

Where the level of price convergence between neighbouring Member States is low, the assumption that the energy mix of one influences indirect carbon costs of the electricity consumed in the other does not appear to be justified. Against this background, Option B1 allows to target best the actual indirect emission costs deriving from electricity consumption in a given area; this option addresses best the risk of carbon leakage due to indirect ETS costs passed on via the electricity prices.

Indicatively, the following table gives an overview of the CO_2 emission factor for each Member State and Norway for 2018, which is the most recent year for which certified Eurostat data on emissions and gross electricity generation is available. The Annex of the Guidelines will be updated to reflect 2019 data once these will be available.

Table 3: CO_2 factors based on 2018 data

Zones	**Countries**	**2018 CO_2 factors**
Iberia	Spain, Portugal	0.70
Baltic	Lithuania, Latvia, Estonia	0.88
Nordic	Sweden, Finland	0.61
Central-Eastern Europe	Czechia, Slovakia	0.82
Central-Western Europe	Germany, Luxembourg, Austria	0.75
Adriatic Zone	Croatia, Slovenia	0.70
Belgium		0.37
Bulgaria		0.99
Denmark		0.62
Ireland		0.50
Greece		0.75

France		0.51
Italy		0.49
Cyprus		0.71
Hungary		0.63
Malta		0.40
Netherlands		0.50
Poland		0.81
Romania		0.87
Norway		*0.74*

In the replies to the targeted consultation on the draft Guidelines, the proposal for a mid-term update of the CO_2 factors in 2025 received a large support from all types of stakeholders. In additions, some Member States (such as Spain and the Netherlands), some environmental NGOs (ClientEarth, E3G, Carbon market watch) would favour an annual update of the CO_2 factors. The mid-term update of the CO_2 factors after five years allows for flexibility to adapt for future changes, such as for example the policy choices made by Member States in relation to their energy mix, or improved interconnections between some countries. The update after five years also offers the advantage of providing Member States with stability, allowing them to better forecast their future compensation budget – compared to a situation with yearly update of the CO_2 factors.

6.2.4. Economic and social impact – competition distortions

Under the Baseline approach, the regional factors as defined in the 2012 ETS Guidelines and output data based on past production do not adequately reflect the indirect ETS costs currently faced by undertakings, and therefore also entail the risk of not adequately calculating the necessary amount of compensation. It thus leads to a risk of intra-sector compensation distortions due to potential over- or under-compensation of undertakings and, in case of overcompensation, strong competition distortions would occur.

The updated approach, by allowing for the most accurate calculation of the indirect ETS costs passed on *via* the electricity consumption in a given area and by taking into account actual output data, limits the risk of intra-sector competition distortions to the minimum possible. In contrast and as explained in section 5.3.2, other emission factors - either EU-wide or national ones, would contribute to such a risk as they less adequately reflect the actual carbon costs passed on *via* the electricity prices. Similarly, historical output value would increase the risk of competition distortion by not estimating properly indirect ETS costs, as explained in section 5.3.3. Inappropriate indicators would thus create the risk of overcompensation and under-compensation depending on in which Member State with a high level of price convergence with a neighbouring Member State an undertaking is active, or depending on recent evolution of an undertaking's output. Also, under the Updated approach, new entrants are not disadvantaged vis-à-vis incumbents as they would also receive State aid in proportion to their actual output.

6.2.5. Environmental impact

Under the Baseline approach, even if the regions as defined in 2012 were to be still relevant, the emission factors allocated to them by the 2012 ETS Guidelines would no longer reflect the current carbon content of the electricity consumed in the respective regions. The 2012 factors would overestimate the carbon content of the electricity consumed in the region and thus lead to a relatively high indirect cost compensation contributing to the risk of overcompensation. Such overcompensation would in particular entail the risk of taking away the incentives for further reduction of electricity consumption and energy efficiency improvements. That would contribute to reduce of indirect ETS emissions, which are also correlated to reductions of other air pollutants.

Also, as the compensation envisaged is not linked to actual production, the Baseline approach does not affect the marginal costs of production of undertakings and therefore fully maintains the incentives for energy-efficiency embedded in the indirect ETS costs[79]. However, since this option does not properly address carbon leakage risks, it does not address the risk of a shift of CO_2 to less carbon-restricted areas outside the EU and therefore a global increase in CO_2 emissions.

The Updated approach, by allowing for the best approximation of the indirect carbon costs passed on *via* the electricity prices in a given area, targets best the risk of carbon leakage due to indirect ETS costs. Similarly, when relying on the actual output, any increase of the production and thus an increase of electricity consumption would go hand in hand with a higher maximum aid amount.

The impact assessment of the 2012 ETS Guidelines stated that such option would risk undoing the price signals and incentives from the ETS to become more efficient in terms of electricity consumption. However, as compensation of indirect ETS costs is only a partial compensation, it results that an increase of production leading to an increase of electricity consumption will always result into increased electricity costs for the undertaking.

Therefore, relying on updated CO_2 factors and on the actual output to determine the aid amount maintains partly the incentive for energy efficiency embedded in indirect ETS costs, while limiting the risk of a shift of CO_2 emissions to outside the EU.

6.2.6. Impact on SMEs

The options related to the CO_2 factors and to the output cover all undertakings including SMEs, and are therefore neutral, in the sense that none of them would create a specific treatment for SMEs. As these options are related to proportionality, the only specific risk to SMEs is that the

[79] These incentives relate to the price of ETS certificates indirectly passed-on through the electricity price. An important feature of the ETS mechanism is to expose undertaking to the costs of emitting CO_2 so they are incentivised to become more energy-efficient, since companies facing higher carbon costs (directly or indirectly) will strive to reduce their consumption.

level of compensation might not be sufficient compared to the administrative costs incurred (see section 6.1.5 above).

6.3. Impacts of the packages reflecting the Maximum aid amount

6.3.1. Methodology

In order to assess the impact of the various options on both the aid intensity and degressivity of the aid, the analysis looks at how the risk of carbon leakage of individual sectors would be impacted. In this respect, the Commission was supported by the assessment of Roques and Laroche (see Table 4 in Appendix 4) and by the results of the consultation activities.

In the 2012 ETS State aid Guidelines, the maximum aid amount was set at 85% at the beginning of the third trading period with a degressive trend over this period. The idea behind an aid intensity set below 100% is to provide a continued incentive to energy users to increase their energy efficiency going beyond the product benchmark.

This degressivity foreseen by the 2012 ETS Guidelines was also a way to capture expected energy efficiency improvements over time. It can be justified by the fact that the efficiency benchmarks calculated at the beginning of the trading period, which ensure that each beneficiary is only compensated for the consumption of its most efficient peer, were not updated throughout the third trading period. Consequently, in the absence of degressivity, any efficiency gains made by the operators would have remained with them and could have given rise to overcompensation.

The potential for such efficiency improvements going forward is determined by the sectors' so-called abatement potential.

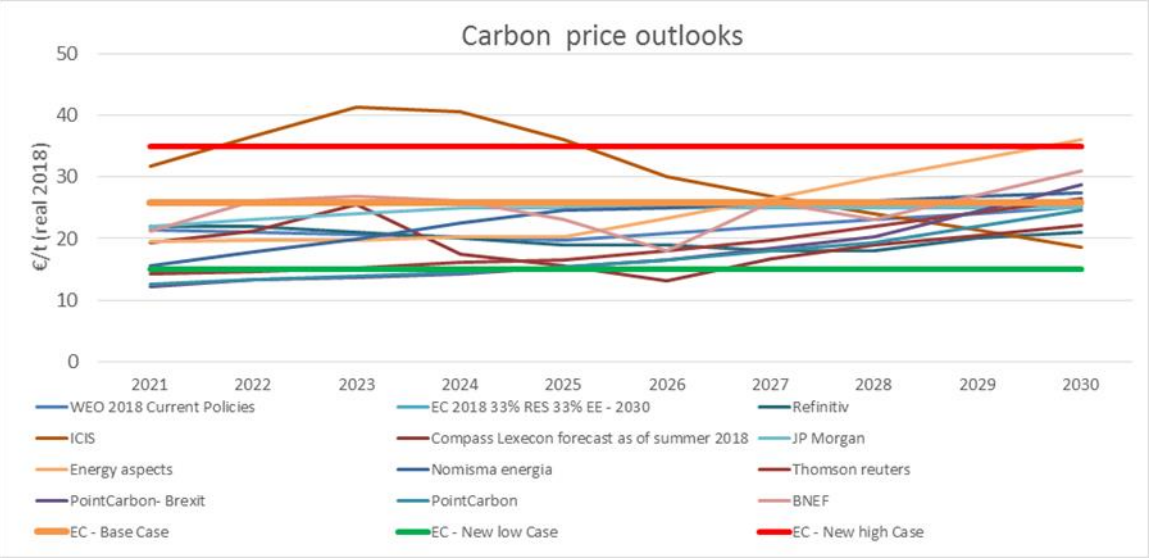
The assessment takes into account the three criteria already used for the purpose of the sector assessment, i.e. market characteristics, profit margins and abatement potential. Accordingly, Roques and Laroche assessed the impact of the level of compensation on each of the criteria and then determined a sector's risk of carbon leakage after compensation at the respective aid intensity level. The assessment aims at determining the minimum level of compensation required to bring the risk to the lowest level. It is made under the assumption that the energy efficiency benchmarks are updated at the start of the fourth trading period.

The analysis took into account the fact that the level of the carbon price created by the EU ETS is a key variable of the risk of carbon leakage due to indirect ETS costs (see section 2.2 above). The impact assessment for the 2012 ETS Guidelines[80] was based on a sensitivity analysis, such as various scenarios regarding future carbon price evolution. Three scenarios have been established (Low, Baseline and High scenarios, respectively at 15, 25, and 35 EUR/t CO_2), also applied to

[80] In the impact assessment for the 2012 ETS Guidelines, the primary price assumption was EUR 30/tCO_2. Additional sensitivity tests used CO_2 prices which are both lower (€10 and €20) and higher (€40). Reference : Impact Assessment Report Accompanying the document Guidelines on certain State aid measures in the context of Greenhouse Gas Emission Allowance Trading Scheme C(2012) 3230 final SWD(2012) 131 final

the research by Roques and Laroche (see Table 5 in Appendix 4, showing the impact under a high price scenario). Those scenarios allow the assessment to factor in the need for the guidelines to adapt to future changes in terms of carbon price evolutions. However, those scenarios can be sufficiently reliable only if based on projections and expectations under the current regulatory framework. They cannot yet capture possible changes deriving from future regulatory changes[81].

Figure 13: Benchmarks of carbon price projections based on market forecasts



Note: *The benchmark was performed in April 2019.*
Source: *Compass Lexecon research based on EC, AIE, Energy aspects, Thomson Reuters, Point Carbon, ICIS, JP Morgan, Nomisma energia, BNEF*

According to that sensitivity analysis, the risk rating under a high carbon price scenario changes the rating only for four sectors: *24.42 Aluminium production* (from Medium-high to High), *20.11 Manufacture of industrial gases* (from Low-medium to Medium), *17.12 Manufacture of paper and paperboard* (from Medium to Medium-high) and *23.11 Manufacture of flat glass* (from Low to Low-medium). Table 5 in Appendix 4 illustrates the impact of the various options on the sectors' exposure to the risk of carbon leakage due to indirect ETS costs.

This table shows a large disparity of carbon leakage risk among sectors. Therefore, even if only 10% of the respondents to the public consultation replied that the aid intensity should vary depending on specificities of the beneficiaries, the Commission has analysed the impact of introducing an additional compensation for the sectors bearing a larger part of indirect ETS costs, with respect to their Gross Value Added (GVA). The study of carbon leakage risk has therefore been complemented with an analysis of the proportion of indirect ETS costs of the GVA, for each sector. This analysis has also been performed under CO_2 price scenarios at 25€/tCO_2 and 35 €/tCO_2.

[81] The revised ETS Guidelines will enter into force for the beginning of the fourth ETS Trading period, and therefore before the regulatory reforms foreseen by the Green Deal (see also sections 2.4. and 4.1. above).

The idea behind the GVA-cap is that some sectors might face very high indirect ETS costs, even after receiving the compensation amount. The GVA-cap would introduce an additional compensation – up to a certain level of the GVA – only for these specific sectors with a high proportion of indirect ETS costs. This corresponds to Option D3.

