EVALUATION OF THE EU ETS DIRECTIVE

Carried out within the project
“Support for the Review of the
EU Emissions Trading System”

November 2015

ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

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Directorate-General for Climate Action
Directorate B – European & International Carbon Markets
Unit B.1 – Implementation of ETS

E-mail: *Clima-ETS-Info@ec.europa.eu*

European Commission
B-1049 Brussels

EVALUATION OF THE EU ETS DIRECTIVE

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"Support for the review of the
EU Emissions Trading System"

Hubert Fallmann
Christian Heller
Katrin Seuss
Monique Voogt
Dian Phylipsen
Sjors van Iersel
Machtelt Oudenes
Elizabeth Zelljadt
Jenny Tröltzsch
Matthias Duwe
Arne Riedel

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1.1 About this report

Policy context

The European Union has been implementing an ambitious climate policy for the last two decades. In 2008, the climate and energy package[1] – including a thorough review of the EU Emission Trading Scheme (EU ETS) – set out a policy architecture and targets to be achieved by 2020. Long-term climate targets for the first half of the century were set out in a roadmap[2] presented in 2011. In order to make this roadmap operational for the coming years, the discussion that followed focussed on the targets to be achieved by 2030[3]. The discussion culminated in the conclusions[4] of the European council in October 2014, which set out a framework of measures, which the Commission was invited to implement in concrete policy measures as soon as possible. The council conclusions contain *inter alia* elements to be implemented by a revision of the EU ETS Directive[5].

According to the Commission's "Better Regulation" agenda[6], any legislative proposal is to be accompanied by an Impact Assessment (IA) and (if applicable) an Evaluation of already existing legislation in this area. In late 2014 the Commission therefore contracted a consortium of consultants[7] for support in this work.

Methodology

The evaluation follows the Commission's better regulation guidelines, to the extent possible given the time overlap between the development of these guidelines and the writing of the report, and using a systematic approach to evaluate relevance, effectiveness, efficiency, coherence and EU-added value of the EU ETS Directive with a main focus on the third phase of the EU ETS (starting from 2013). The predominant methodology for evaluation is literature research, i.e. it was not aim of this study to replicate work already done by other researchers. Wherever possible, findings were "triangulated" by bringing together results of similar studies and checking the consistency of findings. Only occasionally the project team had to carry out own analyses due to a lack of other information sources.

Note that the evaluation presented in this report was carried out during the **first quarter of 2015**. Consequently information and studies which became available

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1 http://ec.europa.eu/clima/policies/strategies/2020/index_en.htm

2 http://ec.europa.eu/clima/policies/strategies/2050/index_en.htm

3 http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm

4 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf

5 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.

6 http://ec.europa.eu/smart-regulation/index_en.htm

7 The consortium was led by ICF International Limited. Further members are Umweltbundesamt GmbH (Austria), SQ Consult B.V., Ecologic Institut, Vivid Economics and ZEW. The evaluation work presented in this report was led by Umweltbundesamt, and was performed by Umweltbundesamt, SQ Consult and Ecologic.

only after March 2015 were not taken into account. The same applies for policy developments such as the adoption of the market stability reserve (MSR).

Report structure

After a description of the EU ETS and the methodology used (chapter 2), evaluation findings are discussed in detail in chapter 3. First the functioning of the EU ETS in general was evaluated (section 3.1). Thereafter some elements (so-called “evaluation areas”) are discussed in more detail as follows:

- Cap setting (see section 3.2)
- Auctioning (see section 3.3)
- Free allocation and carbon leakage (see section 3.4)
- Support for indirect CO_2 costs (see section 3.5)
- The compliance system (monitoring, reporting, verification, accreditation; see section 3.6)
- Registry system (see section 3.7)
- The NER 300 funding programme (see section 3.8)
- Transitional free allocation for the modernisation of the power sector (see section 3.9)
- ETS and small operators (see section 3.10)
- Impact of EU ETS on households (see section 3.11)

This executive summary follows the same approach and chapter structure.

1.2 Design of the EU ETS

The EU ETS is a classical “cap & trade” system. It achieves its environmental goal by definition – the aggregate emissions of a large number of covered entities cannot exceed an absolute ceiling of (annual) emissions. The main difference to “command & control” systems is that the individual participant in the system does not get an individual (legally binding) target for his emissions, and thereby an amount of emission reductions that the individual must make. Instead, the overall target must be achieved *jointly by all participants.* The distribution of efforts among participants (who reduces emissions by how much) is determined through a market interaction on the basis of the various emitters' marginal abatement costs. This is achieved by allocating units of “rights to emit” for free or through auctions. In the EU ETS they are called “allowances”, with a value equivalent to the emission of one metric tonne CO_2. Those rights can be freely traded. Hence each actor (in the EU ETS these are operators of stationary installations and aircraft operators[8]) can decide whether to emit a certain amount of greenhouse gases (GHGs) and cover them with allowances, or whether to reduce emissions so that he will purchase fewer allowances, or is able to sell allowances in case of an allocation surplus.

[8] Note that this study was designed with focus on stationary installations only. It does not explicitly address issues related to aviation emissions as covered under the EU ETS. As indicated in EU Regulation (EU) No 421/2014, following the 2016 ICAO assembly, the Commission shall report on actions to implement an international agreement on a global market-based measure from 2020, that will reduce greenhouse gas emissions from aviation in a non-discriminatory manner.

In order to make the system work, the following elements are required:

- A definition of the environmental goal, corresponding to the emissions "cap", i.e. the total amount of allowances available each year. In practice it is furthermore necessary to define the length of trading periods, banking and borrowing rules, and whether the use of offset credits (i.e. external tradable units are allowed[9]);
- The cap must be lower than expected 'business as usual' emissions, so that scarcity of allowances leads to the development of a positive allowance price. The CO_2 price in turn creates the incentive for participants to reduce their emissions cost-effectively;
- There should be predictability of the allowance scarcity in the system, so that participants can decide on long-term investments in low-carbon technologies.
- Allocation mechanisms (auctioning or free allocation);
- A robust compliance system with rules for Monitoring, Reporting and Verification (MRV) of emissions, including definition of enforcement measures (effective penalties);
- An accounting system for the allowances, i.e. a registry system;
- Development of market places is usually left to the private sector. However, market oversight rules should be defined by the legislator.

The above elements are considered essential for any emission trading system. In the practice of developing the EU ETS, legislators found it important to implement further measures in order to make the EU ETS more efficient or to increase stakeholders' acceptance of the system. These measures can therefore be considered optional to some extent:

- As a result of the CO_2 price developed through the scarcity of allowances, participants in the EU ETS face higher production costs than competitors outside the EU, if they are not subject to similar climate policies themselves. In order to prevent the effect of "carbon leakage" (see 1.3.4), some compensation may be granted. In the case of the EU ETS, the compensation consists of the following elements:
  - Criteria for identifying which industry sectors are exposed to a significant risk of carbon leakage (CL). Those sectors receive higher amounts of free allocation than "normal" industry;
  - Benchmark-based allocation for free to industry with the exception of electricity production;
  - Member States are allowed to grant financial support to CL-exposed sectors for the price increase of electricity caused by CO_2 costs in the power sector (so-called "indirect emissions").
- Support mechanisms for innovation and investments which are favourable for a decarbonisation of the economy, but for which support is needed in addition to the incentive created by the CO_2 price. In the EU ETS, these measures are:

[9] The evaluation of this aspect was outside the scope of this study.

  - The “NER 300” programme[10] which is set up to support demonstration activities for Carbon Capture and Storage (CCS) and innovative renewable energy techniques to reach market readiness at industrial scale.
  - An optional support scheme for certain Member States to speed up the process of modernising their power sector (including electricity generation as well as the distribution networks) and to diversify their energy mix. This “Article 10c” scheme works by granting a certain amount of free allocation as derogation from auctioning to operators of power plants, provided that appropriate investments are proven.
- In order to reduce the administrative costs, Member States are allowed to exclude “small installations” (i.e. installations with low emissions) from the EU ETS, provided that equivalent measures are in place incentivising emission reductions by those installations.

1.3 Evaluation findings

1.3.1 EU ETS in general

Background

The design and functioning of the EU ETS is described briefly in section 1.2 and elaborated in section 2.1 of this report. In section 3.1, the functioning of the EU ETS in general is evaluated. The effectiveness evaluation concentrated on whether the EU ETS Directive resulted in the development of a CO_2 market, whether a carbon price developed which can be explained by market fundamentals (supply/demand) and factors related to GHG emissions such as fuel mix and economic activity (production levels). Furthermore it was important to find evidence if the EU ETS is delivering signs of a transformation to a low-carbon economy. The evaluation of the other criteria also focussed on the overarching characteristics of the EU ETS architecture, as more detailed evaluation is carried out in the sections thereafter.

Evaluation results

Regarding **relevance**, the evaluation has found that the EU ETS Directive is highly relevant for the EU’ climate policy, as it targets about 40% of the EU’s GHG emissions while regulating only some 11 000 installations and 600 aircraft operators. The instrument is able to react to external factors such as technological progress, and can be easily adapted to new needs such as more ambitious GHG emission targets.

The EU ETS has been found to be **effective**. A functioning CO_2 market has been established, and a CO_2 price has evolved. Literature research has proven that clear drivers for the CO_2 price can be identified. Firstly, market fundamentals (supply/demand) have the expected influence, although regulatory uncertainty contributes to some unexpected volatility. Fuel prices, in particular the coal/gas switching price, economic activity levels, and the electricity price have been identified as further influencing factors.

[10] The name is hinting at the 300 million allowances which are taken from the NER (New Entrants Reserve) and sold for raising the funds used by this programme.

It has also been found that CO_2 costs are internalised in product prices, at various levels depending on industry sector. In spot electricity prices this can also be observed, but the effect is partly offset by renewable energy effects. Investments in energy efficiency and GHG emission reductions are found to take place, albeit at smaller scale than considered necessary for a long-term transition to a low-carbon economy. Break-through technologies are currently not visibly applied. Nevertheless studies on the first two phases of the EU ETS conclude that innovation[11] in low GHG technologies was accelerated since the introduction of the EU ETS. Studies furthermore confirm that emission reductions were made, and that significant parts thereof are caused by EU climate policies, of which some are founded in the CO_2 price, and others by RES policies. However, the strong economic downturn starting in 2008 overshadows to some extent the reductions caused by the EU ETS. This makes it difficult to quantify the emission reductions that can be attributed directly to the impacts only of the EU ETS while excluding other factors.

The biggest **strengths of EU ETS** are the environmental integrity, since the outcome is ensured as defined by the cap. A CO_2 tax cannot achieve this. Furthermore the economic efficiency must be mentioned. If sufficient transparency prevails on the market, the carbon price corresponding to the environmental target is found by the market “automatically”, and most cost-effective emission reductions are made first. **Weaknesses** found include that without additional safeguards the carbon price may drop too low for achieving sufficient investments in innovative low-carbon technologies for a long-term decarbonisation of the economy. Political and regulatory uncertainty have resulted in delayed decision making among EU ETS participants regarding long-term investments required for significant GHG emission reductions.

Efficiency: Cap and trade, such as the EU ETS, is considered best fit to achieve emission reductions cost-effectively. Command and control policies are more costly overall. While carbon taxes theoretically are equally efficient as cap & trade, their main drawback is that price discovery is less efficient, and the environmental outcome less predictable.

The scope of the EU ETS, focussing on (big) industrial emitters, is in line with the overall efficiency expectations of the EU ETS. Compliance costs (costs for purchase of allowances and administrative costs) are not excessive, and proportionate in relation to the objective of achieving the emission reduction targets.

The **costs of the EU ETS** are to be weighed against the value created by the EU ETS, which is – like the costs – shared between governments and industry. The amount of allowances auctioned by Member States in 2013 was 808 million allowances, while industry received free allocation amounting to 995 million allowances. With the average carbon price, Member States' revenues[12] were about 3.6 billion €, and are expected to increase with allowance prices. At the same time, energy intensive industries have received revenues in the range of 4.5 billion € in the form of free allowances, and the value of the allowances used for compliance, but not given out for free, was some 4 billion €. These figures show that not only the value of the assets in the EU ETS, but also the distribu-

[11] Innovation can be measured e.g. by assessing the number of relevant patent applications.
[12] For the calculation the average EUA price achieved in auctions in 2013 was used (4.45 €/EUA).

tion of these assets between industry and Member State governments is crucial for judging the efficiency of the EU ETS. Clearly, the costs of achieving EU climate targets would be higher in the absence of the EU ETS, i.e. if non-market based mechanisms were to be used. Thus the EU ETS is considered efficient.

The EU ETS Directive is found to have high **EU-added value**: The EU-wide application of the EU ETS is a prerequisite for ensuring a level playing field for Europe's industry in the internal market. Modelling before the implementation of the EU ETS has shown that reaching the EU's Kyoto target would be much more expensive for the EU without an EU-wide emission trading system. Consequently, the EU-wide character of the EU ETS is neither questioned by stakeholders nor in literature.

When it comes to **coherence**, the EU ETS Directive is well aligned with other EU climate legislation, as well as with legislation on industrial emissions (IED). The EU ETS Directive's effectiveness is to some extent influenced by the effects of the Directives on renewable energy sources (RES) and energy efficiency (EE). Both Directives result in emission reductions which might not have happened to the same extent with the EU ETS alone. They thereby influence the carbon price, but not the functioning of the EU ETS. All three instruments thus serve the joint effort to reach the EU's climate targets, and thus can be considered coherent. Finally, the EU ETS is also highly coherent with the EU's international commitments under the UNFCCC. The introduction of the Market Stability Reserve (not analysed in this report as it was not adopted at the time of writing) will further contribute to the coherence of the EU ETS Directive with other EU climate and energy legislation, by allowing the supply of allowances for auctioning to react to changes in demand.

1.3.2 Cap setting

Background

In this section the mechanism of cap setting is evaluated. Aspects considered include the administrative procedure which was necessary to define the cap, and in particular the improvements brought by the switch from national allocation plans (NAPs) in Phases I and II to an EU-wide cap defined already in the EU ETS Directive. The section also deals with the stringency of the cap and how it impacts the CO_2 price. In this context it must be noted that negotiations over the Commission's proposal for a Market Stability Reserve (MSR) was already quite advanced while this report was written. However, final decision on and implementation of the MSR were still pending. Thus, this evaluation is limited to the situation as it is without the MSR – allowance prices are too low to lead to enhanced investment in low-carbon technologies. Because an extensive impact assessment was prepared by the Commission for the MSR, the respective assessments have not been repeated in the evaluation. However, prospects are good that the allowance price will progressively recover over the coming years, and that the evaluation results would be much better, if the evaluation were repeated within a couple of years.

Evaluation results

Cap setting is found highly **relevant** for the EU ETS and EU climate policy in general. Without a defined cap the EU ETS would have no environmental target, and no stable carbon price could evolve. It is also found highly **coherent** with the EU climate policy framework and international framework (Kyoto commitment periods).

There is also clear evidence for the **effectiveness** of the cap setting as part of the EU ETS: A functioning carbon market has evolved. The cap has achieved its purpose, i.e. establishing a CO_2 price, albeit the economic downturn since 2008 could have made the cap less stringent, as some argue. Despite a lack of full consensus in literature, it may be concluded that the low CO_2 price evolving as a consequence is a proof that the EU ETS follows market fundamentals.

Regarding the environmental *short term* effectiveness of the cap, it must be noted that in individual years (including the target year 2020) the emissions could theoretically be higher than the cap, due to temporal flexibility. However, the cap (i.e. the desired environmental outcome) for the third trading period cumulatively will likely be met. When it comes to the *long term* effectiveness, there is consensus that a stronger price signal is needed to provide incentives for investments in the sustainable transition to a low-carbon economy. Studies show that current GHG reductions are not solely attributable to the economic downturn, but also to climate policies like in particular the EU ETS. In this regard, the EU ETS and its cap proved effective. Nevertheless, continued investments in low-GHG technology are required in the future. Whether the new way of setting the cap from the third phase onwards has changed the situation, cannot be judged yet based on existing data. However, it is expected that the upcoming MSR will contribute to increased CO_2 prices and will thereby strengthen the existing mechanism of cap-setting. The long term effectiveness of the ETS will improve then, too.

The process of cap setting has become **more efficient** compared to Phase II. Less administrative effort was needed in the third phase due to a central data management instead of handling 28 National Allocation Plans (NAPs). Further improvement comes from the fact that cap setting has become a one-off exercise, which will not have to be repeated in coming trading phases.

EU-added value is high, i.e. Member State level interventions would be less favourable. Transparency and predictability have strongly increased as consequence of the 2008 EU ETS review. In combination with EU-wide allocation rules (see 1.3.4 and 3.4), a level playing field for industry across the EU has been established.

1.3.3 Auctioning

Background

The EU ETS Directive has made auctioning the default method of allocation from 2013 onwards. Exceptions are transitional free allocation to industry (Article 10a) and in particular to sectors exposed to a significant risk of carbon leakage (see sections 1.3.4 and 3.4), and the optional derogation for modernisation of the power sector in certain Member States (Article 10c, see sections 1.3.9 and 3.9). Evaluation of auctioning presented below focussed on the functioning of auctions.

Evaluation results

Auctioning has been found highly **relevant**, as it supports the goal of the EU ETS of being an efficient means of GHG emission reduction. Auctioning is regarded the most efficient allocation system. There are several elements fully **effective** already: Auction platforms have been appointed. The planned amounts of allowances are being auctioned. Auctions have been conducted in an open and transparent manner. Some concern may be raised about some delays in reporting on some non-essential elements for some auctions, and findings that access by SMEs and small emitters could be improved in some platforms. In this regard, the main area through which access could be facilitated would be through improved access to information.

More than 50% of auction revenues are used for the purposes listed in the EU ETS Directive, with the major share contributed by Germany, which uses 100% of auction revenues for the appropriate climate-related purposes. However, a couple of Member States failed to report on revenue use in 2013, and for some Member States the figures lack transparency. A (non-crucial) issue remains the lack of an appointed auction monitor. If this were solved, confidence could be further increased regarding the level of harmonization to which of the supervision of auction platforms is applied in all auctioning jurisdictions[13].

Auctioning is the most **efficient** allocation system, leading to the most efficient CO_2 price formation according to theory. While administration of auctioning is cheaper than setting up a benchmark-based free allocation system (see section 3.4.5.3), the full benefit of this efficiency is currently not reaped, since both systems co-exist simultaneously in the EU ETS. Particular costs may occur for operators from membership in the auction platforms, but these are relatively negligible compared to the value of purchased allowances, at least for those operators aiming to buy significant amounts of allowances. Moreover two of the three auction platforms covering 90% of the auctioned volumes provide auction-only and minimal function access to the auctions with reduced costs. No significant structural premiums on auction prices have been found compared to the secondary market, further underlining the efficiency of auctioning under the EU ETS.

[13] Because the supervision of the auction platforms is currently done autonomously by different National Competent Authorities identified under the Market in Financial Instruments Directive, (MiFID), appointment of the Auction Monitor could reduce the risk that their activities are not 100% harmonized.

Regarding **EU-added value** it has been found that administrative costs are limited by the EU-wide action for both authorities and EU ETS participants, compared to running 31 parallel systems.

Coherence of auctioning with other elements of the EU ETS Directive (internal coherence), in particular free allocation, is well established within the Directive. This has led to some practical issues (caused by extensive data requirements for free allocation) and, in the early stages of auctioning, some delays in establishing a small portion of the volumes covered in the auctioning calendars. However, after the start of the third trading period remaining uncertainties are limited. External coherence of auctioning with other interventions that have similar objectives is less straightforward. Since financial market law applies indirectly to the auctioning of allowances[14], the possibility that financial market law may not be applied in a fully harmonized way among Member States could slightly decrease the external coherence of auctioning in the EU ETS. To the extent that there are developments in financial markets law that apply to secondary markets – including spot emission allowances – the provisions regulating auctions may need to be amended to ensure continued coherence with financial markets law. Moreover, developments in other policies with an impact on the ETS can also impact the coherence of auctioning.

1.3.4 Free allocation and carbon leakage

Background

Cap and trade systems like the EU ETS put a price tag on GHG emissions and hence provide an economic incentive to minimize the increase of production costs associated with GHG emissions. Wherever possible, economic rational behaviour will lead producers covered by the EU ETS to pass-through those costs in their product prices. This is an intended effect of the EU ETS: more GHG-intensive products would contain a higher carbon cost than products from more efficient producers or other production processes. This would lead consumers to favour the more GHG efficient products/producers. In this way GHG reductions can be triggered along the whole value chain, and the ETS can exploit its full efficiency.

However, where producers face competition from countries not imposing a CO_2 price or similar climate policy, their ability to pass-through the carbon-induced costs may be limited by the risk of losing market share. This competitive disadvantage can lead production to move to countries without or with lower CO_2 costs – potentially increasing overall global emissions. This theoretical effect has become known as “carbon leakage” (CL).

In order to reduce the potential risk of carbon leakage, the EU ETS Directive contains several measures:

- Industry with the exception of electricity production will receive a significant part of their allocation for free, in order to achieve a smoother transition to full auctioning in the future;

[14] E.g. by virtue of requiring that auction platforms be regulated markets supervised by the national competent authorities

- Criteria are defined which allow the Commission to identify industry sectors deemed exposed to a significant risk of CL. Those sectors receive higher amounts (100 % of the benchmark) of free allocation than “normal” industry (80 % decreasing to 30 % in 2020);
- EU-wide fully harmonised rules based on ex-ante product benchmarks (and fall-back approaches) are put in place for determining the free allocation to each installation.

Note that Member States are furthermore allowed to grant financial support to CL-exposed sectors for the price increase of electricity caused by CO_2 costs in the power sector (so-called “indirect emissions”). This is discussed separately (see sections 1.3.5 and 3.5).

The evaluation in this area deals with the concept of CL, whether it can be proven by evidence, assessment of the criteria set out in the Directive and whether free allocation can indeed help to reduce the risk of CL. The second aspect evaluated is the functioning of the free allocation rules and the related administrative procedures.

Evaluation results

Regarding **relevance**, the evaluation first focussed on whether evidence can be found for actual carbon leakage. The difficulty in any such evaluation, however, lies in the need to establish a causality link between relocation of production and asymmetric climate policies. This difficulty remains unresolved based on current findings. The results of the evaluation suggest that carbon leakage has not occurred in the first two phases of the EU ETS. However, this does not necessarily mean that CL might not happen in the future. There are also studies that argue that the risk of CL needs to be studied over a longer timeframe.

As of Phase III, it remains to be seen how free allocation may have safeguarded against negative impacts on competitiveness and whether the allocation rules have the potential to further prevent or at least reduce the risk of carbon leakage. Carbon leakage will be of lesser concern if extra-EU competitors put in place similar policies. Although there is a growing and encouraging number of jurisdictions implementing or considering carbon markets or taxes, according to the evaluation it is too early to use them as argument that carbon leakage is not relevant any more.

Most importantly, the found absence of evidence of carbon leakage may be caused by the low CO_2 price observed for much of the period covered in the evaluation. Furthermore, stakeholders are still claiming that there is a continued need to prevent carbon leakage. It is therefore advisable to continue to observe if evidence for CL occurs in the future.

The evaluation on **effectiveness** starts with checking if the current CL criteria in the EU ETS Directive are capable of identifying those sectors (and only those) which are at genuine risk of carbon leakage. Some authors link CL to the ability of industry to pass costs on to their customers. Most sectors are found to be able to pass-through considerable amounts of costs, although quantitative findings differ between different studies. Ability to pass-through CO_2 costs should therefore not be the only criterion for CL, in particular because it is difficult to robustly quantify empirically. However, it shows that a differentiation of sectors based on pass-through ability would be justified in order to avoid windfall profits from free allocation.

The EU ETS currently uses two criteria for identifying sectors at risk of CL: (i) Carbon intensity: This criterion shows good correlation with a "vulnerability score" developed by a group of researchers based on interviews of managers of EU ETS installations. (ii) Trade intensity: Several authors find that this criterion (in particular when used as only criterion) was not useful, and should be discarded.

In a next step, the evaluation focussed on the effectiveness of free allocation to reduce the risk of carbon leakage: With current allocation rules and CL criteria, free allocation is found to be at a level high enough so that several important sectors would not meet the Directive's CL criteria anymore, because the CO_2 costs are actually significantly reduced by the provision of free allocation. The fact that the CL risk is further reduced can be concluded from the finding that some part of the CO_2 costs can be passed on to customers by industry. Exceptions are sectors where trade intensity is the decisive CL criterion. It must be noted that this conclusion applies at the level of the whole sector, while in case of individual installations there may exist exceptions to that rule.

Efficiency: First, the impact on auction revenues for Member States as the biggest impact of free allocation was evaluated: Some studies indicate that the windfall profits of industry as a result of free allocation rules could have been in the range of one billion Euros in 2013. Consequently the same amount can be considered an annual loss of auction revenues for Member States which could be avoided without negative impact on industry's CL risk. With increasing carbon prices, these losses will proportionally increase in the future.