Figure 14: Indirect carbon costs as a share of GVA borne after a 75% compensation with carbon price at 25€/t CO_2

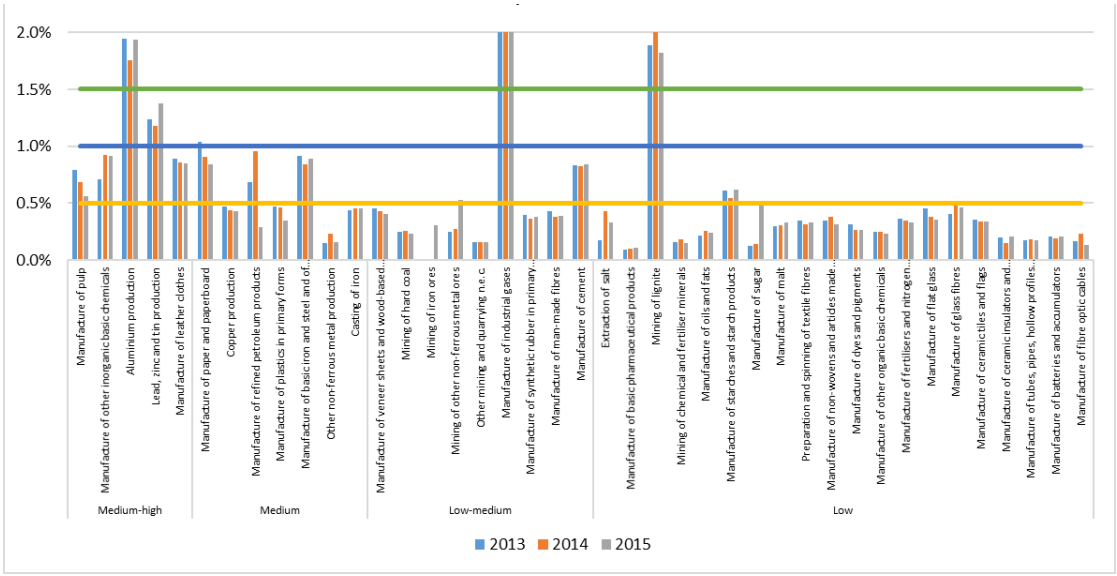
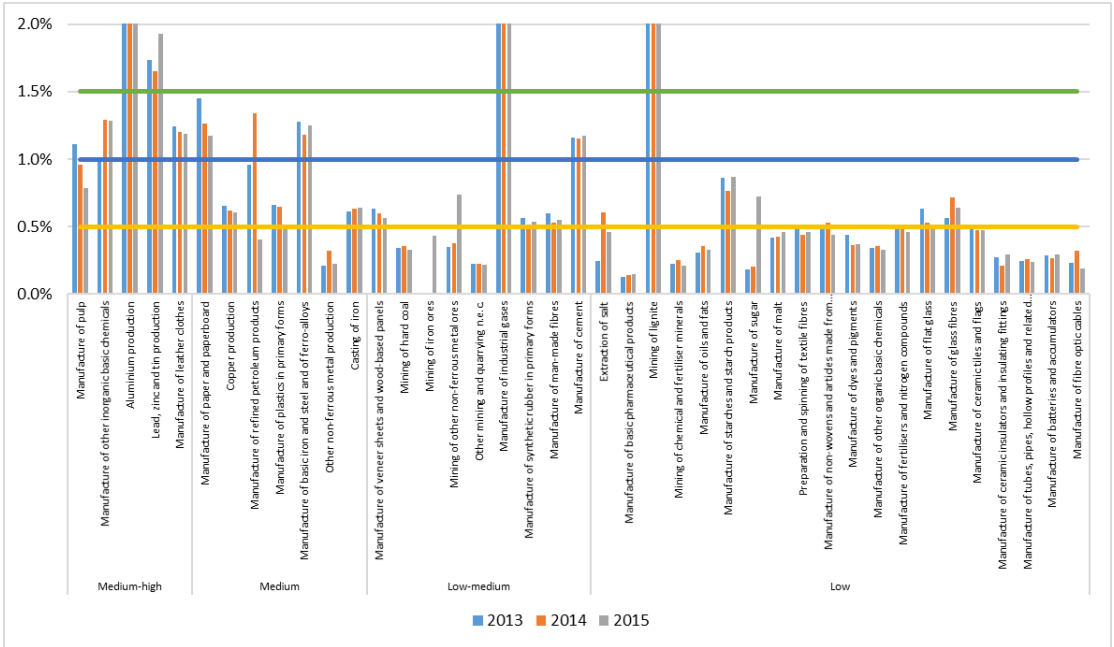


Figure 15: Indirect carbon costs as a share of GVA borne after a 75% compensation with carbon price at 35€/t CO_2



As illustrated in the two graphs above, setting the cap at 1.5% restricts this compensation possibility only to companies facing significant indirect ETS costs with respect to their GVA.

Regarding degressivity, Roques and Laroche also carried out an analysis of the abatement potential for each sector. Out of the 41 sectors, only 2 sectors (*24.42 Aluminium production and 13.95 Manufacture of non-wovens and articles made from non-wovens, except apparel*) present clear evidence for the existence of an abatement potential, while for 8 sectors *(20.11 Manufacture of industrial gases; 20.13 Manufacture of other inorganic basic chemicals; 24.43 Lead, zinc and tin production; 17.11 Manufacture of pulp; 17.12 Manufacture of paper and paperboard; 20.17 Manufacture of synthetic rubber in primary forms; 24.44 Copper production;* and *23.51 Manufacture of cement)* elements indicating a limited ability for further energy efficiency improvements were found. However, no conclusion could be made on the abatement potential of the remaining 32 sectors[82].

Finally, the Commission asked specific questions on the aid intensity both in the public consultation and in the targeted consultation to sectors. On that basis, the Commission tested Option D3 and Option E1 in the targeted consultation on draft Guidelines – which form together the Flexible package.

While many industrial stakeholders welcomed the update of efficiency benchmarks at Mid-term, some of them expressed their opposition to the linear reduction in the meantime. However, the update of efficiency benchmarks is a heavy and time-consuming exercise, and it would not be realistic to update these benchmarks on an annual basis. The closest approximation to the real evolution of these benchmarks is therefore the extrapolation based on recent past evolution, as introduced by the revised Guidelines.

6.3.2. Economic and social impact – carbon leakage

Under **the Baseline approach**, the aid intensity remains stable at a level of 75%. The budget spent with this level of stable aid intensity would be estimated at 1.454 Billion EUR, under the assumption of a carbon price at 25 EUR and that all other parameters are set at the baseline (for more details, see also Appendix 7: Quantification of options).

All sectors deemed at medium-high, medium and low-medium risk will see their risk reduced to the lowest level (see Table 4 in Appendix 4). Even as regards the only sector, *20.11 Manufacture of industrial gases*, whose risk rating would increase from low-medium to medium in a high carbon price scenario (see Table 5 in Appendix 4), would, in such scenario, see its risk reduced to the lowest level at an aid intensity of 75%. However, three sectors would, even after a compensation level at 75%, bear indirect ETS costs representing a significant amount of their GVA over the period 2013-2015: *24.42 Aluminium production*, *20.11 Manufacture of industrial gases* and *05.20 Mining of lignite*, with Aluminium production being the only sector identified with at least a Medium risk of carbon leakage due to indirect ETS costs[83].

Under a high carbon price scenario, four sectors would continue to bear a large share of indirect ETS costs of their GVA: *24.42 Aluminium production, Lead, 24.43 zinc and tin production, 20.11 Manufacture of industrial gases and 05.20 Mining of lignite.* In particular, *24.42*

[82] See Appendix 3: Assessment of carbon leakage risk for each sector.
[83] See footnote 32 above – page 44.

Aluminium production and *24.43 lead, zinc and tin production* have a very high ICLI above 0.5, and have been identified by the consultation with a Medium-high risk of carbon leakage due to indirect ETS costs. Under a high carbon price scenario, Aluminium production would also reach a high risk. The four sectors mentioned above employ 144.000 people in the EU and generate an annual GVA about EUR 16 Billion.

With regards to the stable aid intensity, any efficiency gains made throughout the trading period would not be reflected in the compensation amounts. To the extent that beneficiaries will become more energy efficient during Phase IV, this option would *de facto* result in an increase of the aid intensity over time and therefore further reduce the risk of carbon leakage. As stated above, only 2 sectors[84] present clear evidence of abatement potential, although this can also not be excluded for a range of other sectors.

The targeted consultation on draft Guidelines received a rather mixed feedback on aid intensity. A majority of Member States agrees that the aid intensity at 75% and stable is adequate (Czechia, Germany, Greece, Poland and Spain), however some of them would only agree if the Guidelines allow capping the indirect ETS costs of single undertakings particularly affected[85]. Around 90% of respondents to the public consultation argued that the aid intensity should not be degressive in the fourth trading period. As already noted, however, in that consultation the views of industrial stakeholders are overrepresented.

Under **the Minimalist approach** the aid intensity would be set below 75% and degressivity of the aid would be applied over the years. The budget spent with a level of aid intensity set at 65% would be estimated at 1.260 Billion EUR, under the assumption of a carbon price at 25 EUR and that all other parameters are set at the baseline (for more details, see also Appendix 7: Quantification of options).

Under this approach, all sectors considered at medium-high, medium and low-medium risk would see their risk reduced (see Table 4 in Appendix 4). However this reduction of the risk exposure would play in different degrees: four sectors (*24.43 Lead, zinc, tin production; 17.11 Manufacture of pulp; 17.12 Manufacture of paper and paperboard; and 24.44 Copper production)* see, in the first year, their risk partially reduced to low-medium, and one sector (*24.42 Aluminium production)* sees its risk reduced to medium. An aid intensity set below 75% does not reduce the risk of carbon leakage to a low level for all sectors, since six sectors would still face a low-medium risk of carbon leakage after compensation: *24.42 Aluminium production, 24.43 Lead, zinc and tin production, 24.44 copper production, 14.11 Manufacture of leather* clothes, *17.11 Manufacture of pulp* and *17.12 Manufacture of paper and paperboard.*

This could become even more problematic in subsequent years: carbon leakage risk would not be minimalised in case the aid would decrease at a faster pace than the actual efficiency of undertakings. In fact, under this option the degressivity rate would become a proxy for expected efficiency gains. This proxy can however either over- or underestimate the actual gains, since the abatement potential and thus the potential for further improvement of electricity consumption

[84] *24.42 Aluminium production* and *13.95 Manufacture of non-wovens and articles made from non-wovens, except apparel.*

[85] At 0.5% of their GVA (Greece and Poland) or 1.5% of their GVA (Germany)

efficiency varies between the different sectors. As stated above, out of the 41 analysed sectors, only 2 sectors[86] present clear evidence that could plead for a degressivity principle, meaning that there is a clear abatement potential for these sectors. For seven sectors[87] the analysis concluded that they have no further abatement potential. Consequently, applying a degressivity rate to the aid intensity would translate into applying the same degressivity rate to all sectors. That would not necessarily amount to an adequate consideration of the sector's abatement potential, i.e. a general degressivity principle would not reflect the sector's actual abatement potential. For the sectors with no abatement potential, applying a general degressivity could result in a *de facto* reduction of the aid intensity below the aid intensity level needed to shield the sector from a medium or medium-high risk of carbon leakage.

In the public consultation, less than 5% of the respondents considered an aid intensity below 75% sufficient to address the risk of carbon leakage due to indirect ETS costs, which is explained by the very large participation of industrial stakeholders to that consultation. In reply to the targeted consultation on the draft Guidelines, only some Member States considered 75% excessive (the Netherland and Finland) and that it should be phased out in 2030 (Denmark and Sweden) or reduced in 2025 (Latvia).

The Maximalist approach would set a stable aid intensity at a level above 75%. The budget spent with a level of aid intensity set at 85% would be estimated at 1.648 Billion EUR, under the assumption of a carbon price at 25 EUR and that all other parameters are set at the baseline (for more details, see also Appendix 7: Quantification of options).

Under the Maximalist approach, all sectors would see their risk reduced to the lowest level (see Table 4 in Appendix 4). Also, the stable aid intensity could lead to overcompensation because any realised efficiency gains would not be reflected in the compensation amounts, therefore further reducing the risk of carbon leakage.

In the public consultation, more than 60% of respondents argued that an aid intensity higher than 75% would be necessary to address the risk of carbon leakage due to indirect ETS costs. However, in that consultation the views of industrial stakeholders are proportionally overrepresented. This result was confirmed in the targeted consultation on the draft Guidelines, where the majority of industrial stakeholders, including business associations and single companies, considered that the aid intensity should be higher than 75%[88], and in particular set at 85%[89], or even 100%[90]. As stated above, around 90% of respondents to the public consultation argued that the aid intensity should not be degressive in the fourth trading period.

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[86] *24.42 Aluminium production* and *13.95 Manufacture of non-wovens and articles made from non-wovens, except apparel.*

[87] *20.11 Manufacture of industrial gases, 20.13 Manufacture of other inorganic basic chemicals, 24.43 Lead, zinc and tin production, 17.11 Manufacture of pulp, 17.12 Manufacture of paper and paperboard, 20.17 Manufacture of synthetic rubber in primary forms, 24.44 copper production and 23.51 Manufacture of cement.*

[88] CEFIC, Hellenic Union of Industrial Consumers of Energy, Federation of Greek textile Industrialists.

[89] BusinessEurope, CIA – UK Chemical Industries Association, OEB Cyprus Employers and Industrialists Federation.

[90] EuroChambers, Austrian Chamber of Commerce, Federation of Austrian Industry, German Steel Federation, Czech Chamber of Commerce, Eurofer, Euromines, Euro Chlor, Finnish Steel and Metal

Under **the Flexible approach**, the effectiveness of the compensation mechanism would be improved by further reducing the carbon leakage risk for those sectors that face a high share of indirect carbon costs over their GVA after compensation. This possibility is already foreseen under section 3.7.2. of the Energy and Environmental Aid Guidelines (EEAG), where Member States can reduce charges to finance renewable schemes for sectors with an electro-intensity of at least 20%. The budget spent with a level of aid intensity set at 75% and with a GVA cap would be estimated at 1.474 Billion EUR, under the assumption of a carbon price at 25 EUR and that all other parameters are set at the baseline (for more details, see also Appendix 7: Quantification of options).

The effectiveness of the compensation would be further improved by introducing a mid-term update of efficiency benchmarks. This option has the advantage that it modulates variations of aid intensity to efficiency gains. In sectors where such efficiency gain genuinely arise, they would be reflected in an update of the benchmarks, otherwise the aid intensity would remain stable. This option reflects the fact that future efficiency gains over the next ten years are difficult to predict, but keeping an aid intensity constant at an adequate level in 2021 does not guarantee that this aid intensity will still be appropriate in 2029. Therefore, the update of the efficiency benchmarks at mid-term allows for a better reflection of potential efficiency gains for each sectors.

In reply to the targeted consultation on the draft Guidelines, some Member States considered that an aid intensity at 75% would adequately address the risk of carbon leakage due to indirect ETS costs only if the Guidelines would also allow capping the indirect ETS costs of single undertakings particularly affected at 0.5% of their GVA (Greece and Poland) or 1.5% of their GVA (Germany). Only two environmental NGOs mentioned in their reply that a GVA cap should be set at 1.5%. Some industrial stakeholders clarified that an aid intensity set at 75% would be adequate to minimise the risk of carbon leakage as long as the GVA cap is set at 0.5% (e.g. European Aluminium, Eurometaux, International Zinc Association, Glass Fibre Europe).

Also more than 40% of the respondents to the public consultation ask for the aid intensities to remain stable over the entire trading period, but ask for the electricity consumption efficiency benchmarks to be updated more frequently. In addition, more than 60% of the respondents argued that the efficiency benchmarks should be revised once in 2025, showing that large part of industrial stakeholders would consider it adequate. Some environmental NGOs suggested to update the benchmarks on an annual basis, but that solution would create a high administrative burden for both the Commission and the eligible sectors, in terms of data collection and analysis. An annual revision would also be a costly exercise. Instead, the methodology for updating the electricity consumption efficiency benchmarks under this option would be aligned with the methodology used to establish the efficiency benchmark specified in Article 10a (2) of the EU ETS Directive. Under this methodology, the Commission would extrapolate an annual reduction rate for each benchmark based on past efficiency improvements.