Secondly, potential distortions of the CO_2 price signal were considered: Summarising the findings in literature, it can be concluded that free allocation does distort the CO_2 price signal to some extent, despite the theoretical independence between allocation method and abatement behaviour. This means that overall achievement of the GHG emission reductions as defined by the cap could be achieved at lower cost if no allocation were granted for free. However, a quantification of this effect has not been found.

Finally, administrative costs of free allocation were evaluated as indicator for efficiency: The administrative costs for the free allocation under current rules are estimated to be less than 1 % of the value of allowances allocated. It is assumed that the order of magnitude is similar or lower compared to the costs in the first phases[15], and expected to decline in the future. The costs are considered to be at a reasonable order of magnitude. For completeness reasons it has also been determined that costs are much lower for ex-ante allocation rules than for an ex-post allocation system.

Regarding **EU-added value**, the third trading phase has brought full EU-wide harmonisation of allocation rules. The EU ETS Directive thus ensures an unprecedented level playing field for industry across the EU, such that the allocation for identical installations is now identical in every Member State. Clearly, this could not have been achieved by national legislation only.

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[15] The fully harmonised rules in the third phase have certainly contributed to cost savings compared to a system with 31 different sets of allocation rules. However, this advantage is compensated by the fact that a benchmark-based system requires more demanding data collection by operators and a more elaborate approval process by the authorities than if using grandfathering, which was the predominant allocation method during the first two phases.

Coherence: Although free allocation is an exception to the 'polluter pays' principle enshrined in the Treaty on the functioning of the EU, this is at least partly alleviated by the fact that opportunity costs are still faced by EU ETS operators, and the exception has been justified for avoiding carbon leakage. As shown under "efficiency", free allocation features some potential for distorting the CO_2 price signal, i.e. for making the EU ETS less cost efficient. However, the overall goals of the EU ETS are not affected by free allocation. Double subsidies due to free allocation and other measures are unlikely. Thus the internal coherence of the EU ETS is found to be a given.

1.3.5 Support for indirect CO_2 costs

Background

Electricity producers are usually able to pass CO_2 costs on to their clients. These "indirect CO_2 cost increases" brought about by the EU ETS can have an impact on the risk of CL in some industry sectors (including some which are not covered themselves by the EU ETS). In order to mitigate this type of CL risk the EU ETS Directive allows Member States to provide for financial support to those sectors, provided that the state aid guidelines in this area are respected. Those guidelines define the sectors eligible for such support, electricity consumption benchmarks (for providing an incentive for energy efficiency) and quantitative limits for the support. Currently only six Member States[16] are known to make use of this measure.

Evaluation results

Relevance of compensation for indirect CO_2 costs is given only to the extent that industries are exposed to a significant risk of carbon leakage, and where their competitiveness can't be protected by free allocation. This is the case where they are affected more by cost increases caused by (indirect) CO_2 emissions covered by the EU ETS in the power sector than by own (direct) GHG emissions. This concerns a relatively limited number of industry sectors. As potential reasons for Member States for adopting the measure, the following factors were analysed: Electricity prices and increases thereof, tax levels on electricity, share of electricity-intensive industries, political reasons. However, no clear reasons (except potentially political ones) could be identified why it was only those six Member States which adopted this measure.

The **effectiveness** of indirect cost compensation could not be determined sufficiently. This is mainly because evidence for carbon leakage is not conclusively found yet (see sections 1.3.4 and 3.4 on carbon leakage for details). Furthermore no evidence is found that this special support measure would be more effective than exemptions from or low rates of energy excise duties.

Efficiency: Currently evidence is insufficient for drawing conclusions.

EU-added value: The indirect cost compensation can be attributed to the EU ETS Directive only indirectly. However, it has led to development of dedicated state aid guidelines and has thus helped to limit the potential competitive distortions created by the measure. By developing a uniform approach it has also

[16] Belgium (Flanders), Germany, Greece, Spain, Netherlands and UK; Furthermore Norway, which is not further considered in the evaluation.

created some transparency and efficiency in the Commission's approval process. Subject to further evaluation whether such financial compensation is justified in the light of potential carbon leakage and is administratively feasible, more EU-wide harmonised action might be advisable. However, energy prices and energy markets differ strongly throughout the EU, and further harmonisation of EU ETS-related measures would therefore not in itself be sufficient for establishing a level playing field in this regard.

This measure is **coherent** with the target of a low-carbon economy only to the extent that the Guidelines establish the maximum compensation based on several factors, including benchmarks for electricity consumption, and thereby do not waive the incentive for energy efficiency. Support schemes for electricity-intensive industries in the Member States (including different excise duties and exemptions thereof, different RES support schemes etc.) are highly fragmented and diverse. Therefore, and due to a lack of available information, no conclusions can be drawn in this regard within this evaluation.

1.3.6 The compliance system (monitoring, reporting, verification, accreditation)

Background

For any policy it is essential to be able to monitor whether its target is met, and whether participants comply with all relevant rules. This is even more important where financial assets such as emission allowances are involved. Therefore, a robust system for monitoring, reporting and verification (MRV) is required, so that it can be ensured that "one tonne emitted is one tonne reported". For this purpose the EU ETS Directive provides a strong compliance system, which consists of the following main elements:

- Obligation for operators to monitor emissions based on a monitoring plan approved by the competent authority (CA); Monitoring plans must comply with defined minimum quality criteria, which should also ensure cost-efficiency across sectors;
- Obligation to report emissions every year to the competent authority;
- Emission reports must be verified by an independent, impartial and competent verifier;
- Verifiers need to be accredited by a national accreditation body in order to assure the independence, impartiality and competence of verifiers;
- Competent authorities ensure compliance of operators by imposing effective, proportionate and dissuasive penalties, where applicable.

Evaluation results

Relevance: The MRVA system is not only relevant for the EU ETS, but it forms an absolutely *essential* backbone of the EU ETS. It is also relevant for the overall EU climate policy, as it feeds into the EU's internal and international reporting obligations on climate change. The current MRVA system is reasonably mature, and robust, as demonstrated by the low number of non-compliance cases found.

Effectiveness: The principles completeness, consistency, comparability, accuracy and transparency are at the core of the EU ETS MRVA system. They are firmly implemented by the Regulations following Articles 14 and 15 of the Directive. Confidence in the EU ETS compliance system is high, and therefore effectiveness is rated high, too.

Efficiency: Based on studies on administrative costs for operators, the costs for MRV[17] found in the range between 0.04 and 0.53 € per t CO_2(e) for average installations. For installations with low emissions, cost per t CO_2(e) are higher. This is considered reasonably efficient for a complex system like the EU ETS. The MRV system in the EU ETS is set up such that final emissions data become available at the latest three months after the end of the year monitored. This is much faster than e.g. the process for national GHG inventories, which become available only 15 months after the reporting year.

Coherence: There are some linkages to other reporting requirements, such as EPRTR and UNFCCC Inventories. They are utilised to different extents by Member States. However, there is no direct requirement in the EU ETS Directive, and issues – if any – can be best addressed by guidance documents rather than legislation.

EU-added value: The improvement brought about by the EU Regulations for MRVA has not been questioned since their introduction. They have increased the robustness of the system and improved the level playing field for participating industries. As the situation in previous EU ETS phases shows, a similar level of harmonisation cannot be brought about without EU legislation.

1.3.7 Registry system

Background

For efficiency reasons, allowances in the EU ETS exist purely in electronic form. In order to hold allowances and to control any transfers (allocation, trade, surrender), a registry system is required by the EU ETS Directive. Since 2012 the individual Member States' registries were brought together in the EU Registry operated by the Commission. The main requirements for the registry system are availability and security. Therefore the evaluation focussed on these two aspects. Regarding EU-wide harmonisation, fees charged by national administrators are a further point of interest which is discussed in this report.

Evaluation results

The availability of the EU registry system is high. The switch to the centralised EU registry system has delivered a considerable improvement of the overall security standard of the registry system by introducing two-factor authentication and transaction signing. Since the switch-over to the common EU registry no security problems have been reported, such as phishing and hacking attacks. However, the security level of the registry system has to be constantly revised and checked against evolving security standards. The know-your-customer checks have in general been implemented by EU Member States and have made access to the registry system more difficult for fraudsters.

[17] Excluding MRV tasks relevant for allocation purposes.

It can be assumed that the efficiency of the registry system has improved significantly since the switch-over to the common EU registry because software development is now performed centrally, although data on cost is not available.

The fees that national administrators charge to account holders vary significantly between Member States. The reasons are that different levels of costs are found in Member States, differences of operational efficiencies, and of effort put into different registry activities. Most importantly, the sources of funding of registry activities are very heterogeneous across Member States, meaning that some Member States receive additional funds from other sources to cover their registry activities whereas others are solely reliant on registry fees.

Coherence with other reporting systems (including for MRV under the EU ETS) is theoretically satisfactory in terms of consistency between data from different sources. However, in practice few such links exist. According to the Registry Regulation, a stronger link to IT systems such as trading platforms or MRV systems could be established.

Regarding EU-added value, there have been considerable gains in efficiency since the introduction of the Union Registry. Furthermore, introduction of new security standards was easier possible than with individual Member States' registries. However, according to users, the user-friendliness of the current system should be further improved.

1.3.8 The NER 300 funding

Background

Development of and investment in low-carbon technologies is indispensable for reaching the long-term targets of the EU ETS EU's climate policy in general, and of the long-term targets for the EU ETS more specifically[18]. Therefore, innovative, more cost-effective and efficient technologies are needed to deliver the emission reductions required. However, many technologies that are ready for demonstration at commercial (i.e. large) scale are not yet economically viable and require financial support. This applies to both technologies for the capture and safe geological storage of CO_2 ("Carbon Capture and Storage", CCS), and innovative renewable energy technologies (RES). The EU ETS Directive provides the basis for supporting large scale demonstration plants for these technologies through the so-called NER 300 programme.

Evaluation results

In 2008, it was recognised that new technologies were required for the transition to a low-carbon economy and that currently the CO_2 price signal provided by the EU ETS will alone not be sufficient to tackle the high costs and risks of first-of-a-kind installations in the short term. It was in this context that the NER 300 system was adopted and deemed very **relevant**. The high number of applications received (111 in total across the programme's two calls for proposals) confirms this that a large number of stakeholders considered the programme as a potentially crucial element in allowing large scale demonstration plants to be put into operation. However, the NER 300 programme did not meet expectations as

[18] See the energy Roadmap 2050 (COM(2011) 885), aiming to decarbonise the EU power sector by 2050.

regards funding for CCS projects. Only one CCS project, instead of the anticipated eight, could be funded. It must be noted, however, that this is not a flaw of the EU ETS Directive, but is related to the CO_2 price since the beginning of the economic crisis (and consequently lower than expected NER 300 funding), and/or to financial and technical challenges of the CCS projects, due to which many CCS projects were not confirmed by the Member States. However, no detailed information in this regard is available, so firm conclusions cannot be drawn.

In terms of **effectiveness**, project quality was very good, and the spread of approved projects across technologies and Member States met expectations (with the exception of the number of CCS projects). Almost 80% of the NER 300 awards went to highly innovative or potentially game changing projects as indicated in a qualitative analysis on the proposals' initial eligibility check[19]. Thus, *potential* effectiveness[20] is good. However, it is too early to make conclusions on the *actual* effectiveness since the majority of projects have not entered into operation yet.

A disadvantage of the set-up of the programme is that funds become usually available only once the project has started to store CO_2 (for CCS the project) or generate energy (for RES projects). Member States and project sponsors have generally not made use of the possibility of upfront funding[21]. While giving funding only to operational projects against proof of reaching annual targets can be justified, easier access to upfront funding might be able to speed up project implementation and lower costs for capital.

The programme covers only RES and CCS technologies, while low-carbon industrial technologies and processes covered by Annex I of the ETS Directive are not in its scope. The technology specification as included in the NER 300 is quite specific and detailed. No analysis was made whether this specification is in line with expected technological progress, but such analysis could be useful in case the NER 300 program were continued over a longer timeframe.

Several aspects were evaluated regarding **efficiency:** The assessment of project applications using a Cost-Per-Unit-Performance (CPUP) indicator led to the *most GHG efficient projects* being selected. The *funding leverage* (i.e. ratio between private investment and NER 300 funding) is 1.3. This ratio is considered reasonable given the nature of the funding programme (relatively high risk due to its focus on innovative technologies). The leverage ratio is 1.6 if additional public funding is taken into consideration (NER 300 mobilised €700m of national funds). Overall, the CPUP is favourable to larger projects which benefit from economies of scale. *Administrative efficiency* of the NER 300 programme was

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[19] Internal communication with the Commission, based on the initial eligibility assessment as conducted under the NER 300 programme.

[20] Effectiveness of the NER 300 programme would be defined as achieving the targeted projects, in line with the objectives set on innovation level, geographical coverage and technology spread. The projects selected for funding are to a high extent in line with the goals set. However, since the majority of projects is not yet in operation, no firm conclusion can be drawn. Consequently a distinction is made between the potential effectiveness, i.e. the effectiveness in case the selected projects would actually be realised, and the actual effectiveness, i.e. the effectiveness once projects are realised (or not).

[21] Up-front funding is the possibility to receive part of the project funding at the start of the project activity, i.e. in advance and in anticipation of to the actual storing of CO_2 or the actual supply of renewable electricity to the grid.

not analysed, as there was (at the time of writing) insufficient information available for its quantification.

Size and number of the funded projects suggest that a similar impact could not have been achieved at national level. In this regard NER 300 programme proves a high **EU-added value**. No evidence has been found that the programme would have led to a crowding-out effect from other (in particular national) funding mechanisms. At the same time, it is noted that additional EU-added value in terms of combining the NER 300 funding with complementary financial products offered by the EIB was not achieved. To date project sponsors have not applied for such complementary instruments[22].

The programme in theory has a stronger knowledge sharing element than other similar programmes. However, no knowledge sharing has taken place so far due to the low number of projects which entered into operation but also due to the overall low number of projects in each technology category which could share knowledge.

The NER 300 programme was found **coherent** with the overall EU ETS targets, since it promotes the necessary innovations and investments in innovative low-carbon technologies. No overlap or double funding between NER 300 and other European or national funding systems were identified. Potential overlaps with the EEPR (European Energy Programme for Recovery) were prevented through the programme's rules. While Horizon 2020 focussed on the R&D and pilot stages of the cycle, NER 300 bridged the gap between R&D and commercialisation by funding first-of-a-kind projects. Hence the programme was well designed to cover the technology development cycle complementary to Horizon 2020.

1.3.9 Transitional free allocation for the modernisation of the power sector

Background

During the EU ETS review in 2008 it was found that some Member States might require to support the modernisation of their power sector (electricity generation as well as the distribution networks), without leading to significant increases of consumer electricity prices. This measure (laid down in Article 10c of the EU ETS Directive) was considered relevant in particular where a lack of transmission capacity to other Member States exists or where an undue dependency on a single fossil fuel exists. Based on those criteria ten Member States were eligible for this optional derogation, of which Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania made use. In these Member States operators of power plants may receive a certain amount of free allocation (to be approved by the European Commission) as derogation from auctioning. This derogation is conditional on applications of their Member States to the Commission including detailed investment plans for the said modernisation. Detailed reporting requirements are furthermore in place in order to ensure that investments actually take place.

[22] DG Climate action, personal communication, February 2015.

Evaluation results

Relevance: Free allocation under Article 10c amounted to about 7 % of total EU emissions in 2013. Eight of the ten eligible Member States made use of the derogation. Three of them (Romania, Poland and Czech Republic) have been evaluated in more detail.

Effectiveness: As eight out of ten eligible Member States use this measure, which requires evidence for concrete investments, it must be assumed that to some degree the Article 10c derogation is effective. However, it could not be determined whether those investments would also have happened without Article 10c. Furthermore the analysed investment plans show only a limited number of investments regarding renewable energy sources, or more generally diversification of the energy mix. As only limited data is available in relation to the first years of the implementation, it is not possible to assess to which extent such investments are expected to contribute to the EU ETS' overall target of decarbonisation of the economy.

Efficiency: Investments reported were found bigger than the value of allocated allowances in the three Member States evaluated. However, since only one Member State reported also on avoided emissions, it cannot be evaluated for the Article 10c instrument as a whole whether it is efficient in terms of emission reduction.

EU-added value: No distortion of competition as consequence of Article 10c could be found. However, it was not possible to determine within the scope of this study whether funding of similar investments would have been possible at national level.

Coherence: Article 10c funding has been found coherent with the overall EU ETS target, although the practical outcome could not be verified regarding resulting GHG emission reductions. It was also found coherent with (or complementary to) other types of funding, such as renewable energy support schemes or the NER 300 programme.

Transparency: While all evaluated Member States published some information on the use of the Article 10c allocation, none of them published complete information. Only part of the information is available in English. In particular information on investments taking place and on GHG emission reductions are very fragmented.

1.3.10 ETS and small operators

Background

Many installations covered by the EU ETS are emitting relatively small quantities of greenhouse gases, but represent a larger share of the installations covered by the EU ETS. Along the "think small first" principle for supporting SMEs (small and medium enterprises), and for improving the overall efficiency of the EU ETS, Article 27 of the Directive allows Member States to exclude installations with low emissions from the EU ETS, provided they are covered by equivalent measures for contributing to overall emission reductions.

Evaluation results

74 % of the 11 000 installations in the EU ETS emit less than 25 000 t CO_2 per year and are therefore potentially “installations with low emissions” which can be excluded from the EU ETS under Article 27 of the Directive. However, they are responsible for only 2.7 % of emissions in the EU ETS. Although MRV requirements are less burdensome for small installations, it is confirmed by studies that the relative transaction costs per tonne emitted are the higher, the smaller the emissions are. In a few cases with particularly low fossil emissions, transaction costs have been found to even exceed allowance costs in years with a low carbon price. The option to exclude small installations from the EU ETS is therefore relevant. However, only seven Member States made use of the opt-out of small installations, excluding thereby about 0.3 % of the total verified emissions in the EU ETS in 2013.

Because Member States followed guidance by the Commission, “equivalent measures” regarding a (financial) emission reduction incentive are relatively similar and can be considered indeed equivalent to the incentives under the EU ETS. Thus, environmental integrity is safeguarded. This is further supported by the observation that Member States in general did not waive monitoring and reporting requirements for excluded installations.

Reduction of transaction costs can be observed for installations excluded from the EU ETS. Reasons are mostly the avoided verification costs in some Member States, and the fact that no Registry accounts and no trading are required. However, any potential distortions of the CO_2 price signal by such measure remain insignificant. It can therefore be concluded that the ability of the EU ETS to incentivise cost-efficient emission reductions remains unaffected. Furthermore no significant impact on competitiveness of affected industries has been identified.

Legislation at the EU level in connection with guidance and the need for approval by the Commission have led to an EU-wide harmonised approach to exclusion of installations with low emissions, albeit only few Member States made use of it. This ensured a level playing field between installations inside and outside the EU ETS, and in different Member States. It furthermore helped to ensure the environmental integrity of the EU ETS and of the measures for installations excluded.

There is a wide range of support schemes available to SMEs at EU and Member State level. The exclusion option under the EU ETS is well coherent with this support environment.

1.3.11 Impact of EU ETS on households

Background

Households are affected by the EU ETS only indirectly, by potential increases of energy prices, namely for electricity and district heating (DH). For limiting DH cost increases, some free allocation is given to heat producers if they are covered by the EU ETS. The effects of the EU ETS on DH prices and costs are the main focus of the evaluation in this area.

Evaluation results

Relevance: District heating is a predominant energy source only in a few Member States, playing only a marginal role in the other Member States. About two thirds of all DH consumption in the EU is produced in installations covered by the EU ETS. Price formation in the DH sector follows a variety of mechanisms (from strongly regulated to free market mechanisms), and prices are very diverse across the EU. Information about price levels is fragmented, as no uniform reporting requirement exists. No significant correlation between DH prices and CO_2 emission intensities or the introduction of the EU ETS could be found. Findings thus suggest that any additional burden induced by the EU ETS on households via district heating seems limited, if there is any.

Effectiveness of free allocation to protect households: No actual evidence for price or cost increases for DH for households due to the EU ETS could be found. Consequently the impact of free allocation to DH producers could not be evaluated, either. However, some theoretical considerations show that a shift of households from DH to other energy carriers is only a concern in free market DH systems (most old Member States). In free markets, cost increases for households and windfall profits for producers caused by free allocation might be a concern. Furthermore, in these markets necessary investments for a long-term emission reduction might be delayed. On the other hand, in regulated DH markets (Denmark and new Member States), prices for households will increase due to the EU ETS, but costs would be contained by free allocation.

Efficiency: No empirical evidence was available for supporting the evaluation.

EU-added value: There seems limited value in regulating issues of DH at the EU level. However, in general decisions about free allocation and the level thereof should remain at EU level, avoiding fragmented and less efficient action if Member States were to decide by themselves.

Coherence: Free allocation is not in line with the ‘polluter pays’ principle. However, it could to some extent avoid incentives to move to other, potentially more polluting heating sources, and reduces that risk. It also provides a very strong incentive to switch from fossil fuels to biomass.

1.4 Conclusions

If this report should be summarized in one sentence, it would be: “Yes, the EU ETS has been successfully implemented, but it can still be improved”.

The EU ETS Directive[23] is highly relevant for the EU’s climate policy. It is effective in reducing GHG emissions from the sources covered, and it provides the incentives to reduce emissions efficiently (in terms of limited administrative efforts, and by incentivising emission reductions where they are most cost-efficient). The EU ETS in general is coherent with other EU policies, in particular in the areas of energy efficiency, renewables, other climate policies and environmental regulation for industrial installations. There is significant EU-added value in this legislation. However, this summary applies mainly to the overall

[23] And also its daughter instruments, to the extent it was necessary to complete the evaluation.

design of the EU ETS. In practical implementation there are still a few areas which deviate somehow from this positive picture:

The biggest issue identified is the low carbon price brought about by the deep and prolonged economic crisis starting in 2008. While initially it was considered a big gain for the environmental integrity of the EU ETS that the cap was enshrined in the Directive itself, the unexpected drop in demand of allowances led to a carbon price shock from which the EU ETS has not recovered yet. As a consequence, several aspects of the EU ETS could not be fully evaluated, such as in particular the amount of emission reductions caused by the EU ETS or whether carbon leakage is an actual concern or only a theoretical concept. A clear result of the evaluation was that significant investments in low-carbon technologies, required for achieving the EU ETS' long-term goal, are not taking place yet, as they lack economic viability with the current CO_2 prices. Furthermore the funding under the NER 300 programme had less available volume and auction revenues for Member States, which were intended to be used inter alia for measures of climate change mitigation and adaptation, were far below expectations. However, it must be noted once more that these "teething troubles" of the EU ETS only caused a sub-optimal performance of the EU ETS, while they cannot be claimed to be a proof that the EU ETS is not properly functioning in general. Furthermore the Market Stability Reserve will address the surplus and improve the system's resilience to major economic shocks by adjusting the supply of allowances to be auctioned (but this is outside the scope of this evaluation).

In the more detailed evaluation areas some other issues have been found. Like the low carbon price, these issues are making the EU ETS less efficient, but do not disprove the concept of the EU ETS itself: In the area of cap setting, the above-mentioned lack of mechanisms for reacting to price-shocks was mentioned. Under auctioning, an auction monitor has not yet been appointed. Furthermore the Directive cannot guarantee that auction revenues are used for climate related purposes by Member States. Regarding carbon leakage, further analyses should be carried out if the carbon price becomes significantly higher than at the time of this evaluation (first quarter of 2015). Currently it cannot be firmly established whether levels of free allocation are too high in some cases, thereby leading to windfall profits by industry and undue loss of auction revenues by Member States, or whether those levels of free allocation are appropriate for avoiding carbon leakage as soon as the carbon costs increase.

Similar uncertainty about the appropriateness of the measure applies also to the compensation for indirect CO_2 costs, with the additional issue that the measure is not uniformly applied across the Member States.

In the practical implementation of the EU ETS, i.e. monitoring, reporting, verification, accreditation, and exclusion of small installations, no big issues have been found. Little to no evidence at all is found in literature about problems in these areas, which hints at either little public interest or a real absence of problems. However, vigilance is advisable, since allowance prices rising in the future may also increase the incentive for fraudulent behaviour. Similarly, the centralised Registry system has proven reliable and secure, however this was only achieved after some severe security incidents during the second trading phase with Member State-based registries.

When it comes to the two funding mechanisms within the EU ETS, the NER 300 and the Article 10c derogation for the power sector, it must be noted that the evaluation was difficult due to a lack of public information. As has been stated in the dedicated chapters, both mechanisms do work in principle. Regarding Article 10c, transparency should be improved. While only limited data is available on the performance of completed investments, the decarbonisation is likely to reflect the fact that investments are mainly related to improving the efficiency of existing fossil fuel based installations rather than in renewable energy. The NER 300 would have benefitted from higher carbon prices. The NER 300 has not achieved the goal of supporting up to 12 CCS projects. This problem is however hardly attributable to the EU ETS Directive, but more to a lack of realistic projects at this time (i.e. in a situation with low CO_2 price and limited confirmation of such projects by Member States). Note that both funding mechanisms are non-essential elements of the EU ETS.

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2 INTRODUCTION

2.1 The EU ETS and its legislative history

Addressing climate change is at the heart of EU policies. The EU is strongly committed to achieve the climate objective of limiting global average temperature increase to less than 2°C above pre-industrial levels. For contributing its part in global greenhouse gas (GHG) emission reductions, the European Union has started the development of effective legislation for GHG emission reductions already in the early 1990s. The European Climate Change Programme (ECCP) working groups from 2000 onwards discussed inter alia the use of flexible, market based mechanisms. Those were found particularly useful for industrial-size emitters (i.e. industrial installations and power plants), as companies in general can be considered economically rational actors. According to economic theory this is a prerequisite for market based measures. After consultation on a "green paper"[24] in 2000, a legislative proposal for a Directive was made in 2001, and the final EU ETS Directive[25] was adopted in 2003. It took full effect when the European Union greenhouse gas Emission Trading System ("EU ETS") started on 1 January 2005.

The EU ETS has been put in place as an innovative means of environmental policy. As a market based measure, it was eyed with a lot of curiosity by stakeholders, who were more familiar with classical "command and control" legislation in the field of environment. However, it has rapidly been further developed and is now, in 2015, a reasonably mature instrument. It has attracted a lot of public attention from stakeholders, journalists, academics and policy makers around the world. A Google search for "EU ETS" on 9 April 2015 gave about 450 000 matches, and "emission trading" 426 000 matches[26]. Furthermore studies[27] show that the EU ETS is now a regular topic in board rooms of energy intensive companies. Also the market of CO_2 allowances has matured, with volumes of several million allowances being traded every day. One of the most important effects in this regard is that the EU ETS has in fact proven that a cap and trade system for greenhouse gases does work in practice. It has invited many other countries (see Figure 1) and regions to follow the EU's example. In the long term this may be the most important environmental effect of the EU ETS.

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[24] COM(2000) 87 "Green Paper on greenhouse gas emissions trading within the European Union" http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52000DC0087

[25] 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, http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1443525411300&uri=CELEX:32003L0087

[26] Without the quotation marks, the search gives 1.6 million matches, i.e. if the words "emissions" and "trading" are separately found in the text and not as phrase.

[27] A good example is the review presented in: T. Laing, M. Sato, M. Grubb, C. Comberti, "Assessing the effectiveness of the EU Emissions Trading System", January 2013; Centre for Climate Change Economics and Policy Working Paper No. 126 / Grantham Research Institute on Climate Change and the Environment Working Paper No. 106, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf

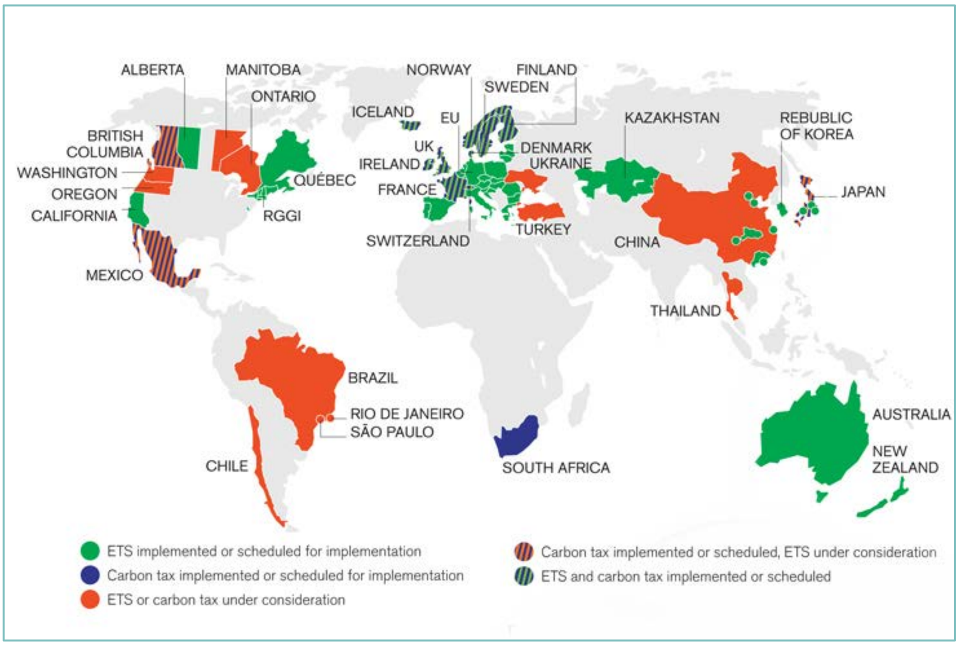

Figure 1: Overview of market based mechanisms for GHG emission reductions around the world. Source: Worldbank's website[28] on the carbon market report 2014.

The quick development of the EU ETS was connected with a steep learning curve for all actors involved, i.e. operators, verifiers, competent authorities (CAs), and not least the EU legislators. It has turned out as useful that the original Directive was designed for providing the first trading period (2005-07) as a learning phase. As can be expected with such complex legislation, several improvements had to be made over time. Therefore the EU ETS Directive has already undergone several amendments[29]:

- "Linking Directive" allowing the use of international credits from Joint Implementation (JI) and Clean Development Mechanism (CDM) projects: Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004;
- Inclusion of aviation activities: Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008;
- The EU ETS Review Directive[30]: Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009;
- Treaty of Accession of Croatia (2012);
- "Backloading": Decision No 1359/2013/EU of the European Parliament and of the Council of 17 December 2013;

[28] http://www.worldbank.org/en/news/feature/2014/05/28/state-trends-report-tracks-global-growth-carbon-pricing

[29] A further amendment, the so-called "omnibus package", which introduced the "regulatory procedure with scrutiny", was omitted in this list for simplicity reasons. For details see Regulation (EC) No. 219/2009 http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1443524880545&uri=CELEX:32009R0219

[30] Part of the 2008 climate and energy package.

- Temporary change of the scope for aviation: Regulation (EU) No 421/2014 of the European Parliament and of the Council of 16 April 2014.

Note that when referring to “the Directive”, the latest version in force[31] is implied. However, the most important changes brought about for the current situation are the requirements of the EU ETS review[32] in 2008. Therefore this report often refers to “the revised Directive” as the version (or all versions) after that review.

At the time of writing this report (first quarter of 2015), the proposal on the introduction of a “Market Stability Reserve” (MSR”) was still under discussion so it is not taken into account.

The EU ETS review in 2008

Based on Article 30(2) of the Directive, the Commission published a communication on the functioning of the EU ETS[33] and started a stakeholder process for improving the EU ETS. A legislative proposal was presented in January 2008 as part of a wider “climate and energy package”, which included also proposals for an amendment of the Directive on Renewable Energy Sources (RES), the “Effort Sharing Decision” (ESD), a Directive for regulating Carbon Capture and Storage (CCS) activities. During the legislative process, the Regulation for CO_2 from cars, the Fuel Quality Directive (FQD) and new environmental state aid guidelines were also included in the “package”.

The outcome of the EU ETS review in 2008 (“the revised EU ETS Directive”) prepared the ground for the third trading phase (2013-2020). It provided an extended scope of the EU ETS, a single cap for the whole EU, a linear reduction factor in line with the EU’s 2020 emission target, preferred allocation by auctioning, harmonised ex-ante benchmark-based allocation and improved rules for Monitoring, Reporting, Verification and Accreditation (MRVA), and a common EU Registry. Therefore this study will focus on the ETS Directive in its version after the EU ETS review in order to evaluate the situation before and after the implementation of the new rules of the third trading phase.

How the EU ETS functions

The EU ETS is a classic “cap & trade” system. It achieves its environmental goal by definition – the aggregate emissions of a large number of covered entities cannot exceed an absolute ceiling of (annual) emissions. The main difference to “command & control” systems is that the individual participant in the system does not get an individual (legally binding) target for his emissions, and thereby implicitly the amount of emission reductions. Instead, the overall target must be achieved *jointly by all participants.* The distribution of efforts among

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[31] The consolidated version can be downloaded at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1414339324018&uri=CELEX:02003L0087-20140430

[32] Although the revision Directive carries a 2009 number, we refer to it as the 2008 review, since both the Commission’s proposal and the political agreement took place in 2008.

[33] COM(2006) 676 final, see http://www.europarl.europa.eu/registre/docs_autres_institutions/commission_europeenne/com/2006/0676/COM_COM(2006)0676_EN.pdf

participants (who reduces emissions by how much) is determined through a market interaction on the basis of the various emitters' marginal abatement costs. This is achieved by handing out ("allocating") units of "rights to emit". In the EU ETS they are called "EU allowances" or EUAs, with a value equivalent to the emission of one metric tonne CO_2. Those rights can be freely traded. Hence each actor (in the EU ETS these are operators of stationary installations and aircraft operators) can decide whether to emit a certain amount of GHGs and cover them with allowances, or whether to reduce his emissions so that he will have to purchase fewer allowances, or is even able to sell allowances in case of a surplus.

Allowances can be in principle sold by the public authority which puts the system in place (usually in the form of auctioning for optimal economic efficiency), or they can be allocated free of charge.

For any market to function there needs to be scarcity – i.e. demand initially exceeding supply. In the case of the ETS this means that the cap must be set below business as usual emissions. Only if there is a net need to reduce emissions (rather than just re-arranging emissions across the economy) a carbon price will emerge. Because the scarcity can be reduced by participants who reduce their emissions, in particular by using or investing in lower emitting technologies, the price should theoretically settle at an equilibrium wherein all emitters face the same marginal (GHG) abatement costs for reducing emissions any further.

The CO_2 price furthermore has an effect similar to increasing prices of the raw materials[34] required in industrial processes by increasing variable costs of the product: With increasing variable costs (e.g. raw materials or the energy consumed), an operator in a competitive market will – applying economically rational behaviour – attempt to increase the price of his product proportionally to the cost increase caused by the GHG emissions. However, if he is active in a competitive market, he may be a "price-taker" and thus unable to pass the full CO_2 costs on to his customers, if competitors do not face similar costs. This is of particular concern in the context of the "carbon leakage" debate, where it is assumed that the operator faces competition from other countries, where there are no similar CO_2 costs and therefore enjoy competitive advantage. As a measure against this effect, the EU ETS currently contains provisions for allowances being allocated for free to sectors which are deemed to be exposed to a significant carbon leakage risk.

While the risk of carbon leakage is an unintended effect of the EU ETS, the price increase of GHG intensive products is an intended effect, because it should trigger demand-side changes down the value chain. Since economically rational actors tend to optimise their profits, either by reducing their costs or by increasing their product prices (if the latter is possible), the following foreseeable effects are at the heart of the ETS: (i) Operators will try to reduce their emissions for reducing their costs. This can be done either by making the production per unit of product less GHG intensive, or by reducing the production of that GHG intensive good. The latter will be in particular incentivised if their consum-

[34] This way of presentation is based on the fact that each fuel or raw material has a relatively well-defined carbon content and a well-defined proportionality factor between this carbon content and the emissions, the so-called emission factor. Thereby operators can add the CO_2 costs proportionally to the costs of the fuel or raw material.

ers find ways of using less of that GHG intensive good, either by making more efficient use of that good, or by completely substituting it. (ii) The consumer in turn also sees an incentive for such changes, because also the consumer will ideally be an economically rational actor who wants to avoid the increased costs brought along by the price of GHG emissions. In case (ii) the reduced emissions are usually referred to as “indirect” emissions, since the economic actor whose behaviour actually leads to the emission reductions has no direct control over the emissions. The most common example is the indirect emissions “contained” in electricity consumed.

As this illustrates, in an optimally functioning ETS virtually all possibilities for emission reductions are incentivised by the CO_2 price:

- producing the same goods more GHG efficiently,
- producing a smaller quantity of those GHG intensive goods, in particular because the demand may decline (induced by behavioural change of the end-users), or
- producing other – less GHG intensive – goods.

It is therefore important that the CO_2 price signal is not distorted, e.g. by measures for reducing the CL risk. In particular free allocation[35] may reduce – or, if granted in excessive amounts, make even void – the operators’ need to pass through the CO_2 costs. This may seem in contrast to economic theory of opportunity costs imposed by the CO_2 price, but is commonly argued by industry stakeholders to solve the competitive disadvantage which leads to the risk of carbon leakage. In such case only the incentive for more efficient production remains, but the incentive to achieve indirect emission reductions (through a reduced use of emission-intensive products) disappears. This loss of GHG reduction options would make the ETS less efficient, and hence drive up the overall cost of achieving the emission target, which is an aspect that needs to be taken into account when free allocation is discussed (see section 3.4).

How to implement the EU ETS

After the more theoretical aspects of the previous sub-section it is important to note that some practical issues must be solved for putting in place a successful cap & trade system such as the EU ETS. Those elements have been regulated by the EU ETS Directive and are therefore of particular interest for the evaluation and further improvement of the EU ETS Directive:

- A robust system for M&R (Monitoring emissions and Reporting them to the competent authority) is the core of any market-based measure. Without a robust M&R system in place, it would be impossible to determine how many allowances each emitter has to surrender for compliance. Moreover, this would undermine the system’s credibility and its environmental integrity. The M&R system is usually accompanied by requirements to have the emissions verified by an independent and competent third party (“the verifier”), who in turn should be under some form of legal control (usually accomplished by accreditation). Therefore Accreditation and Verification (A&V) rules are also re-

[35] The same applies to financial subsidies such as the ones for indirect CO_2 cost compensation, see section 3.5.

quired, thereby completing the “MRVA” system. Effective enforcement options (penalties) will also be essential.

- For efficiency reasons it was decided that the allowances should exist in a purely electronic form. Thus, a secure and reliable registry system using state of the art information and communication technologies is required.
- At least one allocation system is required, so that market participants can receive the allowances which they need for compliance. In case of the EU ETS (speaking about the third phase here), auctioning was defined as the default way of allocation. Therefore an auctioning platform is required, and for optimal functioning, an auctioning monitor was also required to be put in place. As a second option, in particular in view of providing a smoother transition from the previous phase and for reducing the potential risk of carbon leakage, free allocation is still granted. In order to make this allocation fair, EU-wide rules (based on ex-ante benchmarks) have been put in place.
- After achieving all the above, the only missing element for emission trading is the existence of trading places (exchanges, brokers). In the case of the EU ETS this was initially not regulated but left to the private sector to develop, building on the existing regulatory framework for financial markets. However, a series of criminal incidents in the ETS market in 2010-11 served as a reminder that it is also useful to implement some form of market oversight as part of the ETS, which has since been put in place.

A complete picture of the functioning of the EU ETS, using the approach of an “intervention logic” inspired by the evaluation guidelines of the REFIT programme (see below), can be found below in Figure 2 to Figure 4. Note that for the actual evaluation the intervention logic was split into several areas with strongly simplified, separate intervention logics.

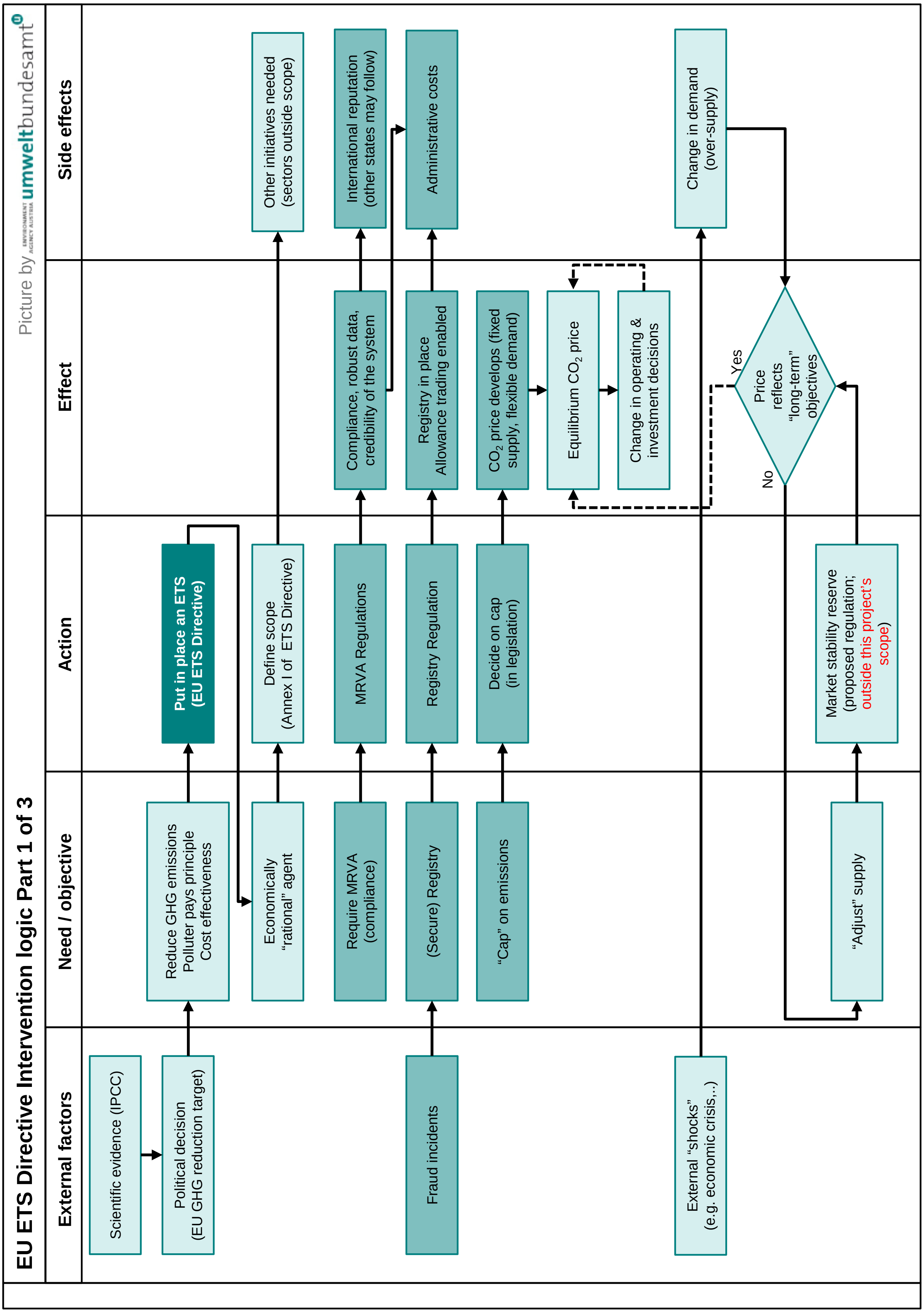

Figure 2: *Complete intervention logic of the EU ETS Directive and its daughter instruments (part 1 of 3)*

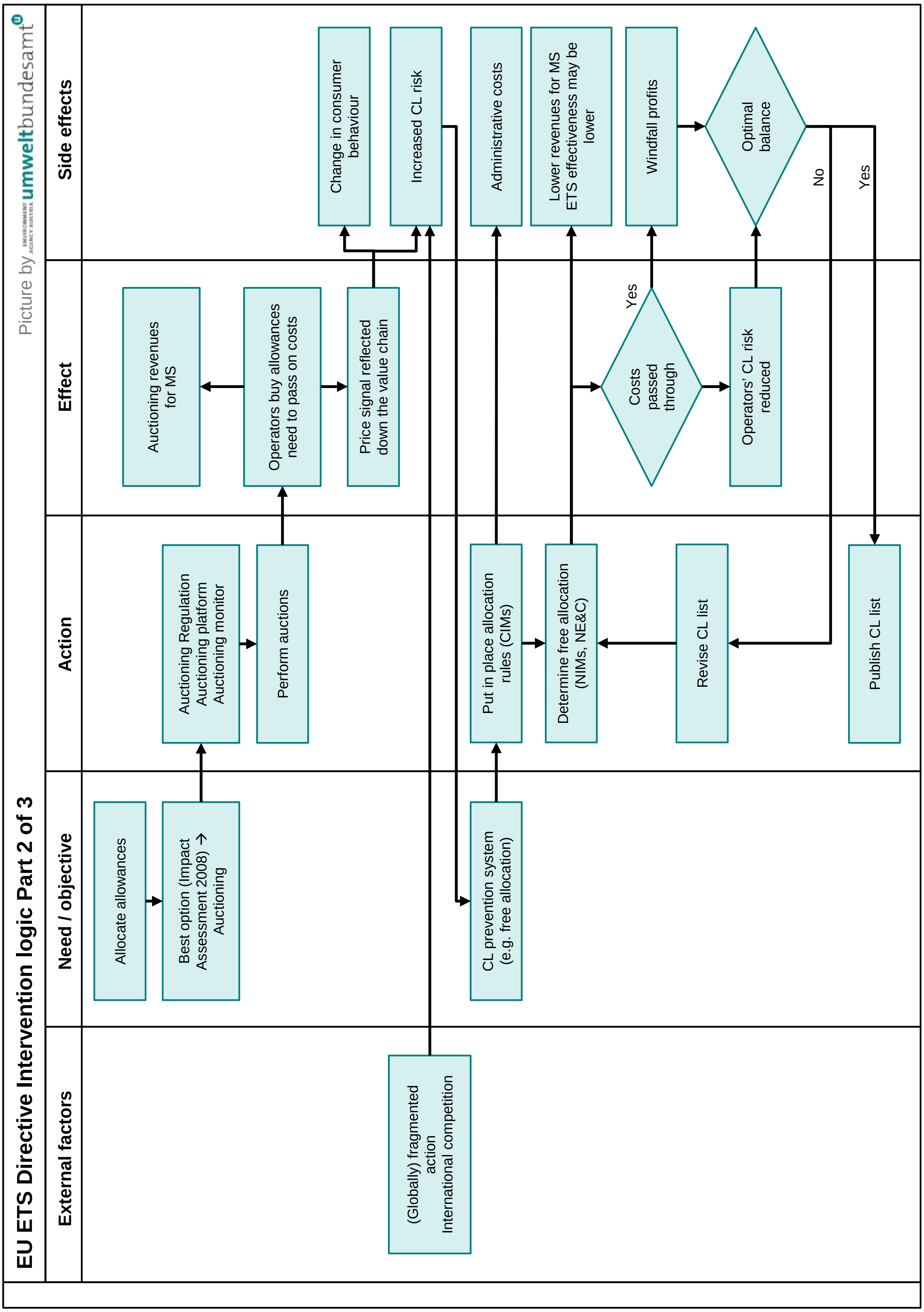

Figure 3: Complete intervention logic of the EU ETS Directive and its daughter instruments (part 2 of 3)

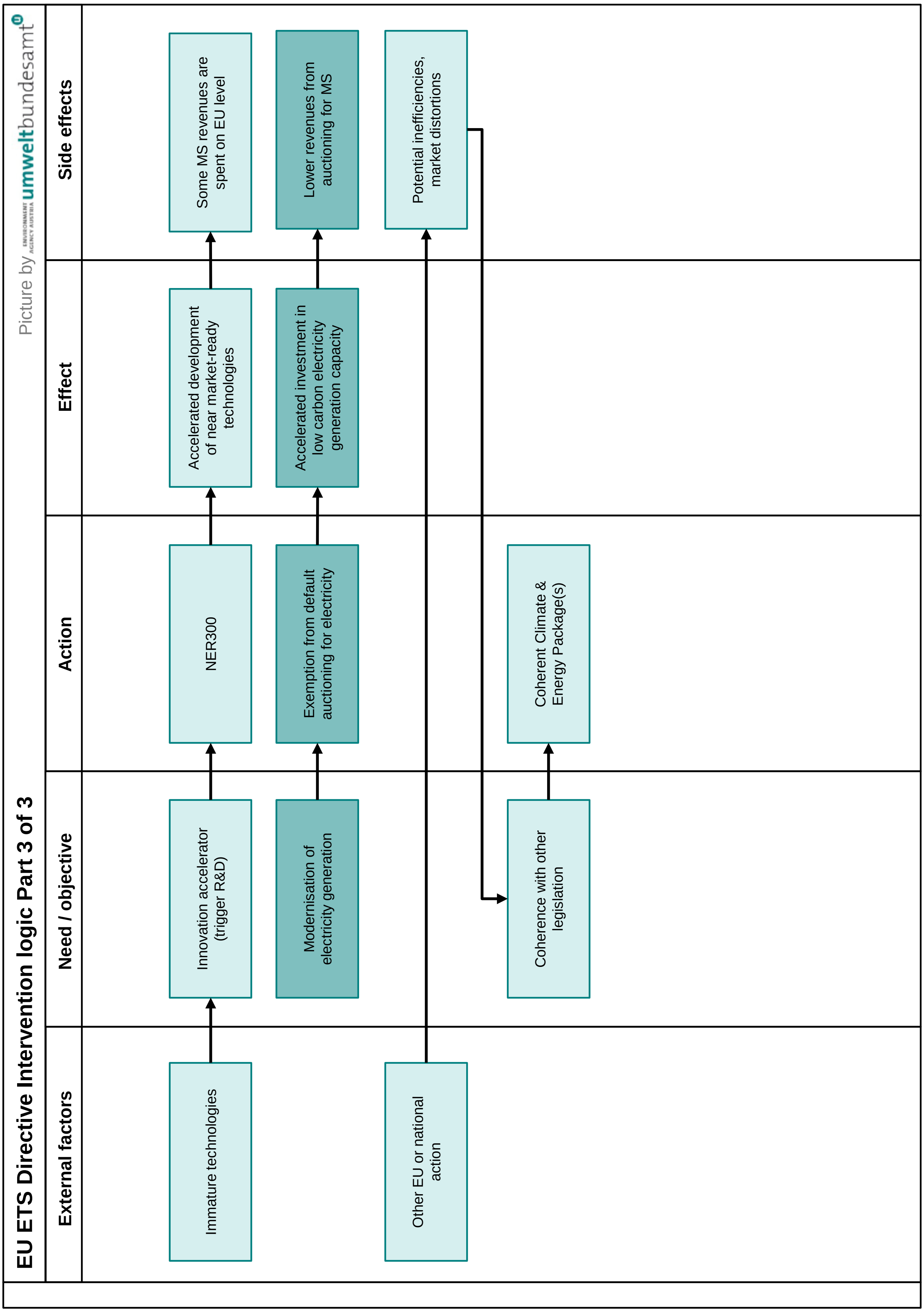

Figure 4: Complete intervention logic of the EU ETS Directive and its daughter instruments (part 3 of 3)

2.2 Evaluation methodology

REFIT[36] is the European Commission's Regulatory Fitness and Performance programme. Action is taken to make EU law simpler and to reduce regulatory costs, thus contributing to a clear, stable and predictable regulatory framework supporting growth and jobs. A key element of the REFIT programme is the evaluation of existing legislation, with a view to simplifying legislation, making it more consistent with the criteria "effective, efficient, coherent and cost-effective", and, where appropriate, to withdraw legislation which is not sufficiently consistent with those criteria or where no sufficient value added can be identified from putting this intervention to the EU level instead to the discretion of the Member States.