The GVA cap would be particularly relevant for sectors with a significant risk of carbon leakage under a high carbon price scenario (see Figure 15 above), as it is not correlated with carbon

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Producers, Fertilizers Europe, Polish Cement Association, Slovakian National Union of employers, Confederation of Lithuanian industrialists, as well as several companies.

prices and therefore provides a more reliable shield against higher level of carbon prices, i.e. in particular *24.42 Aluminium production*[91] and *24.43 Lead, zinc, tin production*. It would therefore strengthen the protection against the risk of carbon leakage for the sectors most at risk. In fact, the Aluminium sector is the only one that would reach a high risk of carbon leakage under a high carbon price scenario (see Table 5 in Appendix 4).

As illustrated in by Figure 14 and Figure 15 above, setting the cap at 1.5% ensures that the compensation is limited to the necessary minimum, meaning that the aid intensity of 75% remains the compensation by default for most EU undertakings. Setting a GVA cap at a lower level than 1.5% would increase significantly the overall compensation paid to many companies, leading to most sectors receiving more aid than what is needed to cover the risk of carbon leakage. In fact, an aid intensity at 75% is deemed sufficient to reduce the overall risk of carbon leakage to a low level for most sectors (see Table 4 in Appendix 4).

6.3.3. Economic and social impact – competition distortions:

Under **the Baseline approach**, a stable and partial aid intensity at the level of 75% would reduce the risk of intra-sector and inter-sector competition distortions compared to a scenario of full compensation. Moreover, the sector risk assessment under several carbon price scenario concludes that a compensation at 75% is enough to obtain a low risk of carbon leakage due to indirect emission costs. The stable aid intensity however contributes to the risk of competitions distortions to the extent that efficiency gains of specific sectors would lead to a *de facto* increasing compensation amount. However, such scenario appears only to be very likely for two sectors for which a clear abatement potential could be identified[92].

Under the **Maximalist approach**, the higher aid intensity would increase the risk of competition distortions. Indeed, compared to the baseline approach, the higher aid intensity does not contribute to a further reduction of the level of carbon leakage risk. It thus entails the risk of overcompensating sectors, which can distort inter sector competition with sectors producing substitutable products. Moreover, the higher aid intensity intensifies intra-sector competition distortions between Member States that implement indirect cost compensation and Member States that do not. Also, the stable aid intensity contributes to the risk of competitions distortions to the extent that it would not reflect potential efficiency gains of specific sectors, leading to a *de facto* increasing compensation amount. However, as stated above, such scenario appears only to be very likely for two sectors for which a clear abatement potential could be identified[93].

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[91] From Roques and Laroche: annex on *24.42 Aluminium production*: "(…) *We see that under a high scenario, the carbon price will have high impact on the profit margins which will change the rating of the profit margins category to high*".

[92] *24.42 Aluminium production* and *13.95 Manufacture of non-wovens and articles made from non-wovens, except apparel.*

[93] *24.42 Aluminium production* and *13.95 Manufacture of non-wovens and articles made from non-wovens, except apparel.*

Under the **Minimalist approach**, an aid intensity below 75% would further reduce the risk of competition distortions compared to options with a higher aid intensity, both from intra-sector and inter-sector point of view. However, the application of general degressivity to all sectors, regardless of whether they have an abatement potential or not, would increase the risk of inter-sector competition distortions. For sectors with no or only a low abatement potential, a general degressivity would lead to faster *de facto* decrease of the aid intensity more than for sectors where the degressivity captures the actual efficiencies gains deriving from the sector's abatement potential. A generalized degressivity has therefore disproportionate effects between sectors depending on their respective abatement potential.

Under the Flexible approach, compensation would continue to be partial and therefore would continue to reduce the risk of competition distortions compared to a higher aid intensity or a full compensation scenario. The undertaking specific approach of the GVA cap ensures that this option does not lead to overcompensation. Setting a GVA cap at a lower level than 1.5% would increase significantly the overall compensation paid to many sectors, leading to many sectors receiving more aid than what is needed to cover the risk of carbon leakage. In fact, an aid intensity at 75% is deemed sufficient to reduce the overall risk of carbon leakage to a low level for most of the sectors (see Table 4 in Appendix 4). In addition, the flexible approach is designed as not discriminatory, as it would be open to all undertakings where the exposure to indirect ETS costs remains significant after compensation at the level of 75%.

In contrast to the baseline approach, the Flexible approach would ensure that energy efficiency gains materialized by sectors with a certain abatement potential would be correctly captured, thereby not leading to a *de facto* overcompensation. The update of the electricity consumption efficiency benchmarks ensures that these sectors continue to face the same share of indirect ETS costs as other sectors. This approach therefore presents a lower risk of competition distortions than the Baseline approach or the maximalist approach.

6.3.4. Environmental impact

By reducing the risk of carbon leakage of all sectors deemed at medium-high, medium and low-medium risk to the lowest level, **the Baseline approach** adequately addresses the risk of a shift CO_2 emissions to less carbon-restricted areas outside of the EU. However, as already analysed in 6.3.2, this option could entail a high risk of carbon leakage due to indirect ETS costs in a high carbon prices scenario for *24.42 Aluminium production* and *24.43 Lead, zinc, tin production*. At the same time, as this option does not grant a full compensation, eligible undertakings are still faced with 25% of the indirect ETS costs, which serves as an incentive to further reduce the electricity consumption and become more energy efficient. That would contribute to reduce of indirect ETS emissions, which are also correlated to reductions of other air pollutants.

The compensation under this approach would cover 58 Million tons CO_2 annually (or 3.2% of annual emissions covered by EU ETS), assuming that all other options are set at the baseline (for more details, see Appendix 7: Quantification of options). This would represent 5.5% of annual emissions from the European power generation sector.

Also, a stable aid intensity reduces the risk of carbon leakage compared to a degressive evolution of the aid intensity. A stable aid intensity therefore protects against a shift of CO_2 emissions to less carbon-restricted areas outside of the EU. At the same time, a stable aid intensity in theory maintains the incentives for undertakings to become more efficient as regards their electricity consumption, as this is the only way to further reduce their exposure to indirect ETS costs. That would contribute to reduce of indirect ETS emissions, which are also correlated to reductions of other air pollutants. However, such incentives can only materialize where the sector has an abatement potential.

Under the Maximalist approach, an aid intensity set at a level above 75% would equally limit the risk of carbon leakage and therefore protects against a shift of CO_2 emissions to less carbon-restricted areas outside of the EU. Also**,** a stable aid intensity reduces the risk of carbon leakage compared to a degressive evolution of the aid intensity, thereby protecting against a shift of CO_2 emissions to less carbon-restricted areas outside of the EU. However, as the higher aid intensity does not contribute to a further reduction of the carbon leakage risk compared to an aid intensity of 75%, this package entails the risk of overcompensation. Such overcompensation risks to eliminate the incentives for reducing electricity consumption and becoming more energy-efficient.

The compensation with an aid intensity set at 85% would cover 66 Million tons CO_2 annually (or 3.6% of annual emissions covered by EU ETS), assuming that all other options are set at the baseline (for more details, see Appendix 7: Quantification of options). This would represent 6.2% of annual emissions from the European power generation sector.

Under the Minimalist approach, an aid intensity below 75% would reduce the risk of carbon leakage due to indirect ETS costs for all sectors. However, this option reduces the risk to the lowest level only for seven sectors deemed at medium and medium-high risk. For the remaining six sectors (*24.42 Aluminium production; 24.43 Lead, zinc, tin production; 17.11 Manufacture of pulp; 17.12 Manufacture of paper and paperboard; 14.11 Manufacture of leather clothes, and 24.44 Copper production*, the risk of carbon leakage would remain at a low-medium level. Therefore, a low aid intensity and a general degressivity of the aid risk not entirely addressing the risk of shifting CO_2 emission to less carbon-restricted areas outside of the EU. At the same time, however, due to the lower aid intensity and its degressive evolution, eligible undertakings would be faced with an even higher share of the indirect ETS costs, which would create additional incentives to further reduce the electricity consumption and becoming more energy-efficient. In reply to the targeted consultation on the draft Guidelines, only two Member States and environmental NGOs considered that the aid intensity should be degressive to be phased out in 2030 (Denmark and Sweden).

The compensation with an aid intensity set at 65% would cover 50 Million tons CO_2 annually (or 2.7% of annual emissions covered by EU ETS), assuming that all other options are set at the baseline (for more details, see Appendix 7: Quantification of options). This would represent 4.7% of annual emissions from the European power generation sector.

The Flexible approach would in a targeted way reduce the risk of carbon leakage to the lowest level, while ensuring that the most electro-intensive undertakings' exposure to indirect ETS costs after compensation remains limited in relation to their GVA. Therefore, this package ensures the

highest level of protection of a shift of CO_2 emissions to less carbon-restricted areas outside of the EU. Moreover, by maintaining a stable compensation level of 75%, this package preserves incentives for further reduction of electricity consumption and energy efficiency improvements since electricity consumption efficiency benchmarks will be updated at Mid-term and since compensation remains partial which provides a continued incentive to increase energy efficiency beyond the product benchmark. Also, to the extent that the GVA is activated in relation to the most electro-intensive undertakings, the cap ensures a continuous, but reasonable exposure to indirect ETS costs, which as such maintains also for these electro-intensive undertakings an incentive for a reduction of electricity consumption and energy-efficiency improvements.

The compensation with an aid intensity set at 75% and a GVA cap would cover 59 Million tons CO_2 annually (or 3.2% of annual emissions covered by EU ETS), assuming that all other options are set at the baseline (for more details, see Appendix 7: Quantification of options). This would represent 5.5% of annual emissions from the European power generation sector.

6.3.5. Impact on SMEs

The set of options related to the aid intensity and degressivity is neutral, in the sense that none of the options assessed would have a specific impact on SMEs. As explained above in section 6.1.5, the only specific risk to SMEs is that the level of compensation might not be sufficient compared to the administrative costs incurred.

6.4 Impacts of the options regarding conditionality

The options on conditionality look into the question whether the aid granted under the ETS Guidelines should be linked more strongly to the beneficiaries' performance as regards energy efficiency. The 2012 ETS Guidelines do not establish such conditionality.

The Energy Efficiency Directive (EED) established in 2012 a common framework of measures across Member States to ensure the achievement of the EU's 20% headline target on energy efficiency by 2020, and to pave the way for further energy efficiency improvements beyond this date. The EED covers a large variety of approaches and measures to achieve these aims. In particular, in its Article 8, it addresses the requirements and promotion of energy audits and energy management systems. This Article requires Member States to promote and ensure the use of high quality, cost-effective energy audits and energy management systems to all final customers. More specifically, Article 8 from the EED requires large enterprises to be subject to an energy audit by 5 December 2015 and at least every four years thereafter, while SMEs should be encouraged to undertake energy audits and implement the resulting recommendations. The EED has been updated in 2018 in the context of the Clean Energy for all Europeans Package (EU 2018), which has set the new EU level binding target for the share of renewable energy of at least 32% and the EU level headline target for energy efficiency of 32.5%.

The evaluation of the 2012 ETS Guidelines show that some Member States (Belgium, the Netherlands and Poland) oblige beneficiaries of aid to sign up to energy-efficiency audits or

energy management systems as a condition for receiving aid. In these cases, the obligation to participate in such programs in principle also extends to companies for which such participation is not already mandatory under the EED[94], in particular SMEs.[95] Two Member States (Belgium and the Netherlands) even go further by requiring a commitment from beneficiaries to not only participate in energy efficiency multiannual agreements but to also implement the recommendations for further improvements which they receive in this context. However, one of those Member States indicated that the cost of the energy audit was partly subsidised.

6.4.1 Methodology

The EED covers a large variety of approaches and measures to achieve its aims. In particular, in its Article 8, it addresses the requirements and promotion of energy audits and energy management systems. This Article requires Member States to promote and ensure the use of high quality, cost-effective energy audits and energy management systems to all final customers. More specifically, Article 8 from the EED requires large enterprises to be subject to an energy audit by 5 December 2015 and at least every four years thereafter, while SMEs should be encouraged to undertake energy audits and implement the resulting recommendations, but are not obliged to do so.

Contrary to Options F0 and F1, Options F2 and F3 would go beyond what is required by the Energy Efficiency Directive. Under Option F2, compensation for SMEs would be conditional to conducting energy audits. For large undertakings, compensation under both Options F2 and F3 would be conditional to making one of these three alternative investments, with different degrees of ambition:

- Implement recommendations of the audit report, under certain conditions
- Reduce the carbon footprint of their electricity consumption,
- Invest a share of the aid amount in projects that lead to substantial reductions of the installation's greenhouse gas emissions and well below the applicable benchmark used for free allocation in the EU ETS

Option F2 was tested in the public consultation on the draft Guidelines, to gather feedback from all possible stakeholders. Following the feedback received from all types of stakeholders on the possible impacts of the various requirements, Option F3 was developed to better calibrate the conditionality requirements. The feedback from stakeholders is described in detail in the sections below.

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[94] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p.1).

[95] Cf. Article 8 (4) of the Energy Efficiency Directive: *"Member States shall ensure that enterprises that are not SMEs are subject to an energy audit carried out in an independent and cost-effective manner by qualified and/or accredited experts or implemented and supervised by independent authorities under national legislation by 5 December 2015 and at least every four years from the date of the previous energy audit."*.

In addition, the options related to conditionality will be assessed also by focusing on the impact for SMEs, since there is a risk that the compensation amount might be lower than the costs to comply with the conditions to get this compensation.

The table below summarises the options assessed with regards to conditionality.

F0	F1	F2	F3
Same as 2012 Guidelines = no conditionality	Limited conditionality	Extended conditionality	Intermediate conditionality

6.4.2 Economic and social impacts – Risk of Carbon Leakage

The options on conditionality are only relevant for sectors eligible for compensation. In fact, conditionality can only affect the risk of carbon leakage of a certain sector where the administrative and investment costs entailed by conditionality in essence reduce the amount of indirect cost compensation available.

Option F0 would therefore not affect the risk of carbon leakage of the various sectors.

Option F1, would also be neutral as regards its impacts on the risk of carbon leakage. For non SMEs, carrying out energy audits or energy management systems is already mandatory for all under Article 8 (4) of the Energy Efficiency Directive 2012/27/EU. SMEs would not be affected by Option F1.

Option F2, instead, would imply the following additional costs for the beneficiaries:

First, the proposal would require additional costs to perform energy audits for SMEs (see also below section 6.4.5), while SMEs are not covered by such an obligation under the EED. Option F2 could increase the risk of carbon leakage for SMEs, to the extent that the increased costs for SMEs exceed the estimated aid amount: this impact will be assessed in detail in section 6.4.5.