Evaluation guidelines

In order to provide a systematic approach to those policy evaluations, the Commission has developed (draft) evaluation guidelines[37], on which this evaluation is based.

"*Through its Smart Regulation[38] agenda, the European Commission has committed to design, deliver and support the implementation of interventions of the highest possible quality. Evaluation is a key tool within Smart Regulation, providing a critical, evidence-based judgement of whether an intervention has met the needs it aimed to satisfy and actually achieved its expected effects. It goes beyond an assessment of whether something happened or not, and looks at causality – whether the action taken by a given party altered behaviours and led to the expected changes.*

A key commitment in the 'Smart Regulation' Communication of 2010 was the undertaking to increase the use of evaluation and the establishment of the "evaluate first" principle. This ensures that: "all significant proposals for new or revised legislation are in principle based on an evaluation of what is already in place." (cited from the draft evaluation guidelines p.3)

Furthermore these guidelines define on p.7 what an "Evaluation" should be: *"a **critical**, **evidence-based judgement** of whether an intervention has met the **needs** it aimed to satisfy and **actually** achieved its **expected** effects.*"

2.2.1 Intervention logic

For ensuring a systematic approach to evaluation, the guidelines propose to analyse the functioning of the intervention by defining an intervention logic before defining dedicated evaluation questions. In particular the following points need to be clarified:

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36 Regulatory Fitness and Performance programme, see http://ec.europa.eu/smart-regulation/refit/index_en.htm

37 http://ec.europa.eu/smart-regulation/evaluation/docs/20131111_guidelines_pc_part_i_ii_clean.pdf

38 COM (2010) 543 final – Smart Regulation in the European Union, see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0543:FIN:EN:PDF

- **What were the "needs"** for which the intervention (legislation) was developed? In the case of the EU ETS it was the need to reduce GHG emissions of stationary (industrial scale) installations, later also of aviation activities. In the present discussion of a potential EU ETS review for the 2030 framework and beyond, the needs must be expressed in a way taking into account the emission reduction target of the whole EU for 2030 and beyond.
- **What were the objectives of the intervention**? For the EU ETS the answer is in Article 1 of the EU ETS Directive (only the first sub-paragraph was part of the original Directive): "This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community […] **in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner**." I.e. the objectives to be assessed are threefold:
  - Achievement of GHG emission reductions. It could be argued that the ETS achieves this target by definition, since emissions have to remain below the cap. As long as the cap is set below BAU (business as usual) emissions, emission reductions will be achieved. Yet, as the accumulation of a significant allowance surplus on the market and the related drop of the allowance price has shown, this objective should be analysed in a more differentiated way: It should be assessed not only whether emissions are reduced in the short term, but whether the ETS in its current implementation is also able to promote long-term emission reductions in line with the targets for 2030 and 2050 while avoiding lock-in of more carbon-intensive technologies.
  - Being cost-effective and economically efficient: While economic theory says that a cap & trade system will in principle lead to GHG emission reductions in the economically most efficient manner (i.e. by incentivising the cheapest emission reductions first, leading to overall minimal cost at a given emission cap), practical implementation can lead to inefficiencies ("distortion of the CO_2 price signal", e.g. by frequent updating of the allocation figures). The evaluation (as well as the impact assessment of improvement options) must therefore also ask questions regarding efficiency. Furthermore compliance costs and administrative costs for participants have to be assessed, and on Member State side administrative costs and the revenues from auctioning allowances
- **What are the results** of the intervention? For the EU ETS, this would be the level of emissions in the system. A key challenge to be overcome for this topic is the attribution of emission reduction to the intended effect of the EU ETS or to other, unexpected or unintended factors, such as the financial and economic crisis since 2008.
- **What are the impacts** of the intervention? In case of the EU ETS, this can be e.g.
  - Intended: Influence on investment and operating decisions for reducing emissions, e.g. fuel switch, energy efficiency improvements;
  - Compliance costs (buying allowances): Intended effect to the extent that external costs of emissions are internalised in the prices of outputs, and passed on through the value chain, where possible;
  - Risk of carbon leakage: Unintended side effect;

- Administrative costs: Unavoidable side effect, but with potential for optimisation;
- Innovation (in particular increased deployment of low-carbon technologies) to the extent that causality can be established.

This simplified intervention logic is presented in Figure 5.

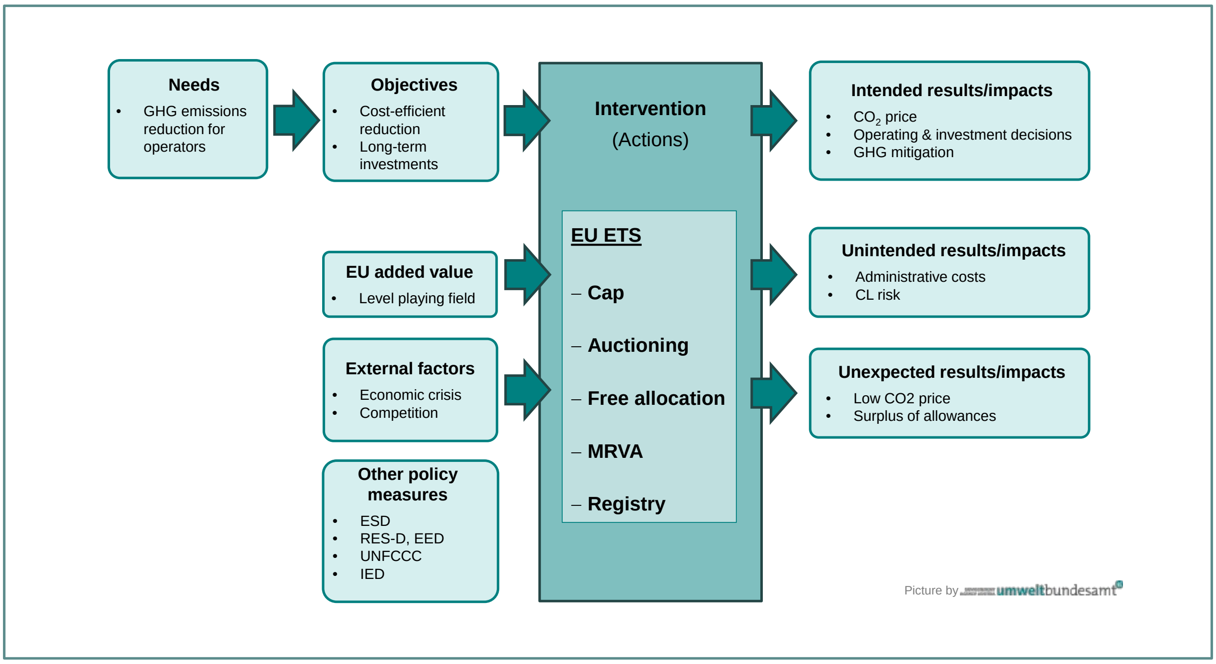

Figure 5: Simplified intervention logic for the EU ETS (the full intervention logic is presented in Figure 2 to Figure 4).

2.2.2 Evaluation criteria

According to the evaluation guidelines, the following criteria for evaluation are mandatory, and have therefore been used for this evaluation report:

- **Relevance**: To what extent do the (original) objectives of the intervention[39] (still) correspond to the needs within the EU?
- **Effectiveness**: To what extent did the intervention cause the observed changes/effects? To what extent can these changes/effects be credited to the intervention? To what extent do the observed effects correspond to the objectives?
- **Efficiency**: Were the costs involved justified, given the changes/effects which have been achieved? Which factors influenced the achievements observed?
- **EU-added value**: What is the additional value resulting from the EU intervention, compared to what could be achieved by Member States at national and/or regional levels?

[39] By intervention the guidelines refer in general to the legislation which is evaluated. In case of this study this is consequently the current EU ETS Directive, and to the extent relevant, also the implementing acts thereunder.

- **Coherence**: To what extent is this intervention coherent with other interventions which have similar objectives? To what extent is the intervention coherent internally?

Figure 6 gives an insight of how the relationship between the intervention logic and the evaluation criteria was understood for this evaluation report.

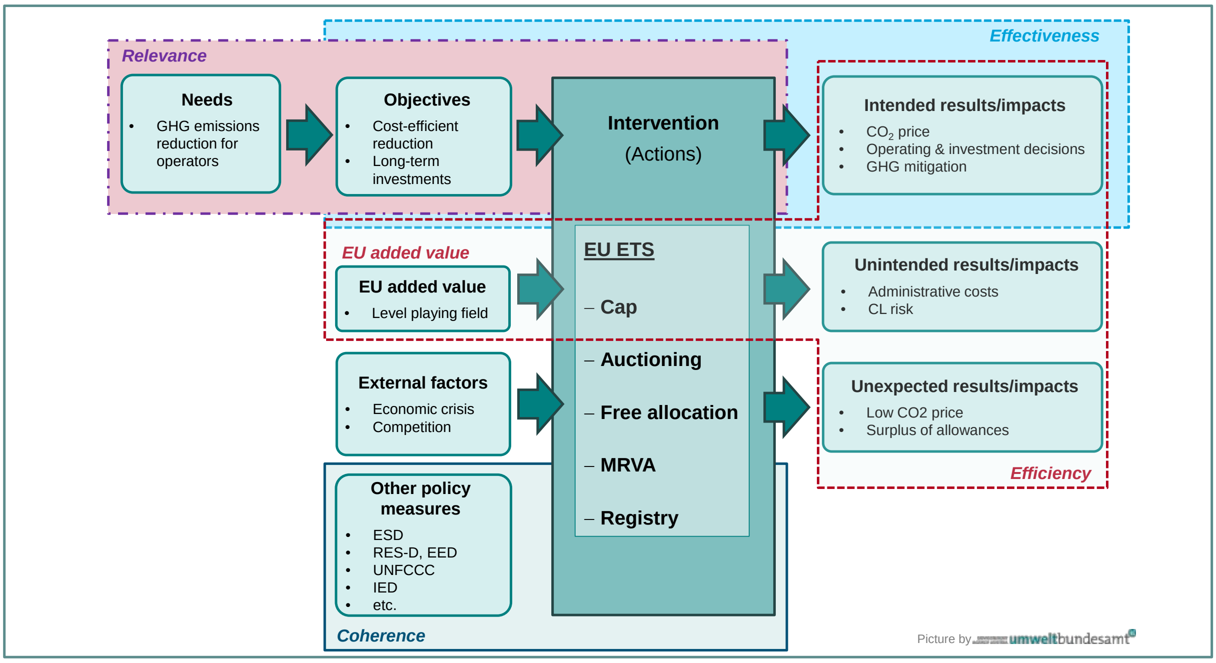

Figure 6: Relation between intervention logic (needs, actions, effects etc.) and evaluation criteria (relevance, effectiveness, efficiency, coherence, EU-added value).

In order to make those criteria more practical for use, they were translated into more detailed *evaluation questions*. In chapter 3 the results of the evaluation are presented separately for several important areas (see below) of the EU ETS. In each section dealing with one of those areas, sub-sections deal with each criterion, and the used evaluation questions are always clearly identified.

2.2.3 Evaluation areas

The EU ETS is a complex piece of legislation with many implementing acts which have a significant impact on the answers to the evaluation questions. In order to structure the evaluation, several key areas have been evaluated separately (with some unavoidable overlap). The following evaluation areas of EU ETS implementation are discussed:

- EU ETS in general (see section 3.1)
- Cap setting (see section 3.2)
- Auctioning (see section 3.3)
- Free allocation and carbon leakage (see section 3.4)

- Support for indirect CO_2 costs (see section 3.5)
- The compliance system (monitoring, reporting, verification, accreditation; see section 3.6)
- Registry system (see section 3.7)
- The NER 300 funding (see section 3.8)
- Transitional free allocation for the modernisation of the power sector (see section 3.9)
- ETS and small operators (see section 3.10)
- Impact of EU ETS on households (see section 3.11)

The focus of the evaluation was the EU ETS Directive itself. However, several of the areas listed here are based only on general requirements of the Directive, while detailed implementation acts were required to define the detailed rules for the actual implementation (in particular the M&R Regulation, A&V Regulation, Benchmarking Decision and Carbon Leakage List Decision, Auctioning Regulation, Registry Regulation). Implementing legislation related to the ETS Directive has been taken into account to the extent possible and only where relevant for the evaluation.

2.2.4 Information sources and limitations

The default approach for the evaluation was literature assessment[40]. This is necessary for achieving a broad assessment within short time and limited budget. Depending on the area / evaluation question to be assessed, the project team selected the most relevant existing studies – judged based on the team's understanding of the issue at stake. It is important that – whenever feasible – several data sources were compared before making conclusions. The evaluation guidelines use the term "**triangulation**" for comparison of several independent data sources.

Most important data sources were studies performed on behalf of the Commission, studies commissioned by Member States, those published by academic researchers or consultancies, or provided by industry stakeholders or NGOs. If none or not sufficient literature sources (or none of sufficient relevance or quality) could be found, other methodologies were used for supplementing the evaluation, based on the project team's own assessments. These are e.g. calculations by the project team based on available data (such as Eurostat and EUTL figures etc.), or e.g. calculation of administrative costs using the standard cost model.

Limitations: A general problem of this study is the limited data already available on the functioning of the third phase's new implementing measures. For example, Article 21 reports were available only for one year at the time of writing the report, allocation figures and new entrant and closure cases were available for approximately 2.5 years, an auctioning monitor was not yet appointed, etc. Answering the questions regarding "how much GHG emissions have been re-

[40] "Literature" here means in the first place "already existing information" for distinguishing it from new assessments carried out by the project team during this project. "Literature" in this sense covers consultancy studies for the Commission, academic papers, but also e.g. contributions to stakeholder consultations etc. However, different types of "literature" require different efforts for judging the content's quality and the value for use in the evaluation.

duced / avoided by the EU ETS" while at the same time emissions were reduced by a strong economic downturn, is a very challenging task. However, some ex-post analyses (including decomposition analysis) approaches for that task existed when writing the report. Where applicable, such limitations have been clearly indicated throughout the report.

The major part of this evaluation was carried out during the first quarter of 2015. Although some editorial improvements and consistency checks between chapters were carried out later, the cut-off date for the research was 31 March 2015. Literature and data which became publicly available later was not taken into account.

3 EVALUATION FINDINGS

3.1 EU ETS in general

3.1.1 Introduction

Evaluating the functioning of the EU ETS as a whole is a challenging task. As a Union policy based on solid legislation and after several years of application, one might assume that such task can only give the answer: "Yes, it works". However, the ETS is a rather unique policy in the EU. As a cap and trade system, it might be compared e.g. to handing out milk quotas in agriculture. However, the international attention it has gained, the amount of money involved[41] and the fierce stakeholder debate around the issue of industrial competitiveness and carbon leakage make it necessary to see what has already been achieved and what should be improved.

The EU ETS has two faces: Firstly, it is an environmental legislation. Its target is the reduction of greenhouse gas emissions from industrial sources. Secondly, it is a market-based policy instrument. When discussing the evaluation of the EU ETS, both aspects must be covered in a reasonable balance. The evaluation framework described in the following pages tries to achieve this goal.

A few notes will be appropriate:

- Several evaluation questions overlap with other evaluation areas. Furthermore some questions will not be 100% clearly attributed to only one of the criteria "relevance, effectiveness, efficiency, coherence, EU added value". In particular the first three may overlap: Efficiency and effectiveness often go together. Both are at the very heart of the EU ETS' objectives, therefore they could also be discussed under "relevance".
- Evaluating the EU ETS "as a whole" must be limited in scope. A very thorough evaluation could go even so far as to assess how much the EU ETS has influenced other GHG market based mechanisms around the world, or whether institutional investors would nowadays invest in allowances. It is clear that limits must be set. The draft intervention logic as presented below has turned out useful to define appropriate boundaries for the evaluation.

With the above in mind, this evaluation area focuses on the very core functions of the EU ETS:

- Whether the environmental goal is achieved, i.e. whether the "cap" delivers emission reductions;
- Whether the establishing of a CO_2 market was achieved, i.e. whether it is a liquid market, creates a stable price signal, and whether it leads to investments in low-GHG technologies.

Other questions, which relate to rather technical implementation details, are evaluated in separate areas (starting from section 3.2), as explained in section 2.2 above. Where results from the detailed sections are relevant for answering evaluation questions for the EU ETS as a whole, reference is made here to the more detailed sections, instead of repeating those findings.

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[41] Even with a currently low CO_2 price (the average auction price in 2013 was 4.45 € per t CO_2), the allowances allocated in 2013 have an aggregated value of approximately 9.27 billion €.

3.1.2 Intervention logic of the EU ETS Directive as a whole

- Needs:
  - Emission reductions in accordance with a predefined “cap” (i.e. the maximum permissible emissions). The cap has to be set in accordance with the politically agreed GHG reduction target of the EU;
  - The cap must be sufficiently stringent for achieving a long-term transition to a low-carbon economy, at least regarding the part of the economy within the scope of the intervention.
- Objectives:
  - Achieve required GHG emission reductions in the most cost-effective way;
  - Provide long-term certainty on the existence of a CO_2 price to incentivise decisions to operate low-GHG technologies, or to investment into low-carbon infrastructure and industry;
  - Ensure environmental integrity through an appropriate compliance system.
- Actions:
  - Set up a cap & trade system (because this is in accordance with the cost-efficiency objective);
  - Establish the scope of the EU ETS[42];
  - Put a cap on emissions in place; Determine the size of the cap[43] in line with politically decided emission targets (based on the scientific evidence) and system scope;
  - Establish the necessary infrastructure for cap & trade: Registry, allocation system (free allocation and/or auctioning system), allow trading and provide market oversight;
  - Establish a compliance system: MRVA rules, compliance & enforcement system with adequate penalties; Ensure surrender of allowances using the principle “a ton emitted is a ton reported is an allowance surrendered”;
  - Operate the system in annual compliance cycles;
  - Establish evaluation and revision procedures for the system;
  - For mitigating the unintended effect of carbon leakage risk (see below), a system for free allocation is put in place;
  - Where it is already known that public support will be needed in addition to the CO_2 price signal, put in place further support mechanisms, such as the “NER 300” programme for funding innovative low-carbon energy demonstration projects which are near-market ready, or for modernisation of electricity infrastructure (as in Article 10c).
- Expected and intended results/impacts:
  - A liquid market for GHG emission allowances;

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[42] For definition of the scope the relevant criteria are: significance of GHG emissions (and reduction potentials) and sensitivity to a carbon price signal, while limiting competitiveness distortions between entities. The scope of the EU ETS Directive (i.e. its Annex I) has not been evaluated separately, as it has been extensively discussed in the 2008 Impact assessment (see http://ec.europa.eu/clima/policies/ets/docs/sec_2008_52_en.pdf). Only the opt-out provisions for low-emitting installations are discussed in section 3.10.

[43] Note that the inflow of international offset credits must be considered as factor which practically increases the cap.

  - A CO_2 price evolves based on market fundamentals (supply/demand), reflecting the marginal GHG abatement costs of covered emitters;
  - A reduction of GHG emissions in the covered sectors can be observed;
  - The CO_2 price signal is used by participants in operating and investment decisions;
  - Technological improvement in the participating sectors/entities and/or fuel-switch takes place;
  - “CO_2 costs” (administrative costs as well as the (opportunity) costs of allowances used in the production process) are passed on through the value chain. Subsequent consumers will take those costs also into account for their consumption or investment decisions, thus contributing to further GHG emission reductions;
  - Auctioning revenues for Member States are generated, which can be used in various ways, including for support of technology innovation or of low-income households, and for adaptation to climate change or for supporting further emission mitigation measures, domestically as well as in third countries.
- Unintended results/impacts:
  - Administrative costs will occur;
  - Where EU ETS participants face international competition from countries where no CO_2 costs apply (see external factors), a risk of carbon leakage may occur.
- Unexpected results:
  - CO_2 price fluctuations;
  - Significant over- or under-supply of allowances;
  - Creation of new jobs for verifiers, consultants, competent authorities.
- External factors:
  - Main unexpected factor: the economic crisis;
  - Influence of complementary policies: the contribution of the Renewable Energy Sources Directive and the Energy Efficiency Directive were anticipated in the 2020 cap setting (as documented in the Impact Assessment of the 2008 review), however, apparently their actual impact might be different from expectations;
  - Significant technological or scientific advances (availability of “breakthrough technologies”, if any);
  - The level of political stability within Europe;
  - Emissions allowance theft / fraudulent trading / fraudulent reporting.

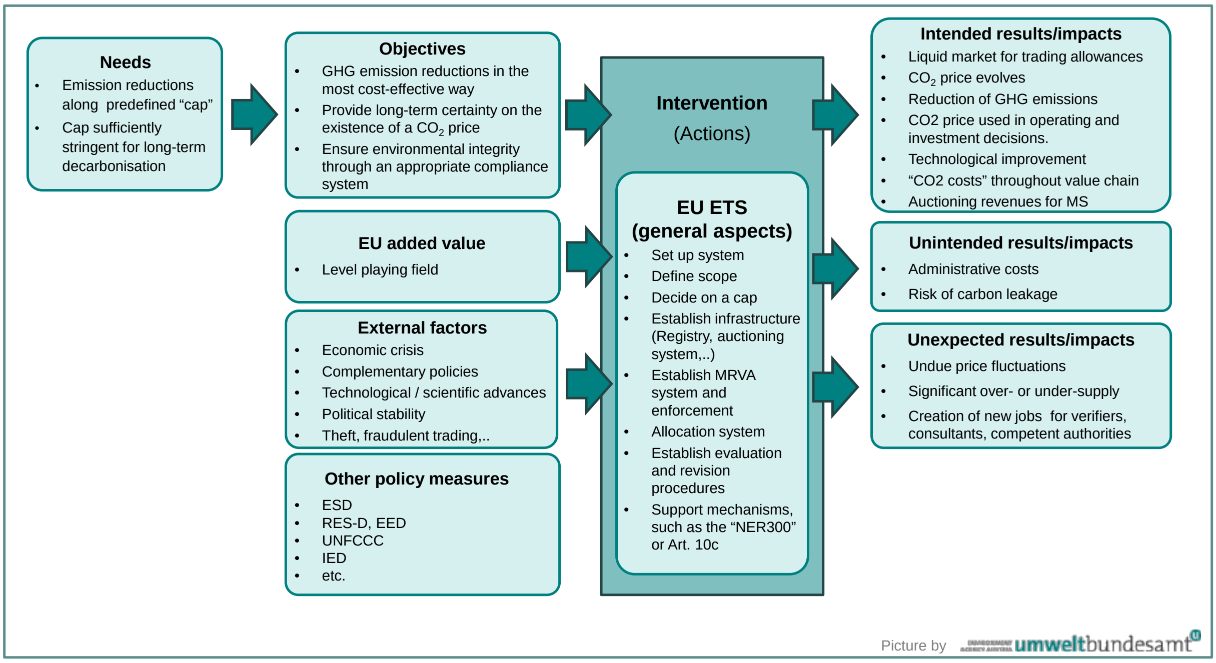

Figure 7: Intervention logic of the area "EU ETS in general".