Second, the proposal would also generate additional costs for large undertakings being required to invest in one of these three alternatives:

- *The implementation of the recommendation of the energy audit*: the costs of implementation, as well as the effects in terms of reduction of energy consumption costs, would be determined on a case by case basis by the auditors and will vary between the various sectors. In fact, the potential for energy efficiency investments will be different depending on the specificities of the sector and of each undertaking. Both the amount of potential savings and of the investment costs will be determined by the auditors on a case by case basis, in line with Annex VI of the EED. Depending on whether the beneficiary is the "best in class" in the sector or one of the worst performers in terms of electricity consumption, those amounts will also likely vary. This option therefore allows flexibility to meet the condition by requiring the costs to be proportionate, which implies some degree of uncertainty. In fact, it is extremely difficult for the Commission to estimate *ex ante* across the various sectors and for all beneficiaries the cost of implementation of the

auditors' recommendations. The feedback from the targeted consultation on the draft Guidelines showed that sectors would consider that linking the obligation under this condition to a payback period of maximum 5 years, would be too long. According to industrial stakeholders, without appropriate investment time limitation, the risk of carbon leakage would be too high. This seems to be confirmed by independent studies which seem to suggest that average payback requirements for Energy Saving Opportunities (ESO) projects are usually ≤1 year. Projects with up to 2 years payback will be given due consideration but the likelihood of it being implemented are fairly low.[96] However, two Member States (Belgium and the Netherlands) already require a commitment from beneficiaries to not only participate in energy efficiency multiannual agreements but to also implement the recommendations for further improvements which they receive in this context.

- *The reduction of the carbon footprint of their electricity consumption (e.g. with the installation of an on-site renewable energy generation facility covering at least 50% of their electricity needs or through a carbon-free power purchase agreement*): almost all industrial stakeholders quantified the 50% requirement in the feedback to the targeted consultation on the draft Guidelines as not feasible for technical reasons.[97] Similarly, a few Member States argued that the minimum threshold would be physically difficult to meet[98]. One stakeholder[99] also explained that the optimal size and cost-efficiency of an on-site renewable installation depends on various factors related to the type of industrial activity and site characteristics. In their view, a specific threshold for onsite renewable energy generation might be counterproductive.
- *The investment of a significant share of at least 80% of the aid amount in projects that lead to substantial reductions of the installation's greenhouse gas emissions and well below the applicable benchmark used for free allocation in the EU Emissions Trading System*: The investment costs are also very difficult to quantify, as depending on the sectors the possible technological shifts would be very different in terms of cost-effectiveness. In terms of benefits, a reduction of their direct emission intensity would not correspond to a reduction of direct ETS costs, since most of those sectors receive free allowances for direct ETS costs. In addition, the investment would not have an impact in

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96 See Impact Assessment for the 2016 Energy Efficiency Directive - SWD(2016)/406 and "Study on energy efficiency and energy saving potential in industry and on possible policy mechanisms", available at: https://ec.europa.eu/energy/studies/study-energy-efficiency-and-energy-saving-potential-industry-and-possible-policy-mechanisms_en?redir=1.

97 E.g. European Aluminium explained that a 1MW photovoltaic capacity requires around 1 hectare of land and produces on average 1300 MWh/year. An average-sized aluminium smelter consumes around 3TWh/year. Covering half of this electricity consumption from on-site PV would require 1200 hectares - the equivalent of 1650 football fields.

98 One Member State gave an example concerning the steel sector, where an electric arc furnace producing 700 000 tonnes of steel annually uses around 450 000 MWh of electricity and an average integrated production plant producing 4 million tonnes of steel is consuming about 1 800 000 MWh. Assuming that onshore wind turbine with an installed capacity of 3 MW will operate 2 000 full load hours per year, an electric arc furnace would need around 40 turbines to cover half of the electricity demand and the integrated installation of approximately 150 turbines. Taking into account the land requirements, as well as regulatory constraints on the installation of such turbines, this requirement would not be technically feasible.

99 The European alliance of stakeholders representing clean energy buyers and suppliers for corporate renewable energy sourcing in Europe.

terms of reduction of indirect ETS costs. To the contrary, decarbonisation investments involving electrification imply an increase of electricity consumption and thus also indirect ETS costs. According to most industrial stakeholders replying to the targeted consultation on the draft Guidelines, this requirement would be against the purpose of the Guidelines. Overall, the risk of carbon leakage due to indirect ETS costs would be high.

Option F3 would be neutral as regards its impacts on the risk of carbon leakage for SMEs, as they would not incur any additional costs.

However, this option would also imply additional costs for non-SMEs. Depending on the size of those costs, the aid intensity would be proportionally reduced, thereby increasing the risk of carbon leakage proportionally. The identified costs are the following:

- *The implementation of the recommendation of the energy audit*: the costs of implementation, as well as the effects in terms of reduction of energy consumption costs, would be determined on a case by case basis by the auditors and will vary between the various sectors. As Option F2, this option allows flexibility to meet the condition by requiring the costs to be proportionate, which implies some degree of uncertainty. During the targeted consultation on the draft Guidelines, some industrial stakeholders indicated that a payback period of 2/3 years would be commercially acceptable. Therefore, at least for some sectors, this condition seems feasible.
- *Reduce the carbon footprint of their electricity consumption so as to cover at least* 30*% of their electricity consumption from carbon-free sources*: many industrial stakeholders explained during the targeted consultation on the draft Guidelines that the opportunities to reduce the carbon footprint of consumption and the ways in which this can be achieved vary greatly between different Member States and industrial sectors. Compared to Option F2, Option F3 allows for more flexibility to meet the condition with both on-site and off-site carbon-free generation.
- *The investment of a significant share of at least 50% of the aid amount in projects that lead to substantial reductions of the installation's greenhouse gas emissions and well below the applicable benchmark used for free allocation in the EU Emissions Trading System*: As for Option F2, the investment costs and possible benefits are also very difficult to quantify, as depending on the sectors the possible technological shifts would be very different in terms of cost-effectiveness. Overall, the risk of carbon leakage due to indirect ETS costs would be higher than without conditionality requirement, but lower than in Option F2.

By implementing the recommendations of the energy audit and by reducing the carbon footprint of their electricity consumption, the beneficiary can also theoretically reduce their exposure to the risk of carbon leakage due to indirect ETS costs. As the costs and benefits of those investments are difficult to estimate for the reasons explained above, for both Options F2 and F3 it is also quite difficult to quantify the impact that those types of investments would have on the ICLI of the various sectors in terms of reduction of the Indirect Emission Intensity.

Some environmental NGOs and one Member State also noted in the consultation on the draft Guidelines that this type of investments are normally eligible to receive State aid under other

Guidelines (e.g. the Energy and Environmental Guidelines – EEAG). Whether that investment cost is effectively reduced by additional investment aid for a certain beneficiary would however depend on Member State' decision to grant the aid.

6.4.3 Economic and social impacts – competition distortions:

Option F0 would be neutral also in relation to the risk of competitions distortions.

Option F1 is also neutral as regards its impacts on the risk of competition distortions for large undertakings, as carrying out energy audits or energy management systems is already mandatory for all undertakings that are not SMEs under Article 8 (4) of the Energy Efficiency Directive 2012/27/EU.

Option F2 potentially amplifies intra-sectors distortions, as Member States not only have discretion on whether to grant indirect ETS compensation, but also as regards environmental investment aid. As regards SMEs, Option F2 could discourage them from applying for indirect ETS costs compensation, as explained in section 6.4.5. The non-application of SMEs could create a competition distortion between small and large undertakings. As regards large undertakings, this option might also risks distorting competition, if the design of the conditions would not take into account the economic justification and feasibility of the required investment in light of the specific situation of the undertaking concerned.

Option F3 potentially amplifies intra-sectors distortions, as Member States not only have discretion on whether to grant indirect ETS compensation, but also as regards environmental investment aid. As regards SMEs, this option is neutral.

6.4.4 Environmental impacts

Under **Option F0**, no additional incentive for energy efficiency improvements would be added to the compensation mechanism. Incentives for energy efficiency improvements would exclusively depend on the fact that the compensation is partial and the level aid intensity as well as an undertaking's level of efficiency compared to the product specific efficiency benchmarks. Many industrial stakeholders consistently stressed in all consultation activities that the fact that the compensation is capped at the costs of the most efficient installation in the sector is already a sufficient incentive for energy efficiency.

Under **Option F1**, undergoing energy audits or energy management systems helps undertakings *via* the recommendations made to identify the potential for further energy efficiency improvements. Hereby, this option can be regarded as maintaining incentives to become more energy efficient. However, as the participation in energy audits or energy management systems is already mandatory for large undertakings under the Energy Efficiency Directive, the environmental impact is neutral for this type of undertakings. The added value of such conditionality would be limited to adding another layer of enforcement to the EED.

Option F2 in principle creates strong incentives for energy efficiency improvement investments and investments aimed at reducing the carbon footprint of an installation energy consumption.

Option F3 creates slightly lower incentives for energy efficiency improvement investments and investments aimed at reducing the carbon footprint of an installations energy consumption. In particular, this option would ensure that energy efficiency investments with payback period that are generally considered economically profitable are performed. Similarly, this option potentially creates an additional incentive to perform investments to reduce the carbon footprint of consumption that would be economically and technically feasible. In particular, some study and report shows that the level of investment in energy efficiency in Europe is still below its economic potential[100].

As already explained above, some NGOs and one Member State noted that separate investment aid under different legal bases (e.g. the Environmental and Energy State aid Guidelines) can be granted in case there is need to cover a funding gap and make the investment possible. The incentive effect of options F2 and F3 would therefore also sometimes depend on the granting of that investment aid.

6.4.5 Impact on SMEs

As illustrated in

100 Impact Assessment for the 2016 Energy Efficiency Directive - SWD(2016)/406 and "Study on energy efficiency and energy saving potential in industry and on possible policy mechanisms", available at: https://ec.europa.eu/energy/studies/study-energy-efficiency-and-energy-saving-potential-industry-and-possible-policy-mechanisms_en?redir=1. As already mentioned in section 6.4.2. above, that study argues that an investment related to energy efficiency demands much higher financial criteria in comparison with other asset classes, with an average payback of 1-2 years and hurdle rates of over 50% required to convince decision makers. In fact, commercial experience with industrial enterprises suggests that average payback requirements for Energy Saving Opportunities (ESO) projects are usually ≤1 year. Projects with up to 2 years payback will be given due consideration but the likelihood of it being implemented are fairly low. Such high returns lead to the question whether enterprises are making rational decisions when it comes to ESO investments.

Appendix 5: number of undertakings with less than 250 employees, the number of SMEs varies depending on the sector concerned.

Mainly Option F2 would have an impact on SMEs, because the proposal would require additional administrative costs to perform energy audits. In this regard, despite the recent progresses in creating a market for energy services for SMEs, the EED does not yet oblige SMEs to perform energy audits[101].

The mere participation in energy audits or in an energy management system is costly for SMEs, as it will add at least 9 000 EUR every four years or around 2 500 EUR per year[102]. As explained in the evaluation attached to this report (Annex 3), Member States have calculated that administrative costs to apply for compensation are between 2 000 EUR and 9 000 EUR (see also paragraph 6.1.5 above). Adding the costs of an energy audit will at least double the application costs for beneficiaries who are not already obliged to do so under the Energy Efficiency Directive.

As a consequence, SMEs could be discouraged from applying for indirect ETS costs compensation. In such case, Option F2 would risk contributing to an increased risk of carbon leakage for SMEs who could decide not to apply for and therefore will not receive indirect ETS costs compensation, despite belonging to a sector at significant risk of carbon leakage due to indirect ETS costs. The non-application of SMEs for compensation would also result in increased competition distortion between small and large undertakings.

Options F0, F1 and **Option F3** would be neutral for SMEs, as they would not incur any additional costs.

7 HOW DO THE OPTIONS COMPARE?

Based on the assessment of their impacts, the options will be compared as regards their effectiveness, efficiency and coherence.

To determine the **effectiveness** of the options, it will be considered to what extent they can be expected to contribute towards the objectives pursued by this initiative (positive impact), to produce a largely neutral impact vis-à-vis the objectives or undermine the objectives (negative impact). Options will be considered to be effective to contribute to the objective of addressing the risk of carbon leakage, where it reduces the risk of carbon leakage to the lowest level over the fourth trading period. Moreover, an option will be considered to be effective in contributing to

[101] Cf. recital 24 of the Energy Efficiency Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance OJ L 315, 14.11.2012, p. 1–56 : *"To tap the energy savings potential in certain market segments where energy audits are generally not offered commercially (such as small and medium-sized enterprises (SMEs)), Member States should develop programmes to encourage SMEs to undergo energy audits. Energy audits should be mandatory and regular for large enterprises, as energy savings can be significant. […]."*.

[102] Report "A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management Systems: Library of typical energy audit recommendations, costs and savings" available at: https://ec.europa.eu/energy/sites/ener/files/documents/eed-art8-study_on_minimum_criteria_for_energy_audits-wp3-final-clean.pdf.

both the objectives of minimising competitions distortions on the one hand and maintaining the incentives for cost-efficient decarbonisation, where it ensures that no overcompensation is granted.

The most **efficient** option will be the one that achieves the objectives set out above (effectiveness) at lowest cost. In practice, the most efficient option will therefore be the most targeted one, meaning the option that will fulfil the objectives described above by spending the smaller compensation budget as possible. The options are therefore considered to have a positive impact in terms of **efficiency** where it minimises the trade-offs between on one hand the budget spent and on the other hand carbon leakage risk, competition distortions and the incentives for a cost-efficient decarbonisation. Moreover, options will be assessed as having a positive impact in terms of efficiency where the costs induced by it are proportionate to its benefits.

Finally, an option will be considered to have a positive impact where it is **coherent** with the EU policy framework. More specifically, the coherence of the options presented above will be assessed with respect to ETS carbon leakage protection for direct ETS cost (such as the Carbon Leakage List 2021-2030[103] and ETS Directive), the Energy Efficiency Directive and the Guidelines on State-aid for environmental protection and Energy (EEAG).

All policy options have been scored on a scale from + + (very favourable) to - - (very unfavourable). Options for policy choices which have a neutral impact in certain fields have not been assigned a score in that respect. This was for example the case as regards SME impacts which was only scored as regards conditionality and for certain options as regards policy coherence. This is also the case for the impact on competition distortions linked to the options of conditionality.