3.1.3 Relevance

The criterion of relevance is evaluated using the following questions:

- How well do the objectives of the EU ETS (still) correspond to the EU climate policy objectives? I.e. is the objective of GHG emissions being reduced cost-effectively and efficiently still relevant?
- Is a cap & trade system (still) an effective and efficient instrument for achieving this?
- How well adapted is the Directive to subsequent technological or scientific advances, or any other unexpected external influences such as the recent economic crisis?
- Can the Directive be easily adjusted to new needs, in particular a new GHG target for the EU?

3.1.3.1 The objective of reducing GHG emissions cost-effectively

The EU's targets for overall GHG emission reductions (–20% compared to 1990 levels by 2020 and –40% by 2030) are of an order of magnitude that requires strong political will and effective policies in place. In 2012 (that latest year for which a complete EU GHG inventory[44] was available at the time of writing), total EU-28 emissions were 4 544 million tonnes (Mt) CO_2(e), of which verified emissions in the EU ETS[45] made 1 837 Mt CO_2(e). In other words, the EU ETS co-

[44] http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2014
[45] EUTL data, e.g. in http://ec.europa.eu/clima/policies/ets/registry/docs/verified_emissions_2014_en.xls

vers 40% of the EU's total GHG emissions, and is thus the biggest single policy instrument for GHG emission reductions in the EU, if not in the world.

Regarding the number of installations actually covered by the EU ETS, numbers are difficult to determine by checking EUTL data. According to EUTL compliance data for 2013 (CITL extract of 1 May 2014)[46], there were 12 134 installations with an open account in the Registry. However, it is sometimes not clear whether an installation was actually operating if it shows zero verified emissions, or whether it had only biomass emissions which are rated as zero. It is also not always clear if an installation with a positive entry in the National Allocation Table (NAT) has actually really received the free allocation indicated. Due to new entrants and closures of installations, numbers of EU ETS participants are changing in the range of some hundreds per year. On 1 May 2014, 432 of the installations with open accounts were indicated as "excluded" (see section 3.10 "small installations"), and further 660 installations had neither an allocation nor verified emissions greater than zero, from which it is concluded that they might not be operating. Therefore the number of installations operating and covered by the EU ETS at the time of writing might be approximately 11 000. Of these, approximately 9 800 (around 90%) received allowances for free (either under Article 10a, see section 3.4 "CL and free allocation" or under Article 10c, see 3.9 "transitional free allocation to the power sector").

The verified emissions under the EU ETS in 2013 were 1 897.8 Mt CO_2(e). This means that the average emissions of an EU ETS participant[47] are about 173 000 t CO_2. In this regard the EU ETS is exceptionally efficient in terms of GHG emissions per participant. In contrast, GHG reductions in the non-ETS sectors, such as domestic heating and road transport, require the contribution of more or less all 500 million EU citizens.

It is therefore concluded that the EU ETS is very relevant for meeting the EU's climate targets. Due to the size of the covered emissions and covered emitters, costs for reducing emissions can be high in absolute terms. Achieving the target in a cost-effective manner is therefore also highly relevant.

3.1.3.2 Relevance of cap & trade

The question "Is a cap & trade system (still) an effective and efficient instrument for achieving the required GHG reductions" is discussed in more detail in section 3.1.5.1 on efficiency of cap & trade as compared to other policies such as in particular a carbon tax.

Due to its design for targeting the biggest emitters' emissions with a cap & trade system, which is generally assumed as cost efficient for the economy as a whole, it is concluded that the EU ETS is a cost-effective means for achieving the targets.

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[46] http://ec.europa.eu/clima/policies/ets/registry/docs/compliance_2013_code_en.xls
Allocation data was checked by a download of the NAT of all Member States on 4 February 2015 from the EUTL website http://ec.europa.eu/environment/ets/napMgt.do

[47] Number of covered installations is assumed as 11 000.

3.1.3.3 Suitability for technological or scientific advances and other external factors

The EU ETS is a "flexible" instrument, i.e. it does not prescribe an operator of an installation how he should react to the demand of GHG reductions. Operators can choose to change their installation's operating conditions by various optimisations such as e.g. fuel switch, they can improve their energy efficiency, can decide to produce different products, or depending on market demand, they can increase or decrease their production. Their ability to pass through the costs of their GHG emissions under the EU ETS plays a decisive role for the latter decision, as is further discussed in section 3.4 on carbon leakage and free allocation.

This flexibility makes the EU ETS's suitability as policy instrument independent of technological progress. Its relevance is therefore independent of technological change. On the contrary, the EU ETS is designed to *drive* technological progress: Whether a technology can be considered "*available*" depends in particular on its associated costs[48]. If GHG emission costs increase with an increasingly stringent cap, avoiding those emissions will lead to bigger savings which can justify higher costs for the emission reduction. Thus, even currently relatively expensive abatement technologies will become economically viable, which is an intended effect of the EU ETS.

On the other hand, if a break-through technology became available unexpectedly, leading to a quick uptake by industry, the result would be an unexpected strong emission reduction. This would lead to an imbalance of supply and demand, and consequently to a decrease of the CO_2 price. If the CO_2 price decreased too fast, it would make the new technology again less feasible, leading to some volatility and uncertainty on the carbon market. Those effects would be comparable to the recent economic crisis. Although the order of magnitude may be different, the common element is the influence on the CO_2 price signal.

More details about such potentially negative effects are discussed in section 3.2 on cap setting. Although it is outside the scope of this evaluation (because it is not yet in place), it is relevant to note that the proposed Market Stability Reserve (MSR) would probably counteract such unexpected imbalances on the market and lead to a more stable market price for allowances. In that regard also the decision about the economic viability of new technologies would be based on a more stable basis. Thus, the MSR would make the EU ETS more robust.

3.1.3.4 Adjustability to new needs

The EU ETS Directive can be easily adapted to new needs, in particular to new climate policy targets in the EU. In principle, only one paragraph (Article 9), or even only one number relating to the linear factor for reducing the cap, needs to be amended. However, such a change can only be done in a formal legislative

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[48] The Industrial Emissions Directive (2010/75/EU) defines 'available techniques' in Article 3(10)(b) as: "those developed on a scale *which allows implementation* in the relevant industrial sector, *under economically and technically viable conditions*, *taking into consideration the costs* and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator" (emphasis added by authors). Download under **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:en:PDF**

setting involving a proposal by the Commission and decision-making by the European Parliament and the Council according to the ordinary legislative procedure. Therefore any proposed change would require sound analysis of impacts and an informed debate with all relevant stakeholders. The history of recent EU ETS amendments (the review in 2008, the debates on "back-loading" and the MSR) suggests that such changes are possible, if accompanied by measures such as free allocation for sectors exposed to a significant risk of carbon leakage, or an "innovation accelerator" such as the NER 300 programme, as found relevant during the analysis and the political process.

3.1.4 Effectiveness

The criterion of effectiveness is evaluated using the following questions:

- Which effects on GHG emissions in the covered sectors can be observed (in particular overall GHG reductions)?
- Can evidence be found of significant investments in GHG efficiency triggered by the Directive, or do GHG emissions take place rather due to operation decisions (such as fuel switch)?
- Have prices of carbon-intensive products originating from the EU ETS (including electricity) increased since/due to the implementation of the EU ETS, demonstrating that the intended internalisation of CO_2 costs is taking place?
- What kinds of parameters are driven by carbon prices and to what extent? Which influencing factors are driving carbon prices?
- To which extent can the GHG reductions (if observed) be attributed to the application of the Directive?
- How do the observed effects correspond to the objectives of the Directive?
- What are the strengths and weaknesses of the Directive? To what extent is the Directive prepared to react to unexpected influences such as an economic crisis or a booming economy?

3.1.4.1 Effect on emissions

The most visible finding when looking at emissions in the EU ETS is that emissions have decreased steadily. According to the EEA EU ETS data viewer[49] (which takes into account scope corrections for the transition from 2nd to 3rd phase of the EU ETS), emissions of installations currently covered by the EU ETS have decreased from 2.38 billion t CO_2(e) in 2005 to 1.81 billion t CO_2(e) in 2014. This equals an annual average reduction of 62.6 Mt CO_2(e) or 2.95% per year.

Not all the emission reductions can be attributed to the EU ETS alone. E.g. for 2014, a mild winter has been named as a driving cause, as well as the falling crude oil prices (which in turn translate into falling natural gas prices). For the whole period since 2008 the economic crisis is still notable. However, as is shown in section 3.2.4.3, evidence is found in several studies that the EU ETS *does* contribute effectively to emission reductions.

[49] EEA: European Environment Agency. The EU ETS data viewer is found at http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer

3.1.4.2 Internalisation of CO_2 costs and effect on product prices and investments

For the evaluation of this topic, please see section 3.4 (carbon leakage and free allocation). In that section the following issues are discussed based on available literature:

- Stakeholder consultations show that the EU ETS has found its way to the board rooms of energy intensive industries;
- Many industries are found able to pass through significant amounts of the CO_2 costs (for indirect CO_2 costs, further information is also found in section 3.5), i.e. for those sectors the ETS delivers the objective to internalise (at least to some degree) CO_2 costs in product prices;
- Because of free allocation, these levels of cost pass-through can be regarded as indicator for windfall profits, i.e. the same environmental effect of the ETS could be achieved more efficiently with less or no free allocation;
- Regarding long-term effectiveness, sections 3.2 (cap setting), 3.4 (free allocation) and 3.9 (free allocation to power sector) provide evidence that investments for emission reductions actually do take place. However, those are identified to a large extent as relatively smaller improvements, retrofits and efficiency improvements, while investments in completely new installations or in new technologies are rarely found. The projects under the NER 300 programme (section 3.8) may be an exception in this regard, but they receive additional funding, i.e. the CO_2 price signal alone does not drive these projects.

3.1.4.3 CO_2 cost impact on electricity prices

An important issue is the effect of the carbon price on electricity prices, as electricity is a commodity used not only by industry, but also by all other economic sectors. Increases of electricity prices induced by the EU ETS would therefore trickle down the value chain and incentivise electricity savings across all sectors, thereby harvesting the EU ETS' full efficiency.

Schumacher et al.[50] found that carbon prices show a clear impact on spot electricity prices, with a carbon price increase of 1% leading to about 0.16% increase in electricity prices. However, the authors acknowledged the mutual influence of carbon prices and electricity prices, a concern that could not be fully resolved by their models to provide satisfying results. By contrast, a study by the European Commission[51] shows that carbon prices have not had a statistically significant impact on retail prices of electricity, owing to the relatively low level of carbon prices in recent years. In contrast to spot prices which reflect the

[50] K. Schumacher, J. Cludius, F. Matthes, J. Diekmann, A. Zaklan, J. Schleich, "Price Determinants of the European Carbon Market and Interactions with Energy Markets", Öko-Institut, DIW Berlin and Fraunhofer-Institut für System- und Innovationsforschung, Karlsruhe on behalf of Umweltbundesamt, 2012, Download under http://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/4300.pdf

[51] European Commission, "Energy Economic Developments in Europe", 2014, Download under http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee1_en.pdf

energy component of prices, retail prices also include network costs, taxes, levies and some preferential pricing under long-term contracts.

Further to this, disentangling carbon price effects from other influencing parameters may be exacerbated by the current design of electricity markets. In particular, effects by the EU ETS cannot be looked at in isolation from other climate and energy policies, such as support schemes for renewables. In electricity markets, power plants supply electricity at certain capacities and are ranked by ascending order of production costs, called the 'merit-order'. The marginal power plant meeting demand is setting the market price which reflects revenues for all other power plants supplying electricity at lower costs. Power plants are however only bidding with their short-run marginal costs which do not reflect full costs of electricity production. Some renewables such as wind and photovoltaics have near-zero marginal production costs and therefore enter the merit-order near the bottom. As a consequence, they are shifting the supply curve to the right and equilibrium prices along this merit order towards lower prices. This is called the 'merit-order-effect'[52]. Therefore, carbon prices can contribute to higher electricity prices while at the same time support for renewables can have the opposite effect, reducing prices.

3.1.4.4 Drivers of carbon prices

The EU ETS is designed such that the balance between the supply of allowances (fixed by the cap in the Directive) and demand (depending on emissions) will lead to a market price (bigger than zero) for allowances. Due to the theory of marginal abatement costs, this price should be related to the costs for avoiding emissions. Some authors have claimed that the CO_2 price formation is not sufficiently understood[53]. However, the following evaluation of existing literature shows that by and large market fundamentals do indeed lead to an "understandable" market price.

There is a growing number of literature available[50,51,54,55,56,57,58,59,60,61,62,63,64] assessing the effectiveness of the EU ETS in terms of curbing emissions as well

52 F. Sensfuss, M. Ragwitz, M. Genoese, "The merit order effect: A detailed analysis of the price effect of renewable electricity generation on spot market prices in Germany", Fraunhofer ISI, Working Paper Sustainability and Innovation, No. S 7, 2007, Download under http://econstor.eu/bitstream/10419/28511/1/565631225.pdf

53 Such as N. Koch, S. Fuss, G. Grosjean, O. Edenhofer, "Causes of the EU ETS price drop: Recession, CDM, renewable policies or a bit of everything? – New evidence", Energy Policy73(2014)676–685, Download under https://www.pik-potsdam.de/members/edenh/publications-1/CausesoftheEUETSpricedrop.pdf
As they describe their findings: "*In this paper we examine whether and to what extent the EUA price drop can be justified by three commonly identified explanatory factors: the economic recession, renewable policies and the use of international credits. […] The bottom line, however, is that 90% of the variations of EUA price changes remains unexplained by the abatement-related fundamentals.*", This, however, must be understood in the light of the narrow list of potential influencing factors used, as shown by other literature cited here.

54 O. Gloaguen, E. Alberola, "Assessing the factors behind CO_2 emissions changes over the phases 1 and 2 of the EU ETS: an econometric analysis", CDC Climat Research Working Paper No, 2013-05, Download under http://www.cdcclimat.com/IMG/pdf/13-10_cdc_climat_r_wp_13-15_assessing_the_factors_behing_co2_emissions_changes.pdf

55 KfW/ZEW CO2 Barometer 2014 – Carbon Edition, Download under https://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-CO2-Barometer/CO2-Barometer-2014-Carbon-Edition.pdf

56 M. Grubb, T. Laing, M. Sato, C. Comberti, "Analyses of the effectiveness of trading in EU-ETS", Climate Strategies 2012, Download under http://climatestrategies.org/wp-content/uploads/2012/02/cs-effectiveness-of-ets.pdf

as the drivers behind carbon prices and their relationship with other factors, e.g. energy prices. Limited success has been achieved, however, in disentangling the impact on observed emissions reductions caused by the EU ETS, more precisely by the carbon price, from other climate and energy policies, such as renewable support, as well as other external factors, such as the economic crisis. A study[56] in 2012 has shown that: *"Over-allocation (in Phase 1) and in particular the recession (in Phase 2) have reduced the direct impact of the EU ETS on emissions, but the combination of rigorous monitoring and awareness, together with a positive carbon price, has driven some abatement.*"

As will be discussed below in the context of allocation rules and carbon leakage (section 3.4), also the rules for allocation can have an impact on the efficiency of the system. A recent study[57] expresses it like this: "*On innovation, there is evidence that investment and innovation responses are stronger in companies which face a shortage of allowances than in those with surplus allowances – a finding at odds with classical theory but consistent with theories of behavioural economics, which emphasise loss and risk aversion more than pure optimisation. However, the volatile price – and lack of clarity beyond 2020 – has undermined the potential of the EU ETS to drive the large, long-term investments that decarbonisation ultimately requires."* This also points to the fact that for a more efficient transition to a low-carbon economy, more needs to be achieved, with the CO_2 price playing a crucial role.

Three publications are worth particular attention:

1. Umweltbundesamt (Germany) 2012:

This study[50] used econometric time series analysis based on continental EU and UK market data. Results suggest that the **EUA price reacts to market fundamentals**. This shows that the EU ETS is able to effectively reflect relevant information of energy markets for the scarcity of EUAs. "*In particular, the gas and switching price tend to exhibit the expected positive effect and the coal price the expected negative effect on the price of EUA, while economic activity*

[57] T. Laing, M. Sato, M. Grubb, C. Comberti, "Assessing the effectiveness of the EU Emissions Trading System", January 2013; Centre for Climate Change Economics and Policy Working Paper No. 126 / Grantham Research Institute on Climate Change and the Environment Working Paper No. 106, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf

[58] G. Bel, S. Joseph, "Industrial Emissions Abatement: Untangling the Impact of the EU ETS and the Economic Crisis", 2014, Research Institute of Applied Economics, Working paper 2014/22 1/23, Download under http://www.ub.edu/irea/working_papers/2014/201422.pdf

[59] R. Martin, M. Muûls, U. Wagner, "The Impact of the EU ETS on Regulated Firms: What is the Evidence After Nine Years?", 2014, Download under http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2344376

[60] S. M. Feilhauer, D. A. Ellerman, "A Top-down and Bottom-up look at Emissions Abatement in Germany in response to the EU ETS", 2008, Download under http://dspace.mit.edu/bitstream/handle/1721.1/45661/2008-017.pdf?sequence=1

[61] U. Wagner M. Muûls, R. Martin, J. Colmer, "The Causal Effects of the European Union Emissions Trading Scheme: Evidence from French Manufacturing Plants", 2014, Download under http://www.iza.org/conference_files/EnvEmpl2014/martin_r7617.pdf

[62] B. Anderson, F. Convery, C. Di Maria, "Technological change and the EU ETS: the case of Ireland", 2011, Download under http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1687944

[63] European Environment Agency (EEA), "Trends and projections in Europe 2014 Tracking progress towards Europe's climate and energy targets for 2020", 2014, Download under http://www.eea.europa.eu//publications/trends-and-projections-in-europe-2014

[64] B. Hintermann, S. Petersond, W. Rickels, "Price and Market Behavior in Phase II of the EU ETS", Kiel Working Paper No. 1962, 2014, Download under https://www.ifw-members.ifw-kiel.de/publications/price-and-market-behavior-in-phase-ii-of-the-eu-ets

has a positive effect. The estimated parameters for coal and gas prices as well as economic activity are highly significant and proved to be robust in terms of sensitivity analyses of different model specifications". The study furthermore finds: "*The parameters can be interpreted as elasticities, showing the percentage increase in the EUA price for a given 1% increase of the exogenous variable. The coefficients for the gas price and economic activity in the continental market turn out to be in the same range of 0.25 (economic activity) to 0.3 (gas price). This implies that a 1% increase of the price of natural gas, for example, would result in a 0.29% increase of the EUA price. The effect of a change in coal prices is negative and substantially smaller (-0.09). In the specification including the switching price, it shows an elasticity of around 0.1."* Furthermore they found that "*the electricity price has a large positive impact on the carbon price in the short run (elasticity of about 1).*"

2. European Commission 2014:

This study[51] used advanced models for determining short and long-run coefficient estimates obtained from the Error Correction Model (ECM) version of the Autoregressive distributed lag (ARDL) model. All the estimated coefficients have emerged with the theoretically expected signs and many are statistically significant.

<u>Long-run results:</u> It was found that economic activity and renewable policy as well as the coal price have had an impact on the carbon price in the period 2008-12. The negative coefficient of coal prices suggests the possibility of fuel switching by electricity producers, when coal prices increase, towards a less carbon intensive energy source, such as natural gas. Business cycles have a strong influence on the carbon price by affecting the demand for allowances. Weather conditions, however, would not have had any systematic impact in this five year period.

The study found that any deviation from the long-run carbon prices path due to changes in the explanatory variables is corrected by approximately 50% over the following month. Moreover, the negative sign of that term implies that the carbon prices series is "non-explosive", implying that the price reverts to its long-run equilibrium after an unexpected incident.

<u>Short-run:</u> Renewable penetration and the evolution of coal prices are the most important factors influencing price formation; Consistent with the long-run results, both affect prices negatively by lowering the demand for allowances. By contrast, the results indicate that economic activity, as well as the hydro production, despite that their coefficients have the expected sign, do not affect the carbon price in the short run.

3. ifw-Kiel 2014

This paper[64] contains a review of the empirical literature examining allowance price formation. As the authors find, "***A consensus has emerged that allowance prices are significantly related to fuel prices and to variables affecting the expected amount of necessary abatement, such as economic activity or changes in the cap.***" However, the authors found that the relationship was not robust, "*probably because the relevant abatement technologies change with the economic conditions they operate in*". Models explicitly accounting for uncertainty about future demand and supply of abatement were found to explain better allowance price variation during certain periods. The study furthermore

found it impossible to decide "*whether the price is 'right', in the sense that it reflects marginal abatement costs, or whether there is a price wedge caused by transaction costs, price manipulation, or other sources of inefficiency*". Finally, they confirm that "*the banking provision has induced it* [i.e. the CO_2 price] *to incorporate future scarcity of allowances and to smooth the effect of transient shocks as intended."*

Conclusions

Summarising these findings, it can be said that in principle the EU ETS has delivered in fostering a carbon price, which apparently reacts to market fundamentals, with the fuel price and the fuel switch price being among the most prominent factors. However, external factors, in particular the economic crisis, have contributed strongly to the (long-term) price development. Considerable uncertainty in recent years has overshadowed the market. This related more to the supply side (discussions on back-loading and the MSR) than to the demand side (GHG efficiency, production levels, weather conditions). This led to seemingly higher price fluctuations than anticipated when setting up the EU ETS. However, similar price fluctuations also exist on other markets (see e.g. the comparison made with crude oil prices in section 3.2.4.1) and should not be considered as a principle flaw of the EU ETS.

3.1.4.5 Effect of the EU ETS on EU GHG reductions

This section tries to identify to what extent the emission reductions (as found in section 3.1.4.1) can be attributed to the EU ETS. This should answer whether the EU ETS responds effectively to the objectives of the EU ETS, and more widely, to the needs of the EU climate policy.

In 2014, the EEA conducted a decomposition analysis[65], based on the Logarithmic Mean Divisia Index (LMDI) method, of the change in total emission from burning of fuels. Figure 8 shows the estimated contributions of the various factors that have affected CO_2 emissions from energy production and consumption in the EU-28 between 1990 and 2012. Over this 22-year period, four of the factors have been identified which had a positive impact on reducing CO_2 emissions:

- lower final energy intensity [less final energy per GDP, e.g. less energy used by end users];
- lower carbon intensity of fossil fuels [less CO_2 per primary energy from fossil fuels, e.g. less carbon-intensive fuels];
- improved energy-transformation efficiency [less primary energy per final energy, e.g. more efficient electricity production]; and
- higher non-carbon fuels effect [less fossil fuels in total primary energy, e.g. more use of renewables].

There were two factors with a negative impact on emissions (i.e. higher CO_2):

- the EU population increased by 31 million since 1990; and
- higher GDP per capita, with an EU net increase of 36% between 1990 and 2012.

[65] EEA, "Why did greenhouse gas emissions decrease in the EU between 1990 and 2012?", 2014, Download: http://www.eea.europa.eu/publications/why-are-greenhouse-gases-decreasing

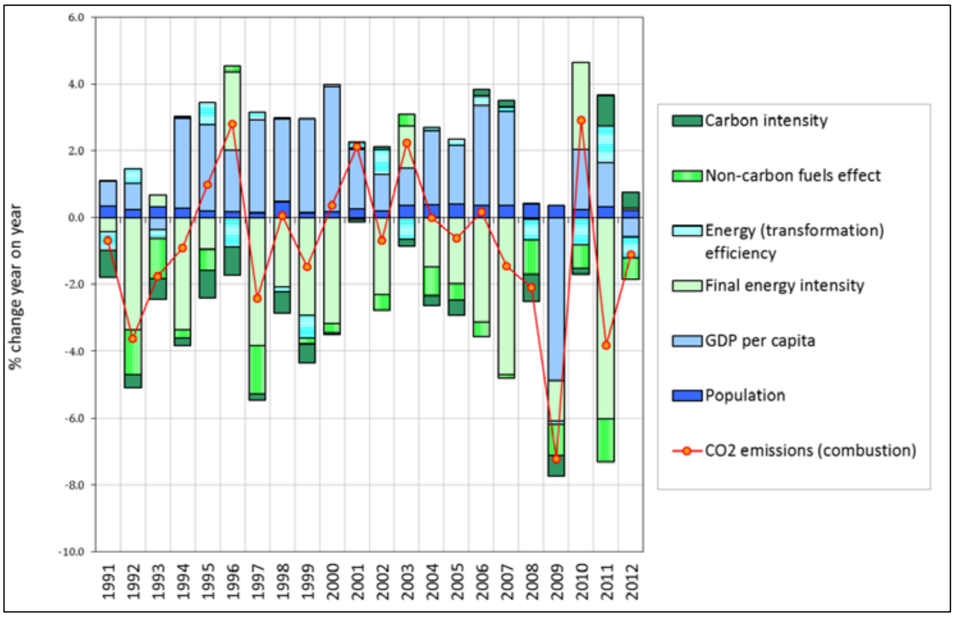

Figure 8: Detailed annual decomposition of the change in total CO_2 emissions from fossil fuel combustion in the EU-28, 1990–2012; Source: EEA 2014[65].