Sector eligibility

An option regarding the sector eligibility will be considered to have a positive impact in terms of effectiveness where it best addresses the sectors' risk of carbon leakage due to indirect ETS costs. Moreover, by targeting the sectors most exposed to a genuine risk of carbon leakage, an option would contribute positively to the objective of minimising the risk of competition distortions, as it would avoid that sectors with a low risk would be overcompensated. Such an option, by being targeted to sectors with a significant risk of carbon leakage, would maintain the incentives for cost-efficient decarbonisation, in particular for the other sectors. This element of the environmental impact can be measured as the % of annual indirect emissions covered by the EU ETS that would receive compensation. A positive environmental impact is also qualitatively assessed based on the ability of an option to maintain the incentives towards electrification.

Also, an option would be deemed to have a positive effect in terms of efficiency where it minimises the trade-offs between the objectives. Also, by not covering sectors at low or low-

[103] Commission Delegated Decision (EU) 2019/708 of 15 February 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council concerning the determination of sectors and subsectors deemed at risk of carbon leakage for the period 2021 to 2030, OJ L 120, 8.5.2019, p. 20–26

medium risk, such option would allow that the available budget of the Member States to be used to efficiently to support the sectors most at risk.

Finally, where an option addresses the risk of carbon leakage due to indirect ETS costs it is coherent with Article 10a (6) of the ETS-Directive and thus can be considered to have a positive impact.

	Effectiveness				**Efficiency** ***[Estimated annual budget]***	**Coherence**
	Addressing the risk of carbon leakage * * *a positive sign indicates a reduction of the risk*	**Minimising Competition distortions * * *a positive sign indicates a reduction of possible competition distortions***	**Maintaining incentives for cost-efficient decarbonisation**			
			Annual indirect emissions compensated	**Ability to maintain incentives to electrification**		
Option A0 - as 2012 Guidelines	**0**	**0**	3.2% of annual emissions covered by the EU ETS	**0**	**0** *[Estimated annual budget = 1.454 billion EUR]*	**0**
Option A1 - as in 2021-2030 carbon leakage decision	++	- -	7.3% of annual emissions covered by the EU ETS	- -	- - *[Estimated annual budget = 3.352 billion EUR]*	+
Option A2 - based on same methodology as 2021-2030 carbon leakage decision (ICLI of 0.2), but applied to indirect ETS costs only	+ +	-	5.8% of annual emissions covered by the EU ETS	-	- - *[Estimated annual budget = 2.676 billion EUR]*	++
Option A3 -- Strict adaptation of the methodology used in the Carbon Leakage List 2021-2030	+	+ +	3.1% of annual emissions covered by the EU ETS	+	+ *[Estimated annual budget = 1.409 billion EUR]*	+

Option A4- same as in option A3 + assessment at subsector level of fuel and electricity substitutability	+	+ +	3.2% of annual emissions covered by the EU ETS	+ +	+ + *[Estimated annual budget = 1.455 billion EUR]*	+

Option A4 is rated as the most favourable option overall. Whilst does not provide the greatest overall carbon leakage protection, it is the most effective by targeting the sectors most at risk and hence effective at minimising competition distortions and maintaining the incentives for a cost-efficient decarbonisation. In terms of environmental impact, it allows compensation for the smallest percentage of indirect emissions, similarly to Option A3. However, contrary to Option A3, it maintains the incentives towards electrification for subsectors with fuel/electricity substitutability. It also most efficient since it manages to fulfil the objectives with a targeted approach, avoiding spending Member States budget on sectors at low risk of carbon leakage. As Option A4 introduces a number of State aid specific requirements not reflected in the system for defining the Carbon Leakage List, it is not the most coherent option. However, Option A4 is not incoherent since it refers to the Carbon Leakage List 2021-2030 to include subsectors with a high potential to switch production between fuel and electricity. In terms of coherence, Option A4 is not the most favourable option but this is outweighed by the higher effectiveness and efficiency.

Both Options A1 and A2 score poorly regarding the objective of maintaining incentives for cost-efficient decarbonisation, because these options would compensate a large amount of emissions, thereby risking undermining the effectiveness of the EU ETS.

Options A0, A1 and A2 are not capable of minimising the trade-offs between the objectives as Option A4. They provide relatively strong carbon leakage protection, this is not sufficiently targeted to the sectors most at risk. Compared to Option A3, Option A4 provides higher incentives for a cost-efficient decarbonisation of the economy, since it better addresses the risk of deterring undertakings from electrifying when they are eligible for free allowances.

Estimation of indirect ETS costs

Under the Baseline Approach, the indirect ETS costs are estimated based on CO_2 factors defined at regional level as set out in Annex IV of the 2012 ETS Guidelines comprises (Option B0) and based on historical output with reference year 2005-2011 (Option C0).

Under the Updated Approach, the indirect ETS costs are estimated based on updated CO_2 factors defined at regional level (Option B1) and based on updated output data (Option C1).

	Effectiveness	**Efficiency**

	Addressing the risk of carbon leakage	Minimising Competition distortions	Maintaining incentives for cost-efficient decarbonisation	
Baseline approach - same regions as 2012 Guidelines (Option B0) and historical output over 2005-2011 (Option C0)	**0**	**0**	**0**	**0**
Updated approach = updated regions (Option B1) and actual output data (Option C1)	+	+	+	+

The Updated package can be identified as the option with the most positive impact on all criteria. It allows for the most accurate representation of the indirect carbon costs passed on via the electricity prices by reflecting appropriately both the carbon content of the electricity consumed and the most recent beneficiary's output. Therefore, it addresses best the risk of carbon leakage due to indirect carbon costs. The Updated package allows to better take account of cross border effects on prices since the region definition is based on the most recent electricity data. The Updated package therefore also minimises the risks of overcompensation and thus of competition distortions. The Updated package therefore allows for a minimisation of the trade-offs between the objectives.

Efficiency will be assessed by examining the extent to which the options fulfil the objectives by spending the lower amounts, for each Member State. The updated package appears to be the most efficient option since it better achieves the objectives while spending a similar budget.

Maximum Aid amount

The options on proportionality will be considered to have a positive impact in light of the effectiveness criteria where they reduces the risk of carbon leakage to the lowest level. However, where an option would lead to a risk of overcompensation, such option would have a negative impact both on the objective of minimising competition distortions and of maintaining the incentives for a cost-efficient decarbonisation. By limiting the aid amount to the minimum necessary, an option would maintain the incentives for cost-efficient decarbonisation. This element of the environmental impact can be measured as the % of annual indirect emissions covered by the EU ETS that would receive the different levels of compensation. Overcompensation would also result in unnecessarily spending Member States budget, which would affect the efficiency of the option considered.

	Effectiveness	**Efficiency** *[Estimated*	**Coherence**

	Addressing the risk of carbon leakage	**Minimising Competition distortions**	**Maintaining incentives for cost-efficient decarbonisation**		*annual budget]*	
			[Annual indirect emissions compensated][104]	*[Incentives for energy efficiency]*		
Baseline package – stable (Option E0) aid intensity at 75% (Option D0)	**0**	**0**	3.2% of annual emissions covered by EU ETS	**0**	**0** [Estimated annual budget =1.454 Billion EUR]	**0**
Minimalist package = an aid intensity < 75% (Option D2) with a degressive evolution	-	-	2.7% of annual emissions covered by EU ETS	+	+ [Estimated annual budget =1.260 Billion EUR]	**0**
Maximalist package - stable (Option E0) aid intensity > 75% (Option D1)	++	- -	3.6% of annual emissions covered by EU ETS	-	- - [Estimated annual budget =1.648 Billion EUR]	**0**
Flexible package = stable aid intensity with update of efficiency benchmarks (Option E1) and an aid intensity at 75% with GVA-cap (Option B4).	+	+ +	3.2% of annual emissions covered by EU ETS	++	+ + [Estimated annual budget =1.473 Billion EUR]	+

The Flexible Package can be identified as having the most positive impact overall.

[104] Under the baseline eligibility option

Compared to the Baseline package, the Flexible package provides a higher degree of carbon leakage protection it addresses the particular situation of some specific sectors most exposed to indirect ETS costs thanks to the GVA-cap feature and it foresees reduction in aid intensity only where they are warranted by proven efficiency gains. The Baseline package would ignore the actual efficiency gains of the economic sectors concerned and could thus *de facto* lead to overcompensation in some sectors, therefore creating more distortions of competition and less incentives for a cost-efficient decarbonisation of the economy.

The Flexible package however does not offer the strongest carbon leakage protection (lower score than the Maximalist package). However, the Maximalist package would result in excessive compensation, which would increase the risk for competition distortions - both inter sectors and intra-sector - and would have worse impact on the objective of maintaining the incentives for reducing electricity consumption and becoming more energy-efficient.

The Minimalist package scores lower than the Flexible Package in terms of carbon leakage because the lowest compensation does not sufficiently decrease the risk of carbon leakage and the degressivity of the aid assumes a certain degree of efficiency gain throughout the fourth trading period which may not materialise in all sectors to the same degree. In terms of competition distortion, the Minimalist package scores better than the Maximalist Package because it provides a lower compensation, but it scores lower than the Flexible package due to the application of general degressivity to all sectors, regardless of the actual abatement potential. In terms of % of annual emissions covered by the EU ETS, the Flexible package scores lower than the Minimalist package and the same as the Baseline package. However, the Flexible Package overall scores the highest regarding cost-effective decarbonisation because the incentives for energy efficiency remains in place, the compensation is reflecting efficiency gains, and the inclusion of a GVA cap decrease the risk of higher overall emissions resulting from relocations to jurisdictions with loosened climate policies.

Overall, this results in higher efficiency for the Flexible package because the budget used better reaches the overall trade-off between the objectives, but also because the budget allocated for compensation would follow closely potential technological efficiency improvements. This avoids both the risk of over- and under-compensation and minimises trade-offs.

As the required update of the efficiency benchmarks will be carried out in line with the methodology used for the application of the Carbon Leakage List 2021-2030, this option obtains a higher score as regards coherence.

Conditionality

	Effectiveness			**SMEs**	**Efficiency**	**Coherence**
	Addressing the risk of carbon leakage	**Minimising Competition distortions**	**Maintaining incentives for cost-efficient decarbonisation**			

Option F0 - - no conditionality	**0**	**0**	**0**	**0**	**0**	**0**
Option F1 limited conditionality	**0**	**0**	**0**	**0**	**0**	+
Option F2 – extended conditionality	-	- -	+ +	- -	**0**	+
Option F3 – intermediate conditionality	+	**0**	+	**0**	+	++

Option F3 can be identified as the option with the most positive impacts overall. It allows for a strengthening of the incentives for energy efficiency improvements compared to Option F0 and option F1 (by strengthening enforcement of existing legislation). At the same time Option F3 avoids a possible reduction of the carbon leakage protection and compliance burdens in particular on SMEs which would arise under Option F2 which would require a strong investment commitment. Option F2 risks amplifying competition distortions, if the design of the conditions would not take into account the economic justification and feasibility of the required investment in light of the specific situation of the undertaking concerned.

As regards to efficiency, the four options would be spending the same compensation budget from Member States. This makes Options F3 more efficient, because it better achieves the objectives while using the same overall budget.

Regarding coherence, Option F3 scores highest as it is coherent with the Energy Efficiency Directive and the industrial strategy as part of the European green Deal. Option F0 is not in line with the EU Green Deal framework, and in particular with the EU Industrial strategy which intends to modernise and transform the economy with the aim of climate neutrality. Option F1 is also not full coherent with the EU Green Deal framework, but is coherent with the EED. Option F2 is coherent with the Green Deal framework, but slightly incoherent with the EED since it enlarges the requirements to SMEs while the EED does not.

8 PREFERRED OPTION

In light of the above, the following options/packages can be identified as the preferred option:

- Option A4 on eligibility: Strict adaptation of the methodology used in the Carbon Leakage List 2021-2030, together with subsectors (from sectors with an ICLI > 0.20) showing a high level of fuel and electricity substitutability

- The Updated Approach estimating indirect ETS costs, combining amended regional CO_2 emission factors (Option B1) and actual output (Option C1)

- The Flexible package on aid amount, combining an aid intensity of 75% + GVA cap (Option D3) and a stable aid intensity + mid-term update of electricity consumption efficiency benchmarks (Option E1)

- Option F3: Intermediate conditionality

	Effectiveness			**Efficiency**	**Coherence**
	Addressing the risk of carbon leakage	**Minimising Competition distortions**	**Maintaining incentives for cost-efficient decarbonisation**		
Package of preferred options	++	++	++	+	+

These preferred options, when combined together, would not lose their advantages. Also, it is not possible to combine less-preferred advantageous options in order to obtain a package that would perform better overall. A less restricted eligibility would lead to a poorer effectiveness, aid intensity appears to be best calibrated to reduce carbon leakage risk when set at 75% and several inputs in the compensation formula need to be updated since they were based on outdated data (CO_2 factor, baseline output).

Therefore, the analysis performed for the purpose of this Impact Assessment leads to the preferred options as described above.

8.1 REFIT (simplification and improved efficiency)

As stated in 3.3, in the absence of State aid Guidelines, the Commission would have to assess the compatibility with the internal market of schemes notified by Member States directly under the TFEU. These Guidelines give a clear guidance on how to design a compensation scheme and therefore, avoid an assessment of compensation scheme on a case by case basis. The Guidelines are therefore more efficient in terms of administrative costs, compared to a situation without Guidelines.

Also, these Guidelines detail the scheme design, which avoid the risk of inconsistencies between schemes in different Member states.

In term of simplification, as stated in the evaluation report annexed to this Impact Assessment Report (Annex 3), the JRC[105] notes that a comparison between the national schemes was made difficult due to the use of different reporting templates by each countries. As a result, several record of beneficiaries could not be included as such in the JRC study due to lack of full comparison points and JRC had to retrieve all missing information from official documentation, a time-consuming exercise (see JRC study - 3.1 Data on beneficiaries of ETS indirect cost compensation)

The design of the revised Guidelines incorporates this comment by creating a standard template for reporting, which will be published online on ETS portal. This will allow for a faster data collection and comparison, therefore improving the quality of future monitoring activities.

9 HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The ETS Guidelines are adopted under the State aid rules of the Treaty. As a result, Article 26 in chapter IX ('Monitoring') of the Council Regulation No 2015/1598 will apply. This means that all Member States and EFTA 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, as it is the case in the 2012 ETS Guidelines. Section 5 of the 2012 ETS Guidelines sets out the information that the annual reports need to contain and requires Member States to keep detailed records relating to the aid for a number of years.