Those findings show that improvements in energy and carbon intensity have significantly contributed to the overall emission reductions. However, they do not provide further insight on the extent to which these reductions can be attributed to the EU ETS alongside other policies and factors, such as renewable support, energy price increases or technological advances.

The study by Laing et al.[57] concludes its literature review as follows: *"Disentangling the impact of the EU ETS from other factors is complex, but academic studies with both "top down", and sector-based "bottom up" evaluations, point to attributable emission savings in the range 40 – 80 Mt CO_2/yr, annual average (and point estimates of particular years) to date. This is about 2–4% of the total capped emissions, which is much bigger than the impact of most other individual energy environmental policy instruments."* It must be noted that these numbers also include short-term (reversible) measures such as fuel shift (including switching between different generating capacities in the power sector")[66].

However, when trying to attribute contributions to the EU ETS impact to specific sectors, finding empirical evidence becomes even more difficult. As concluded in a broad literature review[67] which focussed on ex-post evaluation of the effectiveness of the EU ETS over the first two phases: *"While the EU ETS may have led to abatement in the power sector, the evidence on the impact of the EU ETS*

[66] See e.g. M. McGuinness, D. Ellerman, "CO_2 Abatement in the UK Power Sector: Evidence from the EU ETS Trial Period", 2008, Massachusetts Institute of Technology, Download under http://dspace.mit.edu/bitstream/handle/1721.1/45654/2008-010.pdf?sequence=1

[67] R. Martin, M. Muûls, U. Wagner, "An evidence review of the EU emissions trading system, focussing on effectiveness of the system in driving industrial abatement", 2012, Department of energy & climate change, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48449/5725-an-evidence-review-of-the-eu-emissions-trading-sys.pdf

on participating industrial firms' GHG emissions is not conclusive. Several studies found that, in the aggregate, emissions across all regulated sectors declined by around 3% in Phase I and during the first two years of Phase II, relative to estimated business-as-usual emissions. However […] it was not clear how much the industrial sector contributed to this aggregate figure. What is more, these studies relied on aggregate estimates of what emissions would have been had the EU ETS not been in place. The high level of aggregation precluded breaking down the total effect into emission reductions attributable to individual sectors."

The study by Gloaguen & Alberola[54] contains the attempt to develop counterfactual scenarios (i.e. the hypothetical emissions of the EU without EU ETS). Compared to such scenarios they find accumulated emissions reductions for 2005 to 2011 in the range of 1.1 or 1.2 Gt CO_2. Analysing the reasons for reductions, they conclude that between 600 and 700 Mt CO_2 (i.e. between 50 and 70%) result from EU climate policies (renewable energies and energy efficiency), while only 300 Mt CO_2 reductions are attributed to the economic downturn. Substitution effects between coal and gas also seem to have affected emissions, in an order of magnitude of around 200 Mt CO_2.

The study authors highlight that the econometric analysis and the models do not enable to identify a possible carbon price impact. Therefore they conclude that the price of carbon played a relatively small role for emissions reductions. However, the strong development of renewable energies is found responsible for the fall in carbon price and thus marginalises its influence in terms of the CO_2 emission reductions in EU ETS installations. Finally this study calls into mind that the CO_2 price created by the EU ETS also contributed to a 1 048 Mt CO_2 reduction in emissions outside the EU, via the use of international carbon credits arising from the CDM and JI mechanisms by EU ETS installations between 2008 and 2012.

3.1.4.6 Strengths and weaknesses of the EU ETS

Any cap & trade system's **strength** is its cost-efficiency, as the "low hanging fruits" will always be used first for making emission reductions, and highly costly measures would be delayed, in the ideal case until better and cheaper technologies for GHG reduction become available. In this regard an ETS is only comparable to a carbon tax.

Compared to a carbon tax, the major advantage of cap & trade is its high environmental integrity. The policy maker can be sure that the environmental target given by the cap will be achieved, i.e. the total emissions will be lower than or equal to the target, given that the following conditions are met:

- The target is reflected by the cap (i.e. by the total allowances on the market);
- the legislation and in particular the cap remains unchanged for a sufficient amount of time;
- the MRV (Monitoring, Reporting and Verification) system is robust;
- effective penalties are put in place for non-compliance of participants.

Compared to this, a carbon tax system would achieve the same result only if the "correct" level of tax is found. In the ETS, the market finds this "correct" carbon price automatically. In particularly it reacts also to economic downturns. A tax

would remain unchanged under such conditions and would add unnecessary burden on participants. A tax system would have only “losers” (every covered entity would have to pay some taxes), comparable to an ETS with full auctioning. On the other hand, in an ETS like the current EU ETS, some entities may be winners, if they can sell surplus allowances. This resulted in particular in the early phases of the EU ETS in higher acceptance by participants than a carbon tax might have received.

In the light of recent years’ experience, the most obvious **weakness** of cap & trade is the lack of flexibility to strong external influences such as the economic downturn starting in 2008. As discussed in the “cap setting” section (3.2), such a situation needs additional measures for ensuring the long term target of the system. While the short-term target is still met (emissions in the second phase of the EU ETS were well below the cap), the resulting carbon price turned out too low for steering sufficient low carbon investments.

Further strengths and weaknesses can be found in the technical details of the EU ETS, e.g. whether the MRV system is simple or burdensome (a balance has to be found taking into account the credibility and accuracy of provided data), and in all other kinds of administration such as allocation rules. However, those are only indirect strengths and weaknesses, similar to those necessary for implementing any other policies. Administrative efforts can only be kept to the necessary level, but cannot be avoided completely.

A study by CDC Climat Research 2012[68] summarises what many other authors also have found: “*The carbon market has performed just as it was designed to in two important ways: Firstly, a number of studies have shown that the EU ETS has driven abatement, most notably through fuel switching in the power sector, but also in other industries. Not only does the carbon price exist, therefore, but key emitting sectors are clearly taking it into account in their production and short-term abatement decisions. Secondly, Phases 1 and 2 of the EU ETS have demonstrated that carbon prices in times of low political uncertainty adjust to market fundamentals to ensure that the emissions target is reached at minimal economic cost. This has been demonstrated in the EU ETS literature, which has shown the clear correlations between carbon prices and relative fuel prices, which are a proxy for marginal abatement costs[69].*” Regarding weaknesses, they again summarise what others mention as well: “*We identify three main weaknesses that affect the functioning of the EU ETS: insufficient credibility of long-term scarcity, the consequences of interactions with other energy policies and the lack of regulatory clarity to respond to extraordinary demand conditions.*”

3.1.4.7 Effect on investments

The effects of the EU ETS (and of allocation rules) on investment patterns are discussed in detail in section 3.4.3.4 (carbon leakage / long term effects). Observations there include the difficulty to determine investment patterns based on

[68] N. Berghmans, O. Sartor, N. Stephan, “Reforming the EU ETS: give it some work!”, CDC Climat Research, 2013; Download under: http://www.cdcclimat.com/IMG/pdf/13-03-06_climate_brief_no28_structural_reform.pdf

[69] J. Chevallier, “Carbon Price Drivers: An Updated Literature Review”, 2011, Download under https://halshs.archives-ouvertes.fr/file/index/docid/586513/filename/chevallier_carbon_16_04_11.pdf

surveys or on data (if any data are available at all). However, it has become clear that the EU ETS is a factor that is discussed in board rooms and contributes to investment decisions. However, examples in other sections of this evaluation (section 3.9 dealing with Article 10c, section 3.2 on cap setting) show that up to date bigger investments in GHG efficiency are still the exception, while smaller improvements and retrofits for improving GHG efficiency have become regular practice.

Ecofys 2014[70] carried out a literature review and a consultation of stakeholders and experts in order to provide understanding of how investment decisions are made and how risks and uncertainties are dealt with in general. According to their findings, the decision-making process varies greatly between projects and firms depending on the size of the investment relative to the size of the firm; the objective of the investment (strategic or operational); the types of risks involved; and the time horizon of the investment. In the EU ETS context it is important that carbon prices and energy prices are now regularly within the range of commercial factors affecting investment decisions. The carbon price and its associated uncertainty are therefore to be considered. In many companies carbon price is seen primarily as carbon costs, and in the current situation where carbon prices are low, they are too insignificant to be considered on their own and are often incorporated into the general bracket of energy costs. Ecofys furthermore found that "*the industrial sectors overwhelmingly consider carbon costs as distinct from carbon prices. This is because the high quantity of free allowances available to firms relative to their current need, largely shields them from direct exposure to carbon prices, whereas they may be more strongly affected by policy decisions that impact on the quantity of free allowances allocated to them.*"

Summarizing this section, the EU ETS does have some positive impact on investment decisions, but not yet as strong as this was planned when the EU ETS was introduced.

3.1.5 Efficiency

Efficiency of the EU ETS in general is discussed based on the following evaluation questions:

- To what extent has the Directive been more or less successful in achieving its objectives compared to alternatives, e.g. command and control measures, taxation?
- Is the current coverage (scope) of the EU ETS in line with the objective of cost-efficiency, i.e. are the covered installations those which can be best regulated by a cap & trade system (in terms of emission reduction potential and related abatement costs, and regarding administrative efficiency)?
- To what extent are the costs resulting from the implementation of the Directive proportionate to the results/benefits that have been achieved? Taking into account:
  - Direct costs for operators (purchase of allowances);

[70] A. Gilbert, P. Blinde, L. Lam, W. Blyth, "Cap-Setting, Price Uncertainty and Investment Decisions in Emissions Trading Systems", Ecofys and Oxford Energy Associates, 2014, Download under: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311914/EU_ETS_cap-setting_project_REPORT.pdf

  - Administrative costs for operators (including MRV and registry fees);
  - Administrative costs for regulators;
  - Secondary impacts concerning financing/support mechanisms for low carbon technologies[71];
  - Costs for support to address carbon leakage;
  - Balance of the costs with auctioning revenues.
- What factors influenced the efficiency with which the observed effects (i.e. emission reductions) were achieved?
- If there are significant differences in costs (or benefits) between Member States or industry sectors, what is causing them?

3.1.5.1 Cap & trade versus carbon tax and other instruments

The EU ETS, a cap & trade system, was selected as main policy instrument for reducing GHG emissions from industrial installations because of its cost-efficiency compared to other instruments. Two different alternative approaches need discussion:

- 'Command and control' measures, such as the IED (Industrial Emissions Directive): The latter prescribes the use of best available techniques for each individual installation. Permits of installations under the IED usually also mandate certain ELVs (emission limit values) for the individual case.
- Carbon taxes: These are very similar to cap & trade regarding their underlying theory, particularly the cost-efficiency argument would be the same.

Virtually every piece of literature on ETS and economic theory will state that command & control is economically less efficient than cap & trade where the polluting effect of emissions is not a local one. This is especially the case for the emission of GHGs where each molecule emitted is increasing the GHG concentration of the atmosphere on a global scale, no matter where they are being emitted. A practical comparison between the two systems, in particular on the EU ETS, however, is difficult due to the lack of counterfactual scenarios. Therefore it is necessary to go back to the early days of the EU ETS. As the Commission's green paper on introducing an ETS outlined[72] in 2000, some modelling exercise using the PRIMES model was done for estimating the cost savings by the proposed EU ETS compared to other policies for reaching the Kyoto target. The authors used a so-called "cheese-slicer" case, where each participant[73] in the system would have to achieve the GHG emission reductions of its Member State in line with the burden sharing agreement, instead of all participants re-

[71] Care must be taken here to avoid taking into account those support schemes which are based on other legislation, in particular support schemes for renewable energy sources.

[72] This is further explained in Vainio and Zapfel, "Economic analysis of emission trading in CO_2 emissions in the European Union", in: EU Energy Law Vol. IV – The EU Greenhouse Gas Emissions Trading Scheme, J. Delbeke Ed., Claeys&Casteels 2006;
For the modelling using the PRIMES model see: P. Capros, L. Mantzos,: "The Economic Effects of EU-wide Industry-Level Emission Trading to Reduce Greenhouse Gases", 2000, E3M Lab, National Technical University of Athens, Download under
http://ec.europa.eu/environment/enveco/climate_change/pdf/primes.pdf

[73] In the PRIMES model the "participant" is one industry sector in one Member State, not individual installations. At installation level, the difference to the full ETS application would be even more pronounced.

ducing emissions jointly to the same level. This was considered the economically worst case. It was found 127% more costly than the modelled case of trading between Member States[74], with average marginal abatement costs at EU level being even 230% higher. Although the figures are based on theoretical models used for a different purpose, they demonstrate that a command & control type approach would be more costly than the flexible cap & trade.

Comparing the EU ETS with a carbon tax, theory predicts similar efficiency for both. The main difference is that in case of a tax, the question must be answered by the regulating authority what the "correct CO_2 price" (i.e. the correct level of taxation) is for achieving a certain target. If the tax is set too low, the environmental target is not achieved. A tax that is too high leads to undue costs for the participants. As Tietenberg[75] points out, this price finding requires an iterative trial and error process.

In a cap & trade system, the regulator does not need to know this "correct CO_2 price", but only the environmental target, i.e. the cap. The CO_2 price is then built on the market directly, without "trial and error". Furthermore the nature of the cap ensures that the target is achieved "automatically", if the penalty for non-compliance is sufficiently deterring.

The theoretical aspects therefore support a cap & trade based system as being most efficient in reducing emissions. However, this is only true if market participants are acting rationally, i.e. take their decisions based on the price signals they are facing. In 2009, a study by PWC[76] highlighted along the same lines that market-based policies (trading schemes as well as taxes) are superior to command and control regimes, yet emphasised that taxes might become the preferable option where consumer inertia and myopia prevent an efficient response to market signals. Furthermore, the authors concluded that the choice between carbon taxes and carbon trading is much less clear-cut, pointing at the potential impact of uncertainties on the system's efficiency. The study highlights in particular that carbon taxes are better suited than trading systems in avoiding the risk of excessive short-term carbon price volatility that might discourage potential investors in low carbon technologies. Along these same lines, Wara[77] points out that imperfect information might lead to suboptimal environmental performance of emissions trading, relative to carbon taxation policies.

Some of those arguments from above that can be held against a cap & trade system, in particular participant's myopia and market uncertainty, raise an important question about a system's intertemporal efficiency. Market uncertainty, as mentioned above, relates to the market's predictability, a concept discussed in section 3.2 (cap-setting).

The study by PWC[76] indicated that rather than a pure tax or trading scheme, a hybrid approach of these two instruments may be worth serious consideration.

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[74] Note that this model dealt with the Member States total CO_2 emissions, not only the EU ETS sectors.

[75] T. Tietenberg, "The Evolution of Emissions Trading", 2008; https://www.aeaweb.org/annual_mtg_papers/2008/2008_90.pdf

[76] Price Waterhouse Coopers (PWC), "Carbon Taxes vs Carbon Trading - Pros, cons and the case for a hybrid approach", 2009; http://pwc.blogs.com/files/carbon-taxes-and-trading---final---march-2009.pdf

[77] M. W. Wara, "Instrument Choice, Carbon Emissions, and Information", Stanford Law School 2014, Download under http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2469397

The carbon price floor in the UK[78] is such a system. It adds a tax on top of the EU ETS-induced carbon price such that the overall carbon costs are not lower than the intended price floor. It is thereby designed to steer more GHG abatement in the UK. However, the overall abatement in the EU ETS would remain unchanged.

In 2013, Goulder & Schein[79] presented in their review on this topic, that neither carbon tax nor cap & trade differ in principle, since both offer design options for reaching a certain environmental target, targeting companies' competitiveness, distribution between companies and households, linkage with other ETS or offset systems, different levels of administrative costs. However, possible price volatility is identified as the main drawback of cap & trade, a feature completely absent in a tax system. The authors name price floor/ceiling systems as a potential remedy against excessive volatility. On the other hand the main drawback of carbon taxes is found in the uncertainty not of the carbon price, but the system's environmental effectiveness.

Although no option dominates the others, a key finding of that study is that exogenous emissions pricing (whether through tax or hybrid approach) has some attractions over pure cap and trade. Beyond helping prevent price volatility and reducing expected policy errors in the face of uncertainty, exogenous pricing helps avoid problematic interactions with other climate policies (such as renewables funding) and helps avoid potential wealth transfers to oil-exporting countries.

Regarding administrative costs, a recent study[80] demonstrates for the case of Sweden, where a carbon tax is imposed in addition to the EU ETS, that the administrative costs (in particular MRV) of a carbon tax are lower than for a cap and trade system. However, the review by Goulder and Schein[79] gives some insight that such difference may be mainly due to the difference in "upstream" vs. "downstream" regulation.

3.1.5.2 Scope of the EU ETS

A key prerequisite of cap & trade theory is that participants are rational actors trying to maximise profits. Unlike human individuals, companies comply most likely with this requirement. Furthermore each actor should be sufficiently big (i.e. having sufficient levels of emission under his control) in order to keep transaction costs significantly lower than the costs of the allowances themselves. As mentioned in section 3.1.3.1, average installations' emissions are in the order of magnitude of thousands of tonnes CO_2. It can therefore be as-

[78] HM Treasury, "Carbon price floor: support and certainty for low-carbon investment", 2010, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42639/consult_carbon_price_support_condoc.pdf

[79] L. H. Goulder, A. R. Schein, "Carbon Taxes vs. Cap and Trade: A Critical Review", Climate Change Economics, Vol. 4, No.3, 2013, Download under: http://web.stanford.edu/~goulder/Papers/Published%20Papers/Goulder%20and%20Schein%20-%20Carbon%20Taxes%20vs%20Cap%20and%20Trade%20-%20Cl%20Ch%20Economics.pdf

[80] J. Coria, J. Jaraite, "Carbon Pricing: Transaction Costs of Emissions Trading vs. Carbon Taxes", University of Gothenburg, 2014, Download under https://gupea.ub.gu.se/bitstream/2077/38073/1/gupea_2077_38073_1.pdf

sumed that this second condition is also satisfied by the EU ETS' general design.

The scope of the EU ETS is discussed under the efficiency criterion because the "best" scope will be the one with the best cost/benefit ratio, in line with the EU ETS' principle objective of being a cost-efficient means for reducing GHG emissions. Therefore, a balance needs to be struck between two considerations:

- If only the biggest emitters are included, there is a danger that too few participants will be covered, leading to low liquidity on the market and inefficient price discovery. Important GHG abatement potentials might be excluded.
- If too small participants are included in the EU ETS, the administrative costs may become high.

Since its introduction, the EU ETS was widely promoted as the most cost-efficient policy for reducing GHG emissions. And more importantly, when the EU ETS was reviewed in 2008: it was a measure already in place and well working. Therefore, discussions in the 2008 review only focussed on potential extensions of the scope and not its reduction. This aimed at making the EU ETS more efficient by bringing in further abatement potentials, and for bringing in other sectors which are simply suitable for this type of GHG regulation. The only discussion about reducing the scope was focussed on low emitting installations based on cost/benefit considerations (see section 3.10). Little is therefore to be added to the aspects discussed in the impact assessment of 2008. Criteria formulated (and still valid for potential further inclusion of sectors) are the following:

- Significance of the sector / size of entity covered;
- Feasibility to monitor the emissions;
- Proportionality of transaction costs;
- Interaction with existing policies and regulation: Ensure level playing field among sectors while avoiding double regulation;
- Compliance costs: Abatement potential as such is not the criterion, but whether an undistorted CO_2 signal can be ensured.

All the sectors proposed and complying with those criteria have now been successfully included in the EU ETS. It is concluded that the scope of the current EU ETS regarding stationary, industrial installations is therefore "as it should be".

3.1.5.3 Overview of value and costs of the EU ETS

The EU ETS has created significant value in form of allowances by putting a price tag on the right to emit greenhouse gases from industrial sources. In accordance with the total cap, the value created in 2013 was 2 084 million allowances multiplied by a carbon price[81]. Those assets are shared between Member State governments in the form of auction revenues and the private sector (free allocation to industry).

[81] Throughout this report the average auctioning price achieved in 2013 is used, i.e. 4.45 € per allowance or per t CO_2(e).

In line with the flexible nature of the market-based instrument EU ETS, compliance costs for participants vary between having to buy 100% of allowances (default case for electricity producers in the third phase) and being able to sell a significant part of the allowances allocated for free. Therefore a more detailed analysis of compliance costs exceeds the scope of this evaluation. However, to give an idea about the order of magnitude in the EU ETS, the following quick calculation is made:

- Total free allocation to all installations in the EU ETS[82] in 2013 (i.e. including incumbents and new entrant allocation under Article 10a *and* transitional free allocation under Article 10c) was 995 million EUAs;
- Total verified emissions of installations in 2013 were 1 908 Mt CO_2(e);
- The difference multiplied by an average EUA price of 4.45 €/EUA[83] gives a value of the allowances used for compliance and not allocated for free of approximately 4 063 million € for the EU ETS as a whole in 2013.
- Auction volume in 2013 was 808 million allowances[84], with revenues of 3.6 billion € achieved by Member States (see section 3.1.5.5). Therefore it can be assumed that installations covered significant amounts of 2013 emissions with allowances obtained during the 2nd phase[85] and/or JI/CDM credits. This would mean that compliance costs were lower than estimated. On the other hand some of the allowances used in 2013 may also have been purchased at times of higher carbon prices. Thus, it is difficult to give real compliance costs for installations. The above given estimate of 4 billion € in 2013 may serve as proxy value only.

In a theoretical case of full auctioning (i.e. without any free allocation), the value of allowances to be used for compliance in 2013 would have been approximately 8.49 billion €, i.e. more than double the current value. These figures appear high only if compared to a "do nothing" scenario. As Vis[86] explains, complying with a GHG reduction target (such as under the Kyoto protocol, or the targets posed by EU legislation) will inevitably create costs. Also, not putting a price on carbon would lead to a negative externality. However, it would be a misconception if industry believed the target could be achieved cheaper for them, i.e. if other sectors contributed more reductions. In such case, as Vis points out, industry would have to shoulder costs indirectly. If the transport sector were to reduce more emissions, transport costs faced by industry would increase. If households and agriculture were to contribute more, consumers would demand higher salaries, again at the expense of industry. In analogy, if the EU ETS covered only the power sector, industry would face higher indirect carbon costs.

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[82] Data based on the latest public EUTL data (national allocation tables) accessed on 4 February 2015.

[83] The average EUA price achieved in auctions in 2013 is used here.

[84] This amount was less than what results from Article 10a(5) because a significant number of allowances was already auctioned in 2012 and because of allowances reserved for the use under Article 10c (derogation for the power sector).

[85] More than 90% of the 2nd phase allocation was for free.

[86] P. Vis, "Basic design options for emissions trading", in: EU Energy Law Vol. IV – The EU Greenhouse Gas Emissions Trading Scheme, J. Delbeke Ed., Claeys&Casteels 2006

Regarding administrative or transaction costs, there are studies[80,87,88] available that determined such costs for a couple of Member States. Moreover, all of these studies assessed the relation between those costs and an installation's size in terms of annual emissions. This assessment has therefore to be seen in close conjunction with the evaluation chapter on small installations (section 3.10).

For example, a study[89] for Germany determining transaction costs through surveys found: "*The average transaction costs (transaction costs divided by annual emissions) are highly different for firms of different sizes. Average transaction costs are relatively high for smaller emitters (up to € 1.00 per tonne* CO_2*), but trickle down with rising annual emissions of a firm.*" A similar study[90] for Ireland more or less confirms those findings: "*When costs are expressed per tonne of* CO_2 *emissions emitted, this pattern reverses: the 3-year MRV costs per tonne of* CO_2 *were significantly higher for small firms than for large and medium ones.*"

It has however to be kept in mind that those studies only evaluated costs incurred by operators before the start of the third trading phase. Thus some improvements regarding lighter MRV requirements allowed by the M&R Regulation have not yet been taken into account. Results can therefore only give a first estimate of what the costs were before the start of phase 3.

3.1.5.4 Impacts on competitiveness and employment

For this issue, reference is made to section 3.4 (carbon leakage). The overall conclusion of that section is that theoretically, industries facing international competition, in particular from countries without carbon costs imposed, may suffer competitive disadvantages. However, this effect has not yet been proven by conclusive evidence, mostly due to the low carbon price. In any case, the current EU ETS design with high levels of free allocation is likely to limit the competitive disadvantage, as found by the evaluation in section 3.4. This will go hand in hand with only insignificant impacts on employment in the industries covered by the EU ETS.