That information makes it possible for the Commission to assess and monitor progress towards the specific objectives set out in section 4 of this Report. The Commission receives 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 is possible to assess the impact on ETS efficiency in the form of the extent of insulation against the CO_2 price signal of part of the economy. This is so as the reports enable the Commission to aggregate all aid paid under the ETS Guidelines.

Moreover, 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. According to Article 30 of the ETS Directive, it shall be kept under review in light of international developments and efforts undertaken to achieve the long-term objectives of the Paris Agreement. More concretely, measures to support energy-intensive

[105] Ferrara, A. and Giua, L., The Effects of EU ETS Indirect Cost Compensation on Firms Outcomes, EUR 30241 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19283-1, doi:10.2760/910907, JRC119837.

industries that may be subject to carbon leakage shall be kept under review in the light of climate policy measures in other major economies. In this context, the Commission shall also consider whether measures in relation to the compensation of indirect ETS costs should be further harmonised.

At the end of the trading period 2021-2030, an evaluation of the Guidelines will be conducted in line with the Better Regulation Standards.

The main indicator for evaluating the impact of ETS Guidelines is the avoidance of carbon leakage, which can only be assessed by consulting sectors (including SMEs) or by reviewing the literature on the subject. Similarly, the existence of distortive effects on intra-sector competition will be assessed by analysing potential examples of relocation, for which the existence of a national compensation scheme would have played a significant role. One indicator for evaluating the decarbonisation objective will be the evolution of direct and indirect emissions. Energy efficiency benchmarks, which will be reviewed at mid-term of the period, will also help evaluating the realisation of this objective. Also, the realisation of the cost-effective decarbonisation of the economy can be analysed more specifically by looking at the evolution of the production processes for sectors with a high fuel and electricity substitutability.

APPENDIX 1 – METHODOLOGY FOR QUALITATIVE ANALYSIS OF CARBON LEAKAGE RISK DUE TO INDIRECT EMISSION COSTS

The tables below detail the qualitative assessment of the support study[106] for each of the four parameters: market characteristics, profit margins, abatement potential, fuel and electricity substitutability.

Market characteristics: To what extent are undertakings in the sector already passing or able to pass higher energy costs on to their customers, and in particular the ability to pass on higher electricity costs? - To what extent will undertakings in the sector be able to pass higher energy costs on to their customers?				
Assessed by:	Measure/Formula	Data sources	Scope	Last update
Link between cost and output price / price taker position	Output Prices (domestic and non-domestic market)	sts_inppd_a and sts_inppnd_a	NACE 4 digit	"4/30/2019 5/20/2019 (1)"
	Import and export prices (€/kg)	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	Metadata: 05/16/2019 DS-066341: 12/19/2019
Bargaining position of the sector / Concentration of producers versus concentration of customers	Number of firms	sbs_na_ind_r2	NACE 4 digit	21-03-2019
	Number of firms per size of companies	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
	Number of firms with foreign affiliates	fats_out2_r2	NACE 2 digit	28-01-2019
	Number of firms with foreign control	fats_g1a_08	NACE 2 digit	30-01-2019
	Number of employees	sbs_na_ind_r2	NACE 4 digit	21-03-2019
	Number of employees per size of companies	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
	Number of birth of companies per size of companies	bd_9bd_sz_cl_r2	NACE 2 digit	29-03-2019
	Number of death of companies per size of companies	bd_9bd_sz_cl_r2	NACE 2 digit	29-03-2019
	Rate of companies survival in t per size of companies	bd_9bd_sz_cl_r2	NACE 2 digit	29-03-2019

[106] See footnote 25 above

	Production Value per size of companies	sbs_sc_ind_r2	NACE 2 digit	21-03-2019
Trade patterns	Domestic Demand	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata: 05/16/2019 DS-066341: 12/19/2019"
	Evolution in total production	DS-066342	PRODCOM	18/12/2018
	Sold Production	DS-066341	PRODCOM	19-12-2019
	Import & Export value	Metadata Comext DS-057009	NACE 4 digit	16-05-2019
	Import & Export volume	Metadata Comext DS-057009	NACE 4 digit	16-05-2019
	Export penetration	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata: 05/16/2019 DS-066341: 12/19/2019"
	Import penetration (Import/Domestic demand)	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata: 05/16/2019 DS-066341: 12/19/2019"
	Trade intensity	Metadata Comext DS-057009, sbs_na_ind_r2 and DS-066341	PRODCOM and NACE 4 digit	"Metadata: 05/16/2019 sbs_na_ind_r2: 3/21/2019 DS-066341: 12/19/2019"
	Net trade balance	Metadata Comext DS-057009	NACE 4 digit	16-05-2019

Profit margins: What are the profit margins of EU undertakings in the sector, as a potential driver for long-run investment or relocation decisions? What is the expected evolution of the profit margins of EU undertakings in the sector, as a potential driver for long-run investment or relocation decisions?

To what extent are the products of the sector substitutable with other products (inter-sector competition), the producers of which may be eligible for indirect cost compensation?

Assessed by:	Measure/Formula	Data sources	Scope	Last update
Investment in sector	Investments	sbs_na_ind_r2	NACE 4 digit	21-03-2019

	Production Value & Total Purchases Goods and Services & Turnover	sbs_na_ind_r2	NACE 4 digit	21-03-2019
	Turnover per size of companies	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
	Turnover of companies with foreign affiliates	fats_out2_r2	NACE 2 digit	28-01-2019
	Turnover of companies with foreign control	fats_g1a_08	NACE 2 digit	30-01-2019
	Production Value per size of companies	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
	Total Purchases Goods and Services per size of companies	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
Current situation of the sector	Gross operating rate and surplus	sbs_na_ind_r2	NACE 4 digit	21-03-2019
	Gross operating surplus by size class	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
	Gross operating surplus of companies with foreign control	fats_g1a_08	NACE 2 digit	30-01-2019
	Value Added at factor cost	sbs_na_ind_r2	NACE 4 digit	21-03-2019
	Value added at factor cost per size of companies	sbs_sc_ind_r2	NACE 3 digit	21-03-2019
	Value added at factor cost of companies with foreign control	fats_g1a_08	NACE 2 digit	30-01-2019
Long-term investment in EU ETS area	Domestic demand	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata: 05/16/2019 DS-066341: 12/19/2019"
	Sold production	DS-066341	PRODCOM	19-12-2018
	Import & Export value	Metadata Comext DS-057009	NACE 4 digit	16-05-2019

Feasibility of relocation	Import & Export volume	Metadata Comext DS-057009	NACE 4 digit	"Metadata: 05/16/2019 DS-066341: 12/19/2019"
	Value-to-Weight ratios (€/kg)	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata : 05/16/2019 DS-066341: 12/19/2019"
Trade patterns	Ratio Export/Sold production	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata: 05/16/2019 DS-066341: 12/19/2019"
	Import penetration (Import/Domestic demand)	Metadata Comext DS-057009 and DS-066341	PRODCOM and NACE 4 digit	"Metadata : 05/16/2019 DS-066341: 12/19/2019"

Abatement potential: To what extent is there a scope for energy efficiency investments in order to reduce electricity consumption in the sector? Would these incentives be distorted by granting compensation for indirect ETS costs and if so, how?

Assessed by:	Measure/Formula	Data sources	Scope	Last update
Scope to reduce electricity consumption	Electricity consumption	DG CLIMA	NACE 4 digit	N/A
	Indirect Emission Costs as % of GVA	DG CLIMA	NACE 4 digit	N/A
	Direct emissions	DG CLIMA	NACE 4 digit	N/A
	Indirect emissions	DG CLIMA	NACE 4 digit	N/A
Current fuel mix	Energy consumption	Eurostat database , table [nrg_bal_c] at https://ec.europa.eu/eurostat/data/database	Code RAMON (aggregation of NACE Code 2 digit)	30-04-2019
BAT		http://eippcb.jrc.ec.europa.eu/reference/		

Fuel and electricity substitutability: To what extent could the undertakings of the sectors shift from fossil fuel energies to electricity? Is there a risk that differences in treatment between direct and indirect cost compensation may hinder the energy-efficient electrification of the sector?

Question	Assessed by:	Measure/Formula	Data sources	Comment
Ability of the sector to shift from fossil fuel		In our analysis we have treated this category		

energies to electricity and evaluate if there is a risk that differences in treatment between direct and indirect cost compensation may hinder the energy-efficient electrification of the sector.		differently as the ability to shift to electricity does not put a sector at risk of carbon leakage per se. The sectors at risk are for example those that have no ability to reduce their electricity consumption or cannot pass through costs, or those that face increasing competition from cheaper import products.		
To what extend do undertakings in the sector differ as regards their share of direct versus indirect emissions in their production processes? In particular: are undertakings in the sector using different production technologies which lead to a situation where some undertakings face a higher share of indirect ETS costs (electrification of production processes) compared with direct ETS costs?				

	CO_2 **sensitivity**:			
	Assessed by:	Measure/Formula	Data sources	Comment
What is the sensitivity to indirect ETS costs?	Indirect emission costs	DG CLIMA	NACE 4 digit	N/A
	Average Price of CO_2	Energy market prices	NACE 4 digit	
	Indirect emissions	DG CLIMA	NACE 4 digit	N/A

	Gross operating rate and surplus	sbs_na_ind_r2	NACE 4 digit	21-03-2019
	Turnover	sbs_na_ind_r2	NACE 4 digit	21-03-2019

APPENDIX 2: ELIGIBILITY UNDER OPTION A

a) Under Option A0

NACE Code	Description
2742	Aluminium production
1430	Mining of chemical and fertiliser minerals
2413	Manufacture of other inorganic chemicals
2743	Lead, zinc, tin production
1810	Manufacture of leather clothes
2710	Manufacture of basic iron and steel and of ferro-alloys, including seamless steel pipes
2112	Manufacture of paper and paper board
2415	Manufacture of fertilisers and nitrogen compounds
2744	Copper production
2414	Manufacture of other organic basic chemicals
1711	Spinning of cotton-type fibres
2470	Manufacture of man-made fibres
1310	Mining of iron ores
 24161039 24161035 24161050 24165130 24163010 24164040	The following subsectors within the Manufacture of plastics in primary forms sector (2416): Low-density polyethylene (LDPE) Linear low-density polyethylene (LLDPE) High-density polyethylene (HDPE) Polypropylene (PP) Polyvinyl chloride (PVC) Polycarbonate (PC)
 21111400	The following subsector within the Manufacture of pulp sector (2111): Mechanical pulp

b) Under option A1

Eligibility under Option A1 is based on the same sector and subsector eligibility as in the 2021-2030 Carbon Leakage Decision.

NACE Code	**Description**
0510	Mining of hard coal
0610	Extraction of crude petroleum
0710	Mining of iron ores
0729	Mining of other non-ferrous metal ores
0891	Mining of chemical and fertiliser minerals
0899	Other mining and quarrying n.e.c.
1041	Manufacture of oils and fats
1062	Manufacture of starches and starch products
1081	Manufacture of sugar
1106	Manufacture of malt
1310	Preparation and spinning of textile fibres
1395	Manufacture of non-wovens and articles made from non-wovens, except apparel
1411	Manufacture of leather clothes
1621	Manufacture of veneer sheets and wood-based panels
1711	Manufacture of pulp
1712	Manufacture of paper and paperboard
1910	Manufacture of coke oven products
1920	Manufacture of refined petroleum products
2011	Manufacture of industrial gases
2012	Manufacture of dyes and pigments
2013	Manufacture of other inorganic basic chemicals
2014	Manufacture of other organic basic chemicals
2015	Manufacture of fertilisers and nitrogen compounds
2016	Manufacture of plastics in primary forms
2017	Manufacture of synthetic rubber in primary forms
2060	Manufacture of man-made fibres
2311	Manufacture of flat glass
2313	Manufacture of hollow glass
2314	Manufacture of glass fibres
2319	Manufacture and processing of other glass, including technical glassware
2320	Manufacture of refractory products
2331	Manufacture of ceramic tiles and flags
2351	Manufacture of cement
2352	Manufacture of lime and plaster
2399	Manufacture of other non-metallic mineral products n.e.c.
2410	Manufacture of basic iron and steel and of ferro-alloys
2420	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
2431	Cold drawing of bars
2442	Aluminium production
2443	Lead, zinc and tin production
2444	Copper production
2445	Other non-ferrous metal production
2446	Processing of nuclear fuel

2451	Casting of iron
0893	Extraction of salt
1330	Finishing of textiles
2110	Manufacture of basic pharmaceutical products
2341	Manufacture of ceramic household and ornamental articles
2342	Manufacture of ceramic sanitary fixtures
2332	Manufacture of bricks, tiles and construction products, in baked clay
Prodcom	**Code Description**
081221	Kaolin and other kaolinic clays
10311130	Frozen potatoes, prepared or preserved (including potatoes cooked or partly cooked in oil and then frozen; excluding by vinegar or acetic acid)
10311300	Dried potatoes in the form of flour, meal, flakes, granules and pellets
10391725	Concentrated tomato puree and paste
105122	Whole milk powder
105121	Skimmed milk powder
105153	Casein
105154	Lactose and lactose syrup
10515530	Whey and modified whey in powder, granules or other solid forms, whether or not concentrated or containing added sweetening matter
10891334	Bakers' yeast
20302150	Vitrifiable enamels and glazes, engobes (slips) and similar preparations for ceramics, enamelling or glass
20302170	Liquid lustres and similar preparations; glass frit and other glass in powder; granules or flakes
25501134	Open die forged ferrous parts for transmission shafts, camshafts, crankshafts and cranks etc.

c) Under option A2

Eligibility of sectors based on the methodology used in the Carbon Leakage List 2021-2030, but calculated based on indirect emission intensity only

NACE Code	**Description**
1411	Manufacture of leather clothes
2442	Aluminium production
2011	Manufacture of industrial gases
2013	Manufacture of other inorganic basic chemicals
2443	Lead, zinc and tin production
1711	Manufacture of pulp
0729	Mining of other non-ferrous metal ores
0899	Other mining and quarrying n.e.c.
0710	Mining of iron ores
1712	Manufacture of paper and paperboard
2410	Manufacture of basic iron and steel and of ferro-alloys
2017	Manufacture of synthetic rubber in primary forms
2451	Casting of iron
2060	Manufacture of man-made fibres
1920	Manufacture of refined petroleum products
2444	Copper production
2016	Manufacture of plastics in primary forms
1310	Preparation and spinning of textile fibres
0510	Mining of hard coal
2445	Other non-ferrous metal production
2331	Manufacture of ceramic tiles and flags
2012	Manufacture of dyes and pigments
1395	Manufacture of non-wovens and articles made from non-wovens, except apparel
2314	Manufacture of glass fibres

d) Under option A3

Eligibility of sectors based on a strict adaptation of the methodology used for the Carbon Leakage List 2021-2030.

NACE Code	**Description**
1411	Manufacture of leather clothes
2442	Aluminium production
2013	Manufacture of other inorganic basic chemicals
2443	Lead, zinc and tin production
1711	Manufacture of pulp
1712	Manufacture of paper and paperboard
2410	Manufacture of basic iron and steel and of ferro-alloys
1920	Manufacture of refined petroleum products
2444	Copper Production
2445	Other non-ferrous metal production

e) Under option A4

Eligibility of sectors based on a strict adaptation of the methodology used for the Carbon Leakage List 2021-2030 and subsectors presenting a high level of fuel and electricity substitutability.

NACE Code	**Description**
1411	Manufacture of leather clothes
2442	Aluminium production
2013	Manufacture of other inorganic basic chemicals
2443	Lead, zinc and tin production
1711	Manufacture of pulp
1712	Manufacture of paper and paperboard
2410	Manufacture of basic iron and steel and of ferro-alloys
1920	Manufacture of refined petroleum products
2444	Copper Production
2445	Other non-ferrous metal production

Prodcom	**Code Description**
20.16.40.15	Polyethylene glycols and other polyether alcohols, in primary forms
20.11.11.50	Hydrogen
20.11.12.90	Inorganic oxygen compounds of non metals (excluding sulphur trioxide (sulphuric anhydride); diarsenic trioxide, nitrogen oxides, silicon dioxide, sulphur dioxide, carbon dioxide)
23.14.12.10	Glass fibre mats (including of glass wool)
23.14.12.30	Glass fibre voiles (including of glass wool).
24.51.11.10	Malleable iron castings for land vehicles,

	piston engines and other machinery and mechanical appliances
24.51.11.90	Parts for other utilisation (malleable iron casting)
24.51.12.10	Parts of land vehicles (nodular iron castings)
24.51.12.20	Ductile iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding for bearing housings incorporating ball or roller bearings)
24.51.12.40	Other parts of piston engines and mechanical engineering (nodular iron castings)
24.51.12.50	Ductile iron castings for machinery and mechanical appliances excluding for piston engines
24.51.12.90	Ductile iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery
24.51.13.10	Grey iron castings for land vehicles (excluding for locomotives or rolling stock, construction industry vehicles)
24.51.13.20	Grey iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding bearing housings incorporating ball or roller bearings)
24.51.13.40	Other parts of piston engines and mechanical engineering (cast iron: not ductile)
24.51.13.50	Grey iron castings for machinery and mechanical appliances excluding for piston engines
24.51.13.90	Grey iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery
24.51.20.00	Tubes, pipes and hollow profiles of cast iron excluding tubes, pipes, hollow profiles made into identifiable parts of articles, such as sections of central heating radiators and machinery parts
24.51.30.30	Tube or pipe fittings, of non-malleable cast iron
24.51.30.50	Tube or pipe fittings of malleable cast iron

APPENDIX 3: ASSESSMENT OF CARBON LEAKAGE RISK FOR EACH SECTOR[107]

NACE-4	Sector name	Indirect carbon leakage indicator			Eligible under 2012 ETS Guidelines	Eligible under policy proposal	Overall rating	Market characteristics	Profit margin	Abatement potential	Fuel and electricity substitutability
		TOT	Trade intensity	Indirect emission intensity (kgCO2/ EUR)							
14.11	Manufacture of leather clothes	1,147	83,00%	1,383	yes	yes	**medium-high**	medium-high	medium-high	no conclusion	low
24.42	Aluminium production	1,062	35,20%	3,011	yes	yes	**medium-high**	high	medium-high	low	low
20.11	Manufacture of industrial gases	0,917	6,00%	15,091	no	no	**low-medium**	low-medium	medium	medium	low
20.13	Manufacture of other inorganic basic chemicals	0,732	54,00%	1,359	yes	yes	**medium-high**	medium-high	low-medium	medium	low
24.43	Lead, zinc and tin production	0,620	30,60%	2,025	yes	yes	**medium-high**	medium	medium-high	medium	low
17.11	Manufacture of pulp	0,521	48,10%	1,085	1 subsector	yes	**medium-high**	medium-high	medium	medium	low
07.29	Mining of other non-ferrous metal ores	0,474	83,70%	0,56	no	no	**low-medium**	medium	low	no conclusion	low

[107] This assessment is based on the study by Roques and Laroche, see footnote 25 above.

NACE-4	Sector name	Indirect carbon leakage indicator			Eligible under 2012 ETS	Eligible under policy	Overall rating	Market characteristics	Profit margin	Abatement potential	Fuel and electricity substitutabilit
08.99	Other mining and quarrying n.e.c.	0,438	173,30%	0,253	no	no	**low-medium**	medium	low	no conclusion	no conclusion
07.10	Mining of iron ores	0,423	86,40%	0,490	yes	no	**low-medium**	medium	low-medium	no conclusion	low
17.12	Manufacture of paper and paperboard	0,412	27,80%	1,482	yes	yes	**medium**	medium	medium	medium	low
24.10	Manufacture of basic iron and steel and of ferro-alloys	0,363	25,70%	1,414	yes	yes	**medium**	medium	medium-high	no conclusion	low
20.17	Manufacture of synthetic rubber in primary forms	0,337	55,10%	0,612	no	no	**low-medium**	low-medium	low-medium	medium	no conclusion
24.51	Casting of iron	0,295	41,00%	0,719	no	no	**medium**	medium	low-medium	no conclusion	medium
20.60	Manufacture of man-made fibres	0,282	44,10%	0,638	yes	no	**low-medium**	medium-high	low	no conclusion	no conclusion
19.20	Manufacture of refined petroleum products	0,267	25,80%	1,031	no	yes	**medium**	medium	medium-high	no conclusion	no conclusion
24.44	Copper production	0,250	35,10%	0,714	yes	no	**medium**	medium	medium	medium	low
20.16	Manufacture of plastics in primary forms	0,246	36,00%	0,685	6 subsectors	no	**medium**	medium-high	low-medium	no conclusion	low
13.10	Preparation and spinning of textile fibres	0,244	46,50%	0,524	yes	no	**low**	low-medium	low	no conclusion	low
05.10	Mining of hard coal	0,244	62,10%	0,393	no	no	**low-medium**	medium	low	no conclusion	low
24.45	Other non-ferrous metal production	0,241	83,50%	0,289	no	no	**medium**	medium-high	low-medium	no conclusion	no conclusion
23.31	Manufacture of ceramic tiles and flags	0,225	41,10%	0,548	no	no	**low**	low-medium	low	no conclusion	low
20.12	Manufacture of dyes and pigments	0,218	48,50%	0,449	no	no	**low**	low	low	no conclusion	no conclusion
13.95	Manufacture of non-wovens and articles made from	0,213	38,50%	0,554	no	no	**low**	low	low	low	low

NACE-4	Sector name	Indirect carbon leakage indicator			Eligible under 2012 ETS	Eligible under policy	Overall rating	Market characteristics	Profit margin	Abatement potential	Fuel and electricity substitutabilit
	non-wovens, except apparel										
23.14	Manufacture of glass fibres	0,208	28,40%	0,731	no	no	**low**	low	low	no conclusion	medium
27.20	Manufacture of batteries and accumulators	0,198	61,50%	0,322	no	no	**low**	low-medium	low-medium	no conclusion	low
20.14	Manufacture of other organic basic chemicals	0,191	49,00%	0,390	yes	no	**low**	low-medium	low-medium	no conclusion	low
10.62	Manufacture of starches and starch products	0,176	18,50%	0,949	no	no	**low**	low	low	no conclusion	low
20.15	Manufacture of fertilisers and nitrogen compounds	0,175	31,80%	0,553	yes	no	**low**	low-medium	low-medium	no conclusion	low
23.43	Manufacture of ceramic insulators and insulating fittings	0,164	55,50%	0,296	no	no	**low**	low-medium	low-medium	no conclusion	low
10.41	Manufacture of oils and fats	0,164	43,40%	0,379	no	no	**low**	low	low	no conclusion	low
27.31	Manufacture of fibre optic cables	0,164	57,80%	0,285	no	no	**low**	low	low	no conclusion	low
08.91	Mining of chemical and fertiliser minerals	0,163	62,30%	0,262	yes	no	**low**	low-medium	low	no conclusion	no conclusion
11.06	Manufacture of malt	0,162	32,70%	0,495	no	no	**low**	low	low	no conclusion	low
16.21	Manufacture of veneer sheets and wood-based panels	0,162	23,60%	0,685	no	no	**low-medium**	low-medium	low	no conclusion	medium
23.11	Manufacture of flat glass	0,150	23,70%	0,631	no	no	**low**	low-medium	low-medium	no conclusion	low
05.20	Mining of lignite	0,052	1,70%	3,057	no	no	**low**	low	low	no conclusion	low
21.10	Manufacture of basic pharmaceutical products	0,143	88,60%	0,162	no	no	**low**	low	low	no conclusion	no conclusion

NACE-4	Sector name	Indirect carbon leakage indicator			Eligible under 2012 ETS	Eligible under policy	Overall rating	Market characteristics	Profit margin	Abatement potential	Fuel and electricity substitutabilit
24.20	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0,137	48,50%	0,282	no	no	**low**	low-medium	low-medium	no conclusion	low
23.51	Manufacture of cement	0,135	10,10%	1,330	no	no	**low-medium**	low-medium	low-medium	medium	low
10.81	Manufacture of sugar	0,083	19,70%	0,419	no	no	**low**	low-medium	low	no conclusion	low
08.93	Extraction of salt	0,071	14,10%	0,500	no	no	**low**	low-medium	low	no conclusion	low-medium

APPENDIX 4: CARBON LEAKAGE RISK UNDER SEVERAL SCENARIOS[108]

Table 4: Carbon leakage risk under several levels of compensation

NACE code	Sector name	ICLI	Carbon leakage risk	Option D1: Risk under aid <75%	Option D0: Risk under aid at 75%	Option D2: Risk under aid >75%
24.42	Aluminium production	1.062	**Medium-high**	Low-medium	Low	Low
24.43	Lead, zinc and tin production	0.62	**Medium-high**	Low-medium	Low	Low
24.51	Casting of iron	0.295	**Medium**	Low	Low	Low
24.44	Copper production	0.25	**Medium**	Low-medium	Low	Low
14.11	Manufacture of leather clothes	1.147	**Medium-high**	Low-medium	Low	Low
20.13	Manufacture of other inorganic basic chemicals	0.732	**Medium-high**	Low	Low	Low
20.14	Manufacture of other organic basic chemicals	0.191	**Low**	Low	Low	Low
17.11	Manufacture of pulp	0.521	**Medium-high**	Low-medium	Low	Low
7.1	Mining of iron ores	0.423	Low-medium	Low	Low	Low
17.12	Manufacture of paper and paperboard	0.412	**Medium**	Low-medium	Low	Low
24.1	Manufacture of basic iron and steel and of ferro-alloys	0.363	**Medium**	Low	Low	Low
20.6	Manufacture of man-made fibres	0.282	**Low-medium**	Low	Low	Low
19.2	Manufacture of refined petroleum products	0.267	**Medium**	Low	Low	Low
5.1	Mining of hard coal	0.244	**Low-medium**	Low	Low	Low
24.45	Other non-ferrous metal production	0.241	**Medium**	Low	Low	Low
23.14	Manufacture of glass fibres	0.208	**Low**	Low	Low	Low
16.21	Manufacture of veneer sheets and wood-based panels	0.162	**Low-medium**	Low	Low	Low
8.93	Extraction of salt	0.071	**Low**	Low	Low	Low
20.16	Manufacture of plastics in primary forms	0.246	**Medium**	Low	Low	Low

[108] This assessment is based on the study by Roques and Laroche, see footnote 25 above.

23.11	Manufacture of flat glass	0.15	**Low**	Low	Low	Low
20.11	Manufacture of industrial gases	0.917	Low-medium	Low	Low	Low
7.29	Mining of other non-ferrous metal ores	0.474	Low-medium	Low	Low	Low
8.99	Other mining and quarrying n.e.c	0.438	Low-medium	Low	Low	Low
20.17	Manufacture of synthetic rubber in primary forms	0.337	Low-medium	Low	Low	Low
23.31	Manufacture of ceramic tiles and flags	0.225	Low	Low	Low	Low
20.15	Manufacture of fertilisers and nitrogen compounds	0.175	Low	Low	Low	Low
23.51	Manufacture of cement	0.135	Low-medium	Low	Low	Low
23.43	Manufacture of ceramic insulators and insulating fittings	0.164	Low	Low	Low	Low
11.06	Manufacture of malt	0.162	Low	Low	Low	Low
5.2	Mining of lignite	0.052	Low	Low	Low	Low
24.2	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0.137	Low	Low	Low	Low
10.81	Manufacture of sugar	0.083	Low	Low	Low	Low
13.1	Preparation and spinning of textile fibres	0.244	Low	Low	Low	Low
20.12	Manufacture of dyes and pigments	0.218	Low	Low	Low	Low
13.95	Manufacture non-wovens and articles made from non-wovens, except apparel	0.213	Low	Low	Low	Low
27.2	Manufacture of batteries and accumulators	0.198	Low	Low	Low	Low
10.62	Manufacture of starches and starch products	0.176	Low	Low	Low	Low
10.41	Manufacture of oils and fats	0.164	Low	Low	Low	Low
27.31	Manufacture of fibre optic cables	0.164	Low	Low	Low	Low
8.91	Mining of chemical and fertiliser minerals	0.163	Low	Low	Low	Low