On a separate line of thinking, the EU ETS has certainly created jobs: Competent authorities, consultants, verifiers, auctioneers and traders are required to run the system. However, no studies have been found to quantify this effect. Furthermore, engineers and project developers are needed to develop the basis for the investments to be made for moving to a low-carbon economy. Virtually every Commission document on climate policy (such as impact assessments, road maps, legislative packages) over the last years has emphasised that this

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87 F. Frasch, "Transaction Costs of the EU Emissions Trading Scheme in German Companies", Sustainable Development Law & Policy, Spring 2007, 48-51., Download under http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1308&context=sdlp

88 K. King, S. Pye, S. Davison, "Assessing the cost to UK operators of compliance with the EU Emissions Trading System", Aether UK, 2010, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47953/895-cost-euets-uk-operators-compliance.PDF

89 P. Heindl, "Transaction Costs and Tradable Permits: Empirical Evidence from the EU Emissions Trading Scheme", ZEW, 2012, Download under http://ftp.zew.de/pub/zew-docs/dp/dp12021.pdf

90 J. Jaraite, F. Convery, C. Di Maria, "Assessing the Transaction Costs of Firms in the EU ETS: Lessons from Ireland", University of Birmingham, 2009, Download under http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1435808

transformation of the economy will help to create jobs, in particular in the sector of renewable energies. While these effects cannot be attributed to the EU ETS only, they still seem to be in line with theory that the EU ETS has a more positive effect for creating jobs rather than endangering employment rates as a consequence of carbon leakage.

3.1.5.5 Auctioning revenues

Auctioning revenues in 2013 for the EU were €3.6 billion according to the progress report[91] on Kyoto. Assuming that the auction volume was about 808 million EUAs[92], this would imply that the average EUA price in auctions held in 2013 was 4.45 €/EUA. For use of auctioning revenues by Member States, please see section 3.3.5.

3.1.5.6 Differences in costs across Member States

Some literature has been found on transaction costs (see section 3.1.5.3). As those studies usually focus on individual Member States, these may be an indicator for some differences in administrative costs. Furthermore, in section 3.7.5 it is discussed that Registry fees differ significantly between Member States, and that these differences are partly due to other fees (such as for permits or EU ETS administration in general) which also differ between Member States. In that section it is also mentioned that Member States have different numbers of staff available for EU ETS administration. It is also known that different structures of competent authorities exist in the EU (from one central authority to more than 50 local authorities[93]). From that perspective it is clear that competent authorities face different costs in Member States. Due to the different use of auctioning revenues and different charging systems for administrative tasks this results in different costs passed on to operators of installations. However, the major sources of costs have been completely harmonised in the third phase of the EU ETS:

- Most importantly, compliance costs (amount of allowances to be surrendered) are the same in all Member States, because there is only one CO_2 price in the EU.
- The rules for free allocation are harmonised. Therefore installations of the same efficiency in the same industry sector will receive the same amount of allocation if they have the same historic activity level. The administrative costs for data collection for free allocation will also be comparable (subject to different labour costs).
- The same is true for monitoring, reporting and verification: The relevant rules are completely harmonised. Installations of similar complexity will therefore face similar administration costs (subject to different labour costs).

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[91] COM(2014) 689 final, Download under **http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0689** and SWD (2014) 336 final, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0336&rid=1

[92] According to **http://ec.europa.eu/clima/policies/ets/cap/auctioning/faq_en.htm**; See also footnote 84.

[93] Ecofys and Ricardo-AEA, "Fourth ETS MRVA compliance cycle review", 2015, Download under **http://ec.europa.eu/clima/policies/ets/monitoring/docs/report_4th_ets_mrav_compliance_en.pdf**

Therefore the similarities are much bigger than the differences, in particular because transaction costs have been found relatively small compared with compliance costs (see3.1.5.3).

3.1.6 EU-added value

The EU-added value of the EU ETS is evaluated using the following questions:

- What is the EU-value added of the Directive? To what extent could the changes brought by the Directive have been achieved by national or individual Member States' measures only?
- What would be the most likely consequences of stopping or downscaling the existing EU ETS Directive?

Despite the ever-growing literature on EU ETS, it seems that the possibility of replacing it by national policies in Member States is an unthinkable thought for researchers, as no recent literature dealing with this question has been found. A potential reason is at the core of ETS theory: the bigger an ETS, the better its performance, i.e. the more emissions are covered, the more cost-efficient abatement potentials are covered, too, thus bringing down the overall abatement price. This was already stated in the Commission's Green Paper[94] which summarised the state of the discussion on the introduction of an EU ETS and sought input from stakeholders. This Green Paper in particular discussed the different options of decentralised vs. EU-level regulated ETS. It pointed out that the ETS would be much cheaper for the economy than other means of regulation, and in particular an EU-wide ETS would be at least 20% cheaper than an implementation of optimal policies in the 15 Member States at that time[95]. Another argument brought forward was the internal EU market development. Different ETS or other climate policies were considered as barriers for improving the internal market for energy, and different types of regulation would have led to a very fragmented and costly situation for the industry sectors, with potentially different rules for participation, MRVA, allocation, and most importantly, different ambition levels and thus carbon prices throughout the EU. Also infrastructure would have been needed at Member State level, i.e. registries and market places would have needed to be developed separately. Finally, in some Member States political difficulties might have led to delayed action, or no measures in place for industrial GHG reductions at all, which would have made Kyoto compliance more costly for the other sectors in the country. In the worst case, some Member States would not have achieved the environmental target at all in the power and industry sectors. Because free allocation to industry in general may constitute state aid (see respective caveats in the recitals of the Commission's NAP Decisions[96] in the first two phases of the EU ETS and in the

[94] 'Greenhouse gas emissions trading and climatic change programme' COM(2000) 87, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV:l28109

[95] This is further explained in Vainio and Zapfel, "Economic analysis of emission trading in CO_2 emissions in the European Union", in: EU Energy Law Vol. IV – The EU Greenhouse Gas Emissions Trading Scheme, J. Delbeke Ed., Claeys&Casteels 2006;
For the modelling using the PRIMES model see:P. Capros, L. Mantzos, "The Economic Effects of EU-wide Industry-Level Emission Trading to Reduce Greenhouse Gases", E3M Lab, National Technical University of Athens, Download under
http://ec.europa.eu/environment/enveco/climate_change/pdf/primes.pdf

[96] http://ec.europa.eu/clima/policies/ets/pre2013/nap/documentation_en.htm

environmental state aid guidelines[97]), the Commission would have had to decide on each Member States' GHG reduction measures separately whether undue state aid would have been involved.

In view of the difficulties discussed above it does not come as a surprise that an EU-wide approach was favoured and ultimately became reality in the form of the EU ETS. If – as implied by the evaluation question – the EU decided to withdraw the EU ETS, consequences would be detrimental. For the EU Member States and EFTA countries, the cornerstone of climate policy (covering about 40% of their GHG emissions) would be missing. The EU's credibility in international climate negotiations would be seriously damaged. Energy exchanges, consultants, laboratories, verifiers and even government officials might risk losing parts of their business or jobs, respectively. Economically speaking, the biggest impact would be the instant loss in value of allowances currently owned by ETS participants[98]. It is thus relatively unlikely that any future change of the EU GHG policies for the sectors currently covered by the EU ETS can be introduced without a significant transition period, additionally requiring appropriate measures for organising such transition. However, such a discussion seems rather theoretical, since the EU ETS has been identified the most efficient measure for GHG reduction and has the broad support of stakeholders.

3.1.7 Coherence

The coherence of the EU ETS is evaluated using the following questions:

- How well does the Directive fit with other EU climate and energy policies, including energy efficiency, renewable energies, and state aid guidelines?
- Can unexpected impacts of the Directive on other EU policy instruments be identified?
- Which other EU policies have an impact on the functioning of the EU ETS or on its results?

Some publications[99,100] dealing with the coherence of GHG policies in the EU are available. Mostly, however, they are not based on empirical evidence but rather outline the general principles and interactions between policy instruments and measures. Furthermore, the more specialised sections of this report on EU ETS evaluation (sections 3.2 to 3.11) all contain sub-sections on coherence. Therefore, only general aspects are discussed in this section.

Coherence with EU polices on Climate Change

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[97] Commission Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 OJ C 158, 05.06.2012, and modified by Communication 2012/C 387/06, OJ C 387, 15.12.2012. Download under http://ec.europa.eu/competition/sectors/energy/legislation_en.html

[98] For estimating the financial impact, one could assume that about 2 billion allowances (i.e. roughly a year's supply of allowances) is always "in reserve" for compliance. This would represent a value in the range of 14 to 50 billion € (at 7 to 25 €/EUA). In case of stopping the EU ETS, this value would "evaporate", and companies would have to write this amount off.

[99] N. Berghmans, "Energy efficiency, renewable energy and CO2 allowances in Europe: a need for coordination", CDC Climat Research, 2012, Download under http://www.cdcclimat.com/IMG//pdf/12-09-14_climate_brief_no18_-ec_climate_energy_coordination.pdf

[100] F.C. Matthes, "Der Instrumenten-Mix einer ambitionierten Klimapolitik im Spannungsfeld von Emissionshandel und anderen Instrumenten", Ökoinstitut, 2010, Download under http://www.wwwoeko.de/oekodoc/1020/2010-078-de.pdf

The main source of information for discussing the coherence of EU climate policies still is the impact assessment of the 2008 climate and energy package[101] and the impact assessments of the individual instruments of the package[102]. In that set of assessments, the Commission anticipated that there will be a multitude of policies working together like an orchestra. The principle of cost-efficiency lead to a split of the overall emission reduction obligations between the EU ETS and the non-ETS sectors under the "Effort Sharing Decision" (ESD[103]). For the non-ETS sectors, the Member States are in charge of policies and measures for reducing GHG emissions. However, other EU policies (e.g. F-gas Regulation, CO_2 emission standards for cars, energy efficiency of buildings etc.) support the Member States' efforts. However, in this regard there is a clear scope separation between ETS and ESD sectors. An installation cannot be regulated by both. For the rather rare occasions of opt-in (Article 24) or exclusion of installations with low emissions (Article 27 of the EU ETS Directive, see section 3.10), clear rules are defined, including for accounting of emissions under the ESD and for determining the share of auctioning rights in the EU ETS. In that regard, coherence is good.

Other policies of the EU, including parts of the 2008 package, overlap considerably with the EU ETS. In particular, the "RES" Directive[104] on the promotion of renewable energy sources has an impact on the power sector, and via electricity costs also on industry[105]. At the time of the 2008 package proposal, the Commission used best available modelling for ensuring that the cost-effective approach would be maintained for this potential overlap. However, research such as the review by Gloaguen and Alberola [54] suggests that the uptake of RES technologies (and the related support schemes) in the EU were exceeding expectations, thereby contributing to a reduced demand for allowances in the EU ETS, thereby increasing the CO_2 price drop in the EU ETS (see section 3.2 "cap setting"). Most interesting in this regard is that several renewable energy technologies exhibit CO_2 avoidance prices higher than the current CO_2 price in the EU ETS. In modelling, this results in higher CO_2 costs for reaching the GHG target than in a scenario with only EU ETS and without additional RES target. Thus, RES policy reduces to some extent the efficiency of the EU ETS by distorting the CO_2 price signal. It must therefore be highlighted that RES policy does not only aim at reducing GHG emissions[106], but also at reducing the con-

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[101] SEC(2008) 85/3, Impact Assessment – Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020, Download under http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2008/sec_2008_0085_en.pdf

[102] http://ec.europa.eu/clima/policies/strategies/2020/documentation_en.htm

[103] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020, Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0136:0148:EN:PDF

[104] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0028

[105] A smaller impact came from the introduction of sustainability criteria for biofuels and bioliquids, which in some cases increased MRVA costs for the industry, but rarely lead to biomass emissions not being rated as zero emissions.

[106] One of the most important renewable energy technologies found in the EU ETS sectors is the use of biomass. As "preliminary emission factors" (i.e. emission factors before zero rating due to accounting rules in line with the EU ETS Directive and the M&R Regulation) for biomass is often comparable to the one of lignite, emissions of CO_2 from biomass are significant. At MS level, they can only be zero-rated if an equal amount of CO_2 is accounted for in "sinks" (LULUCF sector) in

sumption of fossil, i.e. non-renewable sources. It thereby aims at the use of domestic resources and the reduction of the EU's dependency on imports of energy carriers.

For the legislation on energy efficiency (EE) similar arguments are valid: It distorts the CO_2 price signal towards higher prices, but reduces the scarcity on the allowance market. It not only aims at CO_2 reductions, but on reducing the energy consumption, thereby reducing imports of energy. Not least it aims at speeding up innovations, and at changing consumers' behaviour. As these targets are well in line with EU climate policy and therefore also with the objectives of the EU ETS, no significantly negative impact on coherence is identified here.

However, for concluding on coherence, one point is more important than the above reasoning: Both RES and EE policies overlap with the EU ETS, but both fully support the environmental effectiveness and integrity of the EU ETS. Thus, the cap is not affected, and neither is the ability of the EU ETS to deliver its objectives. The only difference with RES and EE policies in place is the different cost of achieving the EU ETS' target.

Other EU legislation for industrial emissions

In this regard, only one instrument, the Industrial Emissions Directive (IED[107], formerly known as the "IPPC[108] Directive") seems relevant. As a "command and control" instrument, its approach is diametrically different from the market-based approach of the EU ETS. Under the IED, all installations covered have to apply with BAT (best available techniques) as determined by "BREF" (BAT Reference) documents[109]. Furthermore, each installation has to comply with individual permits issued by the competent authority, usually containing permit conditions such as emission limit values (ELVs, expressed either as concentrations or as hourly, daily etc. loads). The EU ETS Directive has created coherence in this regard by prohibiting ELVs for GHG emissions falling under the EU ETS, "*unless it is necessary to ensure that no significant local pollution is caused*" (Article 26 of the EU ETS Directive). In this regard, the precautionary principle (Article 191 of the Treaty on the Functioning of the European Union[110]) is duly taken into account.

International Climate policy

A further aspect of evaluation is the EU ETS' coherence with international climate policy. In this regard, the EU ETS performs well: Firstly, the climate package (and thus the EU ETS review) in 2008 was helpful for creating public awareness and international momentum for policies for climate change mitigation, as the then upcoming conference of the parties (COP) in Copenhagen

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the UNFCCC inventory. If this is not the case, the "CO_2 savings" in industry in the EU ETS need to be offset in some form by other sectors. In the extreme case, the MS has to use tax payers' money to purchase Kyoto units.
According to a recent paper, total biomass emissions in the EU ETS are in the range of 90 to 150 million tonnes CO_2 per year (see "Reasons to change the zero-rated criteria for biomass in the EU ETS", Transport and environment, March 2015, download under http://www.transportenvironment.org/sites/te/files/publications/2015%2001%20biomass%20ets_rating_FINAL.pdf).

[107] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:en:PDF

[108] Integrated Pollution Prevention and Control

[109] http://eippcb.jrc.ec.europa.eu/reference/

[110] Consolidated version under http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN

2009 was expected to result in a successor for the Kyoto protocol. In this context, the package, and in particular the EU ETS sent remarkable signals to the international community:

- The commitment to step up emission reductions of the EU as a whole from -20 to -30% compared to 1990 emission levels by 2020, “provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries contribute adequately according to their responsibilities and respective capabilities.” (See Recital 3 of Directive 2009/29/EC and Article 28 of the revised EU ETS Directive).
- The invitation for (international) sectoral approaches for GHG emission reductions and the threat of setting up border adjustment measures for tackling carbon leakage, in the event that other nations do not commit to sufficient emission reductions.
- The acceptance of credits (Certified Emission Reductions (CER) and Emission Reduction Units (ERU)) from Kyoto mechanisms in the EU ETS beyond the first Kyoto commitment period;
- NER 300 funding as contribution to develop CCS technology as well as innovative renewable energy technologies to market readiness, which is considered a key enabling technology (at least as transitional measure) to a real low-carbon society;
- The availability of auctioning revenues for financing adaptation and mitigation measures within and outside the EU.

Finally, the EU ETS has become the blueprint for GHG emission trading schemes around the world (see Annex 1 (section 5.1) and Figure 1 in section 2.1). Even though it still requires some adaptation to local requirements, the vast literature on the EU ETS is nonetheless considered helpful by other regulators for avoiding mistakes made in the EU. However, the unsurpassable feature of the EU ETS is that it is working in practice and delivering its targets, despite all voiced criticism. This, above all, makes the EU ETS a very useful instrument for international climate policy.

3.1.8 Conclusions – Overall evaluation of the EU ETS

Regarding **relevance**, the evaluation has found that the EU ETS Directive is highly relevant for the EU’ climate policy, as it targets about 40% of the EU’s GHG emissions while regulating only some 11 000 installations and 600 aircraft operators. The instrument is able to react to external factors such as technological progress, and can be easily adapted to new needs such as more ambitious GHG emission targets.

The EU ETS has been found to be **effective**. A functioning CO_2 market has been established, and a CO_2 price has evolved. Literature research has proven that clear drivers for the CO_2 price can be identified. Firstly, market fundamentals (supply/demand) have the expected influence, although regulatory uncertainty contributes to some unexpected volatility. Fuel prices, in particular the coal/gas switching price, economic activity levels, and the electricity price have been identified as further influencing factors.

It has also been found that CO_2 costs are internalised in product prices, at various levels depending on industry sector. In spot electricity prices this can also be observed, but the effect is partly offset by renewable energy effects. Investments in energy efficiency and GHG emission reductions are found to take place, albeit at smaller scale than considered necessary for a long-term transition to a low-carbon economy. Break-through technologies are currently not visibly applied. Nevertheless studies on the first two phases of the EU ETS conclude that innovation in low GHG technologies was accelerated since the introduction of the EU ETS. Studies furthermore confirm that emission reductions were made, and that significant parts thereof are caused by EU climate policies, of which some are founded in the CO_2 price, and others by RES policies. However, the strong economic downturn starting in 2008 overshadows to some extent the reductions caused by the EU ETS. This makes it difficult to quantify the emission reductions that can be attributed directly to the impacts only of the EU ETS while excluding other factors.

The biggest **strengths of EU ETS** are the environmental integrity, since the outcome is ensured as defined by the cap. A CO_2 tax cannot achieve this. Furthermore the economic efficiency must be mentioned. If sufficient transparency prevails on the market, the carbon price corresponding to the environmental target is found by the market "automatically", and most cost-effective emission reductions are made first. **Weaknesses** found include that without additional safeguards the carbon price may drop too low for achieving sufficient investments in innovative low-carbon technologies for a long-term decarbonisation of the economy. Political and regulatory uncertainty have resulted in delayed decision making among EU ETS participants regarding long-term investments required for significant GHG emission reductions.

Efficiency: Cap and trade, such as the EU ETS, is considered best fit to achieve emission reductions cost-effectively. Command and control policies are more costly overall. While carbon taxes theoretically are equally efficient as cap & trade, their main drawback is that price discovery is less efficient, and the environmental outcome less predictable.

The scope of the EU ETS, focussing on (big) industrial emitters, is in line with the overall efficiency expectations of the EU ETS. Compliance costs (costs for purchase of allowances and administrative costs) are not excessive, and proportionate in relation to the objective of achieving the emission reduction targets.

The **costs of the EU ETS** are to be weighed against the value created by the EU ETS, which is – like the costs – shared between governments and industry. The amount of allowances auctioned by Member States in 2013 was 808 million allowances, while industry received free allocation amounting to 995 million allowances. With the average carbon price, Member States' revenues were about 3.6 billion €, and are expected to increase with allowance prices. At the same time, energy intensive industries have received revenues in the range of 4.5 billion € in the form of free allowances, and the value of the allowances used for compliance, but not given out for free, was some 4 billion €. These figures show that not only the value of the assets in the EU ETS, but also the distribution of these assets between industry and Member State governments is crucial for judging the efficiency of the EU ETS. Clearly, the costs of achieving EU climate targets would be higher in the absence of the EU ETS, i.e. if non-market based mechanisms were to be used. Thus the EU ETS is considered efficient.

The EU ETS Directive is found to have high **EU-added value**: The EU-wide application of the EU ETS is a prerequisite for ensuring a level playing field for Europe's industry in the internal market. Modelling before the implementation of the EU ETS has shown that reaching the EU's Kyoto target would be much more expensive for the EU without an EU-wide emission trading system. Consequently, the EU-wide character of the EU ETS is neither questioned by stakeholders nor in literature.

When it comes to **coherence**, the EU ETS Directive is well aligned with other EU climate legislation, as well as with legislation on industrial emissions (IED). The EU ETS Directive's effectiveness is to some extent influenced by the effects of the Directives on renewable energy sources (RES) and energy efficiency (EE). Both Directives result in emission reductions which might not have happened to the same extent with the EU ETS alone. They thereby influence the carbon price, but not the functioning of the EU ETS. All three instruments thus serve the joint effort to reach the EU's climate targets, and thus can be considered coherent. Finally, the EU ETS is also highly coherent with the EU's international commitments under the UNFCCC. The introduction of the Market Stability Reserve (not analysed in this report as it was not adopted at the time of writing) will further contribute to the coherence of the EU ETS Directive with other EU climate and energy legislation, by allowing the supply of allowances for auctioning to react to changes in demand.

3.2 Cap setting

3.2.1 Introduction

In terms of cap-setting, issues potentially determining the achievements of the EU ETS[111] are:

- The level of harmonisation – 'national caps' vs 'an EU-wide cap';
- The level of the cap;
- Design options to increase predictability compared to the first two trading periods.

Level of harmonisation / level of the cap

During Phase I and II of the EU ETS, each Member States established its own 'national cap', or rather the total amount of allowances available to ETS participants within their jurisdiction. The level of the cap at EU level was determined by summing the 'national caps' across the Member States. The allocation in each MS (and the resulting 'national caps') had to meet criteria set by Annex III of the EU ETS Directive, further elaborated by the European Commission in guidance documents[112] and was subject to approval[113] by the Commission. Still, this left room for different approaches between Member States in setting their 'national cap' with a potential to distort the level playing field for EU ETS participants. In Phase II, the Commission applied a uniform approach for determining a 'maximum allowed annual average cap' for each Member State's 'national cap'[114], thereby reducing the imbalance of Member States' proposals.

With the legislative changes in the revised EU ETS Directive further measures were taken to reduce the room for different approaches across Member States and increase harmonisation. First and foremost, this was done by making the EU-level cap the starting point for, rather than the resultant of, the allocation process. Establishing the cap first, and subsequently making the allowances available to all ETS participants according to harmonised rules (see Section 3.4 on allocation), aims to ensure that the ambition level of the cap (and the resulting stringency of the allocation) is harmonised across Member States.

The uniform ex-ante EU-wide cap in Phase III was set on the basis of the agreed overall EU greenhouse gas reduction commitment for 2020 and the distribution of the required emission reductions over ETS and non-ETS sectors, based on extensive modelling for achieving least cost for the whole EU economy. Article 9 of the revised Directive establishes the annual EU-wide quantity of allowances available after 2013 by defining a linear reduction path. It starts at

[111] In line with the 2008 impact assessment of the proposal for the revised EU ETS.

[112] Communication from the Commission on guidance to assist Member States in the implementation of the criteria listed in Annex III to Directive 2003/87/EC (COM(2003) 830) and "Further guidance on allocation plans for the 2008 to 2012 trading period of the EU Emission Trading Scheme", Communication from the Commission, COM(2005) 703 Brussels, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52003DC0830 and http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52005DC0703&from=EN

[113] Or rather 'non-rejection'.

[114] For more precise explanation of the method used by the Commission, taking into account the 2005 verified emissions, GDP growth and extrapolated GHG efficiency improvements per GDP, see Commission Communication on the assessment of allocation plans, COM(2006) 725 final, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0725

the mid-point of allocations in 2008-2012 and is reduced every year by 1.74% of the starting value. Article 9a furthermore contains provisions for an adjustment of the cap with regard to activities included in the EU ETS only from 2013 onwards. A review and potential proposal for revision of the linear reduction factor by the Commission not later than by 2025 are foreseen in the revised Directive for application after 2020.

Design options to increase predictability: Trading period length

One of the overarching goals of the EU ETS review in 2008 was to increase the predictability in the EU ETS. The corresponding Impact Assessment analysed the length of the trading period as one of the elements providing longer-term certainty. In this regard, the trading period was understood as a period of regulatory stability, i.e. during which the amount of available allowances was known, thereby allowing estimates of their scarcity on the market. This in turn would allow analysts to make longer term allowance price forecasts and operators to plan their investments in clean technologies and emission reduction measures. Where uncertainty in general is seen as a risk for delayed action, longer-term certainty on the rules and their potential impacts (carbon prices and associated costs) is seen as beneficial to the system and its participants.

The revised EU ETS Directive (Article 13) defines the length of the trading period as 8 years, which is an extension compared to the consecutive 5-year periods foreseen (as of 2008) in the original Directive (and used during the second trading period). This is combined with the establishment of a linear reduction factor reducing the EU-wide cap that applies beyond the 3rd trading phase of to provide longer-term certainty on the supply of allowances.

Besides the desire to provide predictability, further considerations have an important influence on the choice of the length of the trading period:

- Short trading periods would reduce the flexibility for participants to take emission reduction measures at times fitting with their internal operation, maintenance and investment decision cycles. Furthermore very short periods (in particular annual true-up) could lead to high CO_2 price fluctuations. More temporal flexibility helps to limit the compliance costs for participants.
- Long trading periods – in combination with banking & borrowing rules – reduce the certainty on the environmental outcome in any specific year as emission reduction measures may be postponed to a later stage. The latter is also important because of the relation to the wider EU environmental targets and the international climate change agreements, which are defined for specific points in time (2008-2012, 2020, 2030).