Table 5: Comparison of carbon leakage risk under several scenarios

NACE code	Sector name	ICLI	Risk rating	Risk rating under high carbon scenario	RAG rating before fuel and electricity substitutability
14.11	Manufacture of leather clothes	1.147	**Medium-high**	**Medium-high**	**Medium-high**
24.42	Aluminium production	1.062	**Medium-high**	**High**	**Medium-high**
20.11	Manufacture of industrial gases	0.917	Low-medium	**Medium**	Low-medium
20.13	Manufacture of other inorganic basic chemicals	0.732	**Medium-high**	**Medium-high**	**Medium-high**
24.43	Lead, zinc and tin production	0.62	**Medium-high**	**Medium-high**	**Medium-high**
17.11	Manufacture of pulp	0.521	**Medium-high**	**Medium-high**	**Medium-high**
07.29	Mining of other non-ferrous metal ores	0.474	Low-medium	Low-medium	Low-medium
08.99	Other mining and quarrying n.e.c	0.438	Low-medium	Low-medium	Low-medium
07.10	Mining of iron ores	0.423	Low-medium	Low-medium	Low-medium
17.12	Manufacture of paper and paperboard	0.412	**Medium**	**Medium-high**	**Medium**
24.10	Manufacture of basic iron and steel and of ferro-alloys	0.363	**Medium**	**Medium**	**Medium**
20.17	Manufacture of synthetic rubber in primary forms	0.337	Low-medium	Low-medium	Low-medium
24.51	Casting of iron	0.295	**Medium**	**Medium**	**Medium**
20.60	Manufacture of man-made fibres	0.282	Low-medium	Low-medium	Low-medium
19.20	Manufacture of refined petroleum products	0.267	**Medium**	**Medium**	**Medium**
24.44	Copper production	0.25	**Medium**	**Medium**	**Medium**
20.16	Manufacture of plastics in primary forms	0.246	**Medium**	**Medium**	**Medium**
05.10	Mining of hard coal	0.244	Low-medium	Low-medium	Low-medium
13.10	Preparation and spinning of textile fibres	0.244	Low	Low	Low
24.45	Other non-ferrous metal production	0.241	**Medium**	**Medium**	**Medium**
23.31	Manufacture of ceramic tiles and flags	0.225	Low	Low	Low
20.12	Manufacture of dyes and pigments	0.218	Low	Low	Low
13.95	Manufacture non-wovens and articles made from non-wovens, except apparel	0.213	Low	Low	Low

23.14	Manufacture of glass fibres	0.208	Low	Low	Low
27.20	Manufacture of batteries and accumulators	0.198	Low	Low	Low
20.14	Manufacture of other organic basic chemicals	0.191	Low	Low	Low
10.62	Manufacture of starches and starch products	0.176	Low	Low	Low
20.15	Manufacture of fertilisers and nitrogen compounds	0.175	Low	Low	Low
10.41	Manufacture of oils and fats	0.164	Low	Low	Low
23.43	Manufacture of ceramic insulators and insulating fittings	0.164	Low	Low	Low
27.31	Manufacture of fibre optic cables	0.164	Low	Low	Low
08.91	Mining of chemical and fertiliser minerals	0.163	Low	Low	Low
11.06	Manufacture of malt	0.162	Low	Low	Low
16.21	Manufacture of veneer sheets and wood-based panels	0.162	Low-medium	Low-medium	Low
23.11	Manufacture of flat glass	0.15	Low	Low-medium	Low
21.10	Manufacture of basic pharmaceuticals products (Prodcom 21.10.20.10 & 21.10.20.20)[109]	0.143	Low	Low	Low
24.20	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0.137	Low	Low	Low
23.51	Manufacture of cement	0.135	Low-medium	Low-medium	Low-medium
10.81	Manufacture of sugar	0.083	Low	Low	Low
08.93	Extraction of salt	0.071	Low	Low	Low
05.20	Mining of lignite	0.052	Low	Low	Low

[109] The ICLI is calculated at the NACE code level and not at the Prodcom level.

APPENDIX 5: NUMBER OF UNDERTAKINGS WITH LESS THAN 250 EMPLOYEES

The following table shows the number of undertakings with less than 250 employees and for each sector. The table distinguishes undertakings characterised by the NACE code at primary level and at secondary level.

NACE – 4	Sector name	SME's primary code	SME's secondary code
14.11	Manufacture of leather clothes	1140	2496
24.42	Aluminium production	827	653
20.11	Manufacture of industrial gases	443	429
20.13	Manufacture of other inorganic basic chemicals	684	1051
24.43	Lead, zinc and tin production	157	157
17.11	Manufacture of pulp (one Prodcom)	126	307
07.29	Mining of other non-ferrous metal ores	197	153
08.99	Other mining and quarrying n.e.c.	476	903
17.12	Manufacture of paper and paperboard	1047	1442
24.10	Manufacture of basic iron and steel and ferro-alloys	1576	1822
20.17	Manufacture of synthetic rubber in primary forms	183	190
24.51	Casting of iron	730	583
20.60	Manufacture of man-made fibres	275	240
19.20	Manufacture of refined petroleum	692	560

	products		
24.44	Copper production	166	190
20.16	Manufacture of plastics in primary forms (six Prodcom)	1733	1615
13.10	Preparation and spinning of textile fibres	1683	994
05.10	Mining of hard coal	77	123
24.45	Other non-ferrous metal production	396	540
23.31	Manufacture of ceramic tiles and flags	677	682
20.12	Manufacture of dyes and pigments	365	369
13.95	Manufacture of non-wovens and articles made from non wovens, except apparel	444	929
23.14	Manufacture of glass fibres	321	270
20.14	Manufacture of other organic basic chemicals	1078	1313
10.62	Manufacture of starches and starch products	195	438
20.15	Manufacture of fertiliser and nitrogen compound	1042	1062
10.41	Manufacture of oils and fats	3223	1916
08.91	Mining of chemicals and fertilising minerals	71	187
11.06	Manufacture of malt	99	316

16.21	Manufacture of veneer sheets and wood-based panels	1232	4073
23.11	Manufacture of flat glass	296	455
07.10	Mining of iron ores	45	51
21.10	Manufacture of basic pharmaceuticals products	731	1475
24.20	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	1286	1011
23.51	Manufacture of cement	224	508
10.81	Manufacture of sugar	178	543
08.93	Extraction of salt	124	93
06.10	Extraction of crude petroleum	176	133
19.10	Manufacture of coke oven products	47	154
23.13	Manufacture of hollow glasses	827	484
23.19	Manufacture and processing of other glass, including technical glassware	1419	1418
23.20	Manufacture of refractory products	464	620
23.52	Manufacture of lime and plaster	337	681
23.99	Manufacture of other non-metallic mineral products	1792	1459
24.31	Cold drawing of bars	129	309
24.46	Processing of nuclear	52	16

	fuel		
13.30	Finishing of textile	4663	4435
24.41	Manufacture of ceramic household and ornamental articles	4028	1599
23.42	Manufacture of ceramic sanitary fixtures	197	597
23.32	Manufacture of bricks, tiles and construction products in backed clay	870	675

Source: Orbis, accessed in May 2020
The database Orbis provides only data at Nace code 4 digits level. Therefore, the possibility to retrieve and show data at Prodcom level is hindered.

APPENDIX 6: ADDITIONAL DATA ABOUT CO_2 FACTORS

a) National CO_2 factors

The national CO_2 emission factors have evolved since 2014 as shown by Table 6 below.

Table 6: Evolution of national emission factors 2002-2017

Zones	**2002**	**2005**	**2008**	**2011**	**2014**	**2017**
Belgium	0.55	0.52	0.43	0.41	0.43	0.36
Bulgaria	1.03	1.05	0.98	0.99	0.97	1.00
Czechia	0.99	1.00	0.99	0.93	0.91	0.83
Denmark	0.57	0.54	0.57	0.55	0.6	0.61
Germany	0.83	0.79	0.77	0.76	0.81	0.75
Estonia	1.02	1.01	1.04	1.08	1.14	1.07
Ireland	0.68	0.64	0.55	0.56	0.59	0.55
Greece	0.88	0.88	0.81	0.84	0.9	0.72
Spain	0.84	0.68	0.56	0.61	0.73	0.70
France	0.67	0.70	0.67	0.58	0.67	0.51
Croatia	0.69	0.70	0.67	0.63	0.77	0.54
Italy	0.59	0.55	0.52	0.52	0.56	0.49
Cyprus	0.76	0.80	0.77	0.77	0.71	0.71
Latvia	0.42	0.38	0.36	0.34	0.35	0.31
Lithuania	0.47	0.46	0.44	0.43	0.4	0.42
Luxembourg	0.39	0.37	0.37	0.37	0.38	0.42
Hungary	0.74	0.867	0.62	0.65	0.78	0.64
Malta	0.94	0.87	0.85	0.87	0.73	0.48
Netherlands	0.52	0.51	0.5	0.47	0.53	0.51
Austria	0.58	0.55	0.53	0.49	0.52	0.42
Poland	0.86	0.83	0.84	0.84	0.84	0.82
Portugal	0.69	0.65	0.59	0.61	0.8	0.62
Romania	0.78	0.80	0.87	0.88	0.83	0.85
Slovenia	0.98	0.93	0.92	0.91	0.9	0.77
Slovakia	0.83	0.81	0.84	0.69	0.76	0.72
Finland	0.62	0.55	0.59	0.62	0.62	0.59
Sweden	0.54	0.59	0.6	0.52	0.61	0.63
United Kingdom	0.64	0.65	0.61	0.61	0.66	0.44
Norway	0.58	0.72	0.81	0.69	0.54	0.7

APPENDIX 7: QUANTIFICATION OF OPTIONS

This quantification is based on indirect emissions and electricity consumption data used for the purpose of establishing the Carbon leakage list 2021-2030. These data come from a data collection exercise and are averaged over 2013-2015. Therefore, the proportion of emissions with respect to the whole EU ETS or to emissions from power production has been calculated based on average verified emissions over the same period 2013-2015[110].

In order to estimate the **maximum compensation budget**, the calculation assumes a carbon price at 25 EUR/ton (and a stable aid intensity at 75% - baseline D0 option - for each eligibility option).

The calculation is top-down – starting from data at sector level – and therefore do not take into account differences in energy efficiency across installations. A calculation "bottom-up" starting from data at installation level was not possible due to lack of available data at undertaking level. The estimation of the maximum budget assumes that only Member States (and EFTA States) with current scheme in place[111] will continue to compensate and at the same level as previously. This estimation does not take into account the overall budget cap defined as 25% of the revenues generated from the auctioning of allowances.

In order to reflect the geographic repartition of each sector, the indirect ETS costs, indirect emissions and electricity consumption for each sector have been allocated among Member States (and EFTA States) following the Gross Value Added (GVA) distribution across Member States (and EFTA States) for each sector.

For all the reasons stated above, the quantification of compensation budget, indirect emissions and electricity consumption represent therefore a broad estimation.

a) Eligibility options

The following table shows the estimated compensation budget, compensated indirect emissions and electricity consumption – under the baseline option of 75% aid intensity.

Over 2013-2015, the average annual verified emissions of the EU ETS amounted to 1.841.667.083 tons, of which 1.064.666.667 tons are from power generation.

[110] See Report from the Commission to the European Parliament and the Council - Report on the functioning of the European carbon market - COM/2019/557 final/2

[111] Twelve Member States (Germany, the Netherlands, Belgium (Flanders and Wallonia), Spain, Greece, Lithuania, Slovakia, France, Finland, Luxembourg, Poland, Romania), the United Kingdom, and Norway have implemented a scheme under the 2012 ETS Guidelines.

Table 7: Estimated budget, compensated indirect ETS costs and electricity consumption under each eligibility option

	MS with a scheme in place				
	Budget (eur)	Indirect emissions compensated (tons)	% EU ETS	% Emissions from power generation	Electricity consumption
A0	1.454.591.714	58.183.669	3,2%	5,5%	173 TWh
A1	3.352.914.379	134.116.575	7,3%	12,6%	391,6 TWh
A2	2.676.450.019	107.058.001	5,8%	10,1%	314 TWh
A3	1.409.506.200	56.380.248	3,1%	5,3%	168,7 TWh
A4	1.455.932.175	58.237.287	3,2%	5,5%	174,1 TWh

b) Proportionality – aid intensity

The following table shows the estimated compensation budget, compensated indirect emissions and electricity consumption – for each option of aid intensity. The low aid intensity has been assumed at a level of 65% and the high intensity at a level of 85%. These estimations are static, in the sense that they do not take into account potential degressivity over time.

Table 8: Estimated budget in function of the aid intensity (in EUR), under each eligibility option

	Budget			
	Same as 2012 Guidelines -75%	Aid intensity < 75% (at 65%)	Aid intensity > 75% (at 85%)	75% + GVA cap
A0	1.454.591.714	1.260.646.152	1.648.537.275	1.473.100.867
A1	3.352.914.379	2.905.859.128	3.799.969.629	3.594.259.332
A2	2.676.450.019	2.319.590.017	3.033.310.022	2.917.794.973
A3	1.409.506.200	1.221.572.040	1.597.440.360	1.428.015.353
A4	1.455.932.175	1.261.807.885	1.650.056.465	1.474.441.329

Table 9: Indirect emissions compensated (in tons CO2) in function of the aid intensity, under each eligibility option

	Indirect emissions compensated			
	Same as 2012 Guidelines -75%	Aid intensity < 75% (at 65%)	Aid intensity > 75% (at 85%)	75% + GVA cap
A0	58.183.669	50.425.846	65.941.491	58.924.035
A1	134.116.575	116.234.365	151.998.785	143.770.373
A2	107.058.001	92.783.601	121.332.401	116.711.799
A3	56.380.248	48.862.882	63.897.614	57.120.614
A4	58.237.287	50.472.315	66.002.259	58.977.653

Table 10: Proportion of indirect emissions compensated in function of the aid intensity, under each eligibility option

	Indirect emissions as % EU ETS			
	Same as 2012 Guidelines -75%	Aid intensity < 75% (at 65%)	Aid intensity > 75% (at 85%)	75% + GVA cap
A0	3,2%	2,7%	3,6%	3,2%
A1	7,3%	6,3%	8,3%	7,8%
A2	5,8%	5,0%	6,6%	6,3%
A3	3,1%	2,7%	3,5%	3,1%
A4	3,2%	2,7%	3,6%	3,2%

Table 11: Indirect emissions as a proportion of emissions from power generation, in function of the aid intensity, under each eligibility option

	Indirect emissions as % emissions from power producers			
	Same as 2012 Guidelines -75%	Aid intensity < 75% (at 65%)	Aid intensity > 75% (at 85%)	75% + GVA cap
A0	5,5%	4,7%	6,2%	5,5%
A1	12,6%	10,9%	14,3%	13,5%
A2	10,1%	8,7%	11,4%	11,0%
A3	5,3%	4,6%	6,0%	5,4%
A4	5,5%	4,7%	6,2%	5,5%

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