The choice for the trading period length needs to balance these different considerations: environmental outcome, predictability and flexibility (costs). The impact of any choice on each of these considerations will also be determined by other design elements, such as the existence of banking and borrowing rules.

The above considerations are also reflected in the Intervention logic outlined in the following section.

3.2.2 Intervention logic

- Needs
  - A cap-and-trade system needs a cap to be set below business as usual emissions.
- Objectives
  - The cap should be in accordance with politically determined GHG emission targets;
  - The cap should provide long-term certainty for market participants;
  - For cost-efficiency, the cap should allow flexibility across a number of years, but not for too many, in order to ensure environmental integrity.
- Actions
  - Determine the “correct” cap for the intended environmental outcome, and make it legally binding;
  - Determine a reasonable period length and put it into legislation.
- Intended results
  - A CO_2 price develops due to scarcity of allowances;
  - Investments in low carbon technologies are triggered;
  - Emissions are lower than the cap.
- Expected impacts
  - The landscape of industrial emitters (industry, power sector and aviation) becomes successively decarbonised.
- Side effects
  - EU ETS participants may face a risk of carbon leakage, which may trigger the need for further intervention (see topic area of “allocation & carbon leakage”, Section 3.4)
- External factors
  - Economic crises: If the cap is set without management mechanism for maintaining a reasonable scarcity of allowances, the CO_2 price may drop too low for triggering the desired long-term effective investments for GHG reductions. GHG reductions are mainly based on short-term operating decisions.
  - Unexpected economic booms may have the opposite effect. However, a booming industry can be expected to be more willing and able to make investments. Therefore a booming industry might facilitate the functioning of the ETS as intended.

The intervention logic for this topic is summarised in Figure 9.

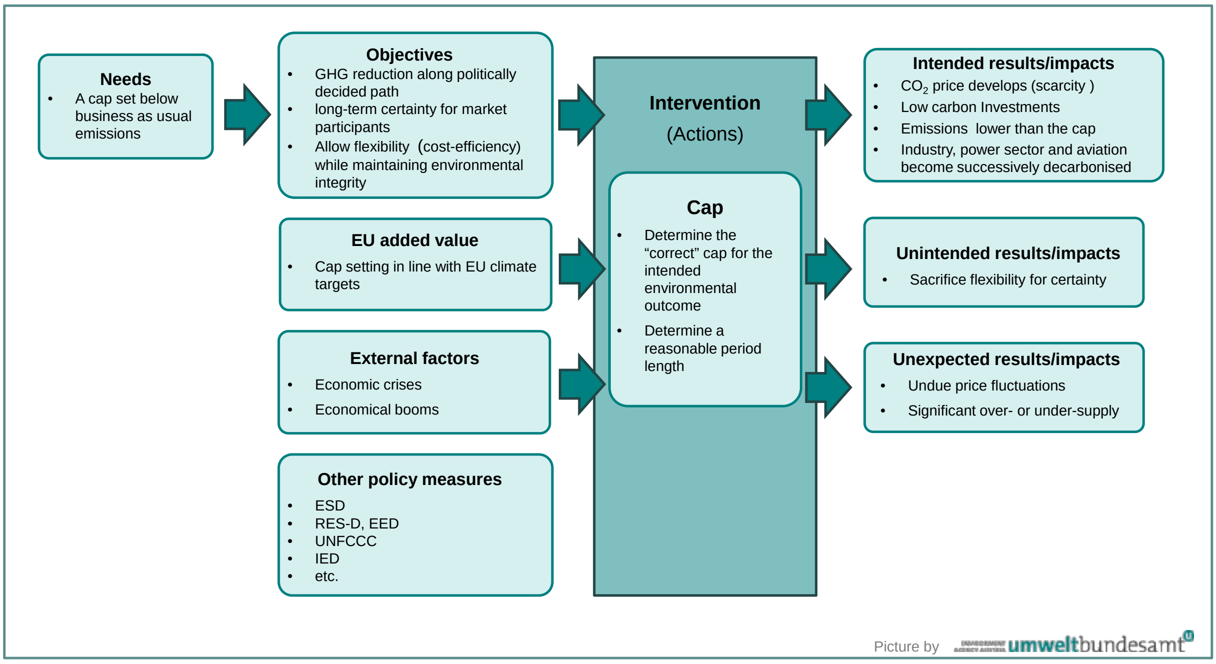

Figure 9: Intervention logic for the EU ETS topic "cap setting"

3.2.3 Relevance & coherence

The evaluation questions related to the criterion of 'relevance' are closely related to that of 'coherence'. Therefore, these questions will be discussed here together.

With respect to the criterion of relevance, the following evaluation questions are addressed:

- To what extent does the current EU ETS architecture (regarding cap setting, period length and banking/borrowing rules) correspond to the needs of the energy and climate policy framework?
- More specifically, is the length of the trading period suitable in determining predictability and investment behaviour of ETS participants?

With respect to the criterion of coherence, the evaluation questions are:

- Is the EU ETS architecture (regarding cap setting and trading period design) coherent with other EU legislation, in particular the other elements of the 2008 package?
- Regarding internal coherence of the EU ETS, how does the choice for longer trading periods for the purpose of increasing predictability relate with the provision on banking of allowances into next trading periods?

In addition to its 'own' objective of a 21% reduction in GHG emissions in ETS sectors in 2020 compared to 2005, the EU ETS also contributes to the overall EU 2020 targets to reduce GHG emissions, increase renewable energy generation and reduce primary energy use[115]. Having separate targets for the ETS sectors (the EU-wide cap) and non-ETS sectors ensures that both ETS sectors

[115] Conclusions of the European Council, 8/9 March 2007, Download under http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/93135.pdf

and non-ETS sectors contribute proportionally to the overall EU objectives in a cost-effective way. A separate EU-wide cap for the EU ETS also facilitates that the different capacities in different Member States to invest and adapt can be acknowledged, without distorting the level playing field in the ETS[116].

Little information is found in literature evaluating the split of the EU 2020 GHG target into ETS and non-ETS targets since the Impact Assessment of the 2008 review[117], suggesting wide support for this approach. This was confirmed during the stakeholder consultation on the 2030 policy framework, where there was consensus around having an EU-wide target for 2030, split up into ETS and non-ETS targets[118].

The 2nd trading period of the EU ETS was lined up on purpose with the 1st commitment period (CP1) of the Kyoto Protocol, both in terms of timing (2008-2012) and accounting (no annual compliance, but true-up over the whole 5-year period). This is also the case for the 3rd trading period of the EU ETS and the 2nd commitment period (CP2), from 2013-2020. So here, accounting framework of the EU ETS cap and the EU's international climate target are coherent (see also Figure 10).

For the EU's stand-alone climate policy, a caveat needs to be made in this regard. While a linear reduction of emissions has been defined between 2013 and 2020 for both ETS and non-ETS sectors, the politically agreed emission reduction targets for both are defined for a single year: 2020. With unrestricted banking under the current banking rules, compliance with the EU ETS cap would not necessarily mean that the target formally defined for 2020 is also reached in that specific year, as shown in Figure 10. For a more detailed discussion of this issue, see Section 3.2.4 on effectiveness.

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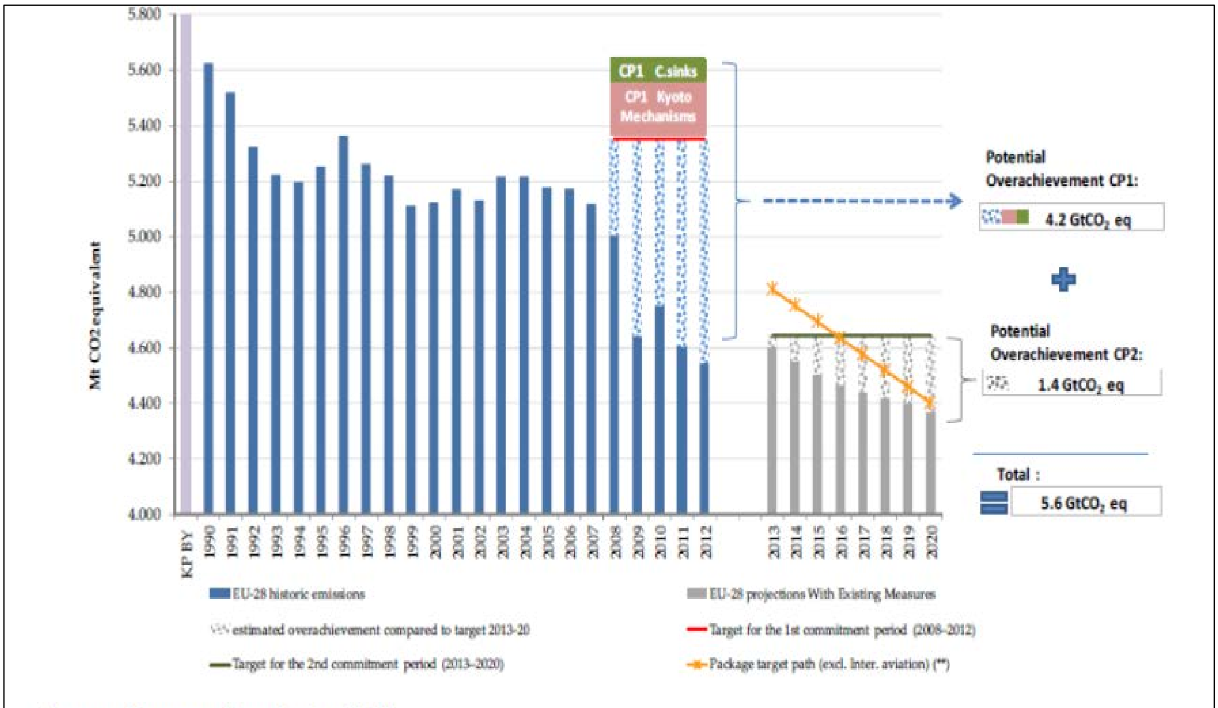
[116] European Commission, 2012, "Green paper: A 2030 framework for climate and energy policies" (COM(2013) 169), Download under
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0169:FIN:en:PDF
European Commission, 2014, Impact Assessment Accompanying the Communication A policy framework for climate and energy in the period from 2020 up to 2030, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0015
Phylipsen, D., Blok, K., "European experiences with burden sharing in climate change; Lessons learned for the post-2020 negotiations", PCCC, Utrecht, commissioned by the MAPS (Mitigation Action Plans and Scenarios) Programme, run by SouthSouthNorth and the University of Cape Town; Download under
http://dspace.africaportal.org/jspui/bitstream/123456789/34623/1/Paper_EU-burden-sharing-experiences.pdf?1

[117] Evaluation efforts focussed on the other components of the EU ETS review.

[118] European Commission, 2014, Impact Assessment Accompanying the Communication A policy framework for climate and energy in the period from 2020 up to 2030, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0015



Source: European Commission, EEA

Figure 10: Timing and accounting of Kyoto Protocol commitment periods and the EU overall GHG target for 2020[119]. The figure shows the projected development of total GHG emissions in the EU during the 2nd Commitment Period (CP2) under the Kyoto Protocol, compared to the targets for that period. It also shows the over-compliance during CP1/CP2 (corresponding to EU ETS Phase II and III), which would allow emissions in 2020 to rise above the EU 2020 target, similar as for the EU ETS emissions.

In terms of *predictability*, the length of the trading period is important to provide a stable legislative regime in case the rules do not change during the trading period. During the public consultation on the structural reform of the EU ETS, stakeholders asked for a stable, predictable legislative framework as a necessity for business investment. Most energy-intensive industry submissions contained a request to defer action till after the current trading period (though others were in favour of short-term action)[120]. Also in the public consultation on the back-loading proposal, so-called 'market interventions' during the period were opposed by part of the stakeholders, who indicated that short-term actions could potentially undermine discussions on structural, long-term solutions[121].

[119] European Commission, 2014, COM(2014) 689 final, Report from the Commission to the European Parliament and the Council Progress Towards Achieving the Kyoto and EU 2020 Objectives (required under Article 21 of Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC), Download under http://ec.europa.eu/transparency/regdoc/rep/1/2014/EN/1-2014-689-EN-F1-1.Pdf.

[120] Public consultation on the structural reform of the EU ETS – summary of responses, website: http://ec.europa.eu/clima/consultations/docs/0017/main_outcomes_en.pdf

[121] Public consultation on back-loading – summary of responses, website: http://ec.europa.eu/clima/consultations/docs/0016/summary_en.pdf

These outcomes are in line with the results of the stakeholder consultation carried out during the 2006 Mid-term review, where industry and business representatives opted overwhelmingly for longer trading periods[122].

However, in this context it must be noted that avoiding any change of rules during a trading period cannot be fully guaranteed, as shown by the political discussions of which the above-mentioned public consultations were a part. Unforeseen events or developments outside policy makers' control can result in impacts that are too important to leave to the next trading period[123]. Addressing such impacts will then take precedence over maintaining the legislative regime over the trading period.

With regards to *stimulating low-carbon investments*, the length of the trading period is only one element determining predictability, with the predictability of costs faced by operators as more important factor determining investment behaviour. Costs are influenced by the carbon price as a result of supply/demand match as well as by the level of free allocation received. Within an ETS with unlimited banking between trading periods (as is the case in the EU ETS), the choice of the trading period length is of minor relevance for determining investment behaviour, and therefore also of the timing of emission reductions. This is discussed in more detail in the following section on the effectiveness of the system towards the long-term environmental objective.

3.2.4 Effectiveness

With respect to the criterion of effectiveness, the following evaluation questions are addressed:

- To what extent does the EU ETS architecture (with regard to cap-setting, period length and banking/borrowing rules) support that the objectives of the EU ETS can be met?
- In particular, does the EU ETS architecture create reasonably predictable conditions which allow that timely investment decisions in GHG emission reductions are made?
- More specifically, has the increased length of the trading period compared to Phase I-II led to stimulating investments in emission reductions through increased predictability and reducing longer-term uncertainty?

When evaluating the effectiveness of the revised Directive towards meeting the objectives of the EU ETS, it is useful to make a distinction between the different types of objectives the EU ETS aims to achieve:

- The operational objective to establish a carbon price and a functioning carbon market, facilitating cost-effective compliance;
- The (short-term) environmental objective of keeping emissions in the system below the cap;

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[122] McKinsey, "Review of EU emissions trading scheme - Survey Highlights", Environment McKinsey & Company, Ecofys, 2005, carried out for the European Commission as part of the 2006 ETS review. Download under **http://ec.europa.eu/clima/events/docs/0065/highlights_en.pdf**

[123] This is demonstrated by discussions on (potential) changes during Phase III (change to a -30% EU GHG emission reduction target in case of an international climate agreement, back-loading, potential implementation of the MSR pre-2020).

- The (long-term) objective of stimulating low-carbon investments and reducing emissions in line with climate change policy objectives[124].

These points are discussed separately in sections 3.2.4.1 to 3.2.4.3 below. The optimal balance between the short-term and long-term environmental objectives is referred to in the Impact Assessment for the MSR as 'inter-temporal efficiency' of the carbon market.

3.2.4.1 A functioning carbon market and price formation

The EU ETS is to date the largest compliance carbon market in the world, covering 31 countries, more than 11 000 installations and approximately 1900 Mt $CO_{2(eq)}$ or 40% of total EU GHG emissions[125]. In part due to the increased scope in the EU ETS in Phase III, this represents an increase in the number of countries (Croatia) and installations (+4%) covered in 2013 compared to 2012. The additional emission sources covered due to the extension of the scope represent 110Mt (+17%)[126].

Trade *volume* of EU allowances amounted to 8.7 billion tonnes in 2013 (86% of global trade volume for all types of carbon credits), up from 7.9 billion tonnes in 2012[127]. Primary trades in 2013 were estimated to amount to 2.1 billion tonnes[128]. Due to "back-loading" (i.e. withdrawing allowances from the auctions in 2014 for auctioning them in later years of the third trading phase), the trade volume in 2014 was 13% lower. As the impact of back-loading will be smaller in 2015, trade volume is assumed to re-bounce in 2015, with an impacted increase in trade with 7.5% compared to 2014[129].

As reported in abundance, *carbon prices* dropped significantly since the start of the economic crises in 2008 and they have remained at low levels with increasing insight into the accumulating surplus (see also Figure 11). There is, however, no consensus about whether this is a market or system flaw, or a consequence of a market system responding as intended to changing demand[130]. The latter view holds that 'It is the job of the market to reflect scarcity (or the lack of

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[124] From Article 1 of the revised EU ETS Directive: "*This Directive also provides for the reductions of greenhouse gas emissions to be increased so as to contribute to the levels of reductions that are considered scientifically necessary to avoid dangerous climate change*". Recital 17 of Directive 2009/29/EC mentions the objective of '*transformation of the Community economy towards a safe and sustainable low-carbon economy*'.

[125] Emission data for 2013. Source: EEA EU ETS Data viewer, see footnote 49.

[126] EEA ETS data viewer, see footnote 49.

[127] Bloomberg New Energy Finance, "Value of the world's carbon markets to rise again in 2014", 2014, Download under **http://about.bnef.com/press-releases/value-of-the-worlds-carbon-markets-to-rise-again-in-2014/**

[128] Including auctions, free allocation and sales through the EIB (NER300 allowances), estimated by Thomson Reuters, Download under **http://www.businessgreen.com/bg/analysis/2337543/eu-carbon-price-rides-the-rollercoaster-as-emissions-fall**

[129] ThomsonReuters Point Carbon, 5 January 2015, Download under **http://www.businessgreen.com/bg/analysis/2388683/global-carbon-market-value-to-hit-eur70bn-this-year**

[130] CEPS, 2012, Reviewing the EU ETS Review? Report of the CEPS Task Force 'Does the ETS Market Produce the 'Right' Price Signal?', Download under **http://www.ceps.eu/publications/reviewing-eu-ets-review**

This lack of consent was also demonstrated during the public consultation on the structural reform of the EU ETS.

it)'[131] – and the fact that emissions reduction targets are being achieved at lower costs in an economic downturn is a positive characteristic of a market-based instrument[132]. In this regard, the objective of cost-effective target achievement has certainly been achieved.

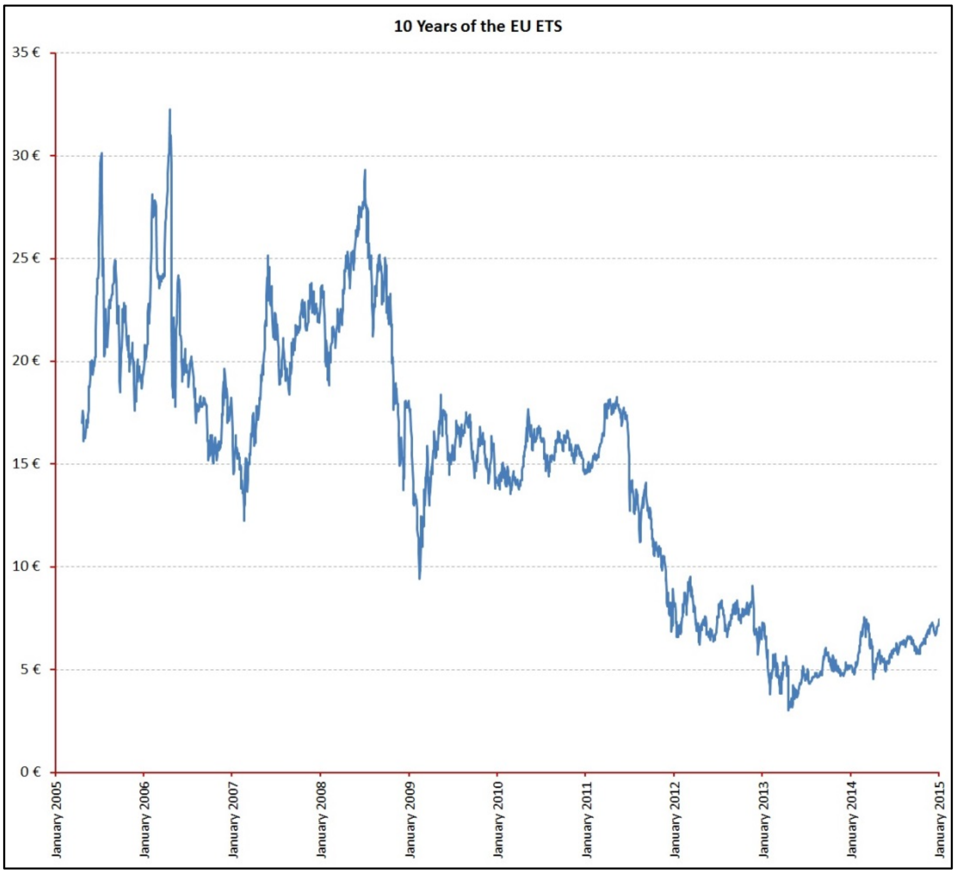

Figure 11: Development of carbon prices in the EU ETS over time (Source: Blog by David Hone, Shell International Ltd.[133])

The entry into operation of the revised Directive did not result in a break in price trends. Prices continued their slide from 2013, with a recovery starting a few months into the new phase (see also Figure 11 and Figure 12). During 2013 prices for EU allowances ranged between 2.5 and 5.5 €/t CO_2, with an estimated average of 4.5 €/t[134], while in 2014 the average price was around 6.5 €/t, with year-end prices increasing to 7.5 €/t. This is in part attributed to the implementation of back-loading[135], though more positive economic outlooks may also

[131] Energy Aspects, 2014, 'Carbon Market Research the MSR', presentation by Trevor Sikorski, Energy Aspects to the EU Expert meeting on the MSR, June 2014. Download under http://ec.europa.eu/clima/events/docs/0094/energy_aspects_en.pdf

[132] Note that this difference in views also relates to the difference in the short-term and long-term environmental objectives, discussed in the next sections.

[133] http://blogs.shell.com/climatechange/category/carbon-price/

[134] based on ICE data: Sandbag, 2014, see footnote 136

[135] Bloomberg Business, 2 January 2014, http://www.bloomberg.com/news/articles/2015-01-02/eu-carbon-market-has-first-volume-decline-after-brake-on-supply; The Energy collective,

have played a role[136]. Further increases are expected in 2015, with estimates from +60% to +100%[137]. As a result of the price increase, trading value in the EU ETS increased by 26% between 2013 and 2014, to 41 billion Euro per year[138]. Notwithstanding this increase in prices, it is generally accepted that significantly higher carbon prices are needed to stimulate investment in low-carbon technology and drive longer-term emission reductions (see also the section below on 'Long-term environmental goal').

While recognising the issues related to the current low carbon price, the European Commission emphasises that 'the EU ETS is widely recognised as a *liquid market* with a functioning infrastructure'[139]. In its 2014 report 'State and trends of carbon pricing'[140], the World Bank distinguishes between the (structural) carbon price determined by fundamental policies and day-to-day prices that are determined by market players. It also concludes that the EU ETS has quickly become a sophisticated market, with active private sector market players and complex financial infrastructures. However, various market actors indicate ongoing political discussions as a cause for price volatility, with some suggesting that the allowance market is consequently not yet a mature market[141].

While it is relatively easy to label price developments with potential explanations, firmly establishing a (causal) relation between individual explanations and the actual development is more difficult. This is especially true for short-term price fluctuations where electricity markets and weather patterns can also play an important role. This is also demonstrated in the various labelled trend figures included here, where some of the developments are counter-intuitive given the labelled event. The World Bank distinction into structural price determinants and day-to-day price fluctuations is therefore relevant to keep in mind. And where, under a market-based instrument, daily price formation should be left to the market, structural misalignments may justify policy intervention.

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http://theenergycollective.com/silviomarcacci/2178686/four-questions-global-carbon-markets-2015

[136] Sandbag, 2014, "Slaying the dragon – vanquish the surplus and rescue the ETS: the environmental outlook for the EU Emissions Trading System", 2014, Download under https://sandbag.org.uk/site_media/pdfs/reports/Sandbag-ETS2014-SlayingTheDragon.pdf

[137] Survey of traders carried out by Bloomberg

[138] http://www.bloomberg.com/news/articles/2015-01-02/eu-carbon-market-has-first-volume-decline-after-brake-on-supply

[139] Report from the Commission to the European Parliament and the Council, 'The State of the European carbon market in 2012' Download under http://ec.europa.eu/clima/policies/ets/reform/docs/com_2012_652_en.pdf

[140] World Bank, "State and trends of carbon pricing", World Bank, Washington DC, 2014, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286_20140527095323/Rendered/PDF/882840AR0Carbo040Box385232B00OUO090.pdf

[141] Eurobserver, 'Political statements cause swings in EU carbon prices', 4 February 2015, Download under https://euobserver.com/environment/127481,

Business Green, 2014, 'EU carbon prices ride the rollercoaster as emissions fall', 2 April 2014, Download under http://www.businessgreen.com/bg/analysis/2337543/eu-carbon-price-rides-the-rollercoaster-as-emissions-fall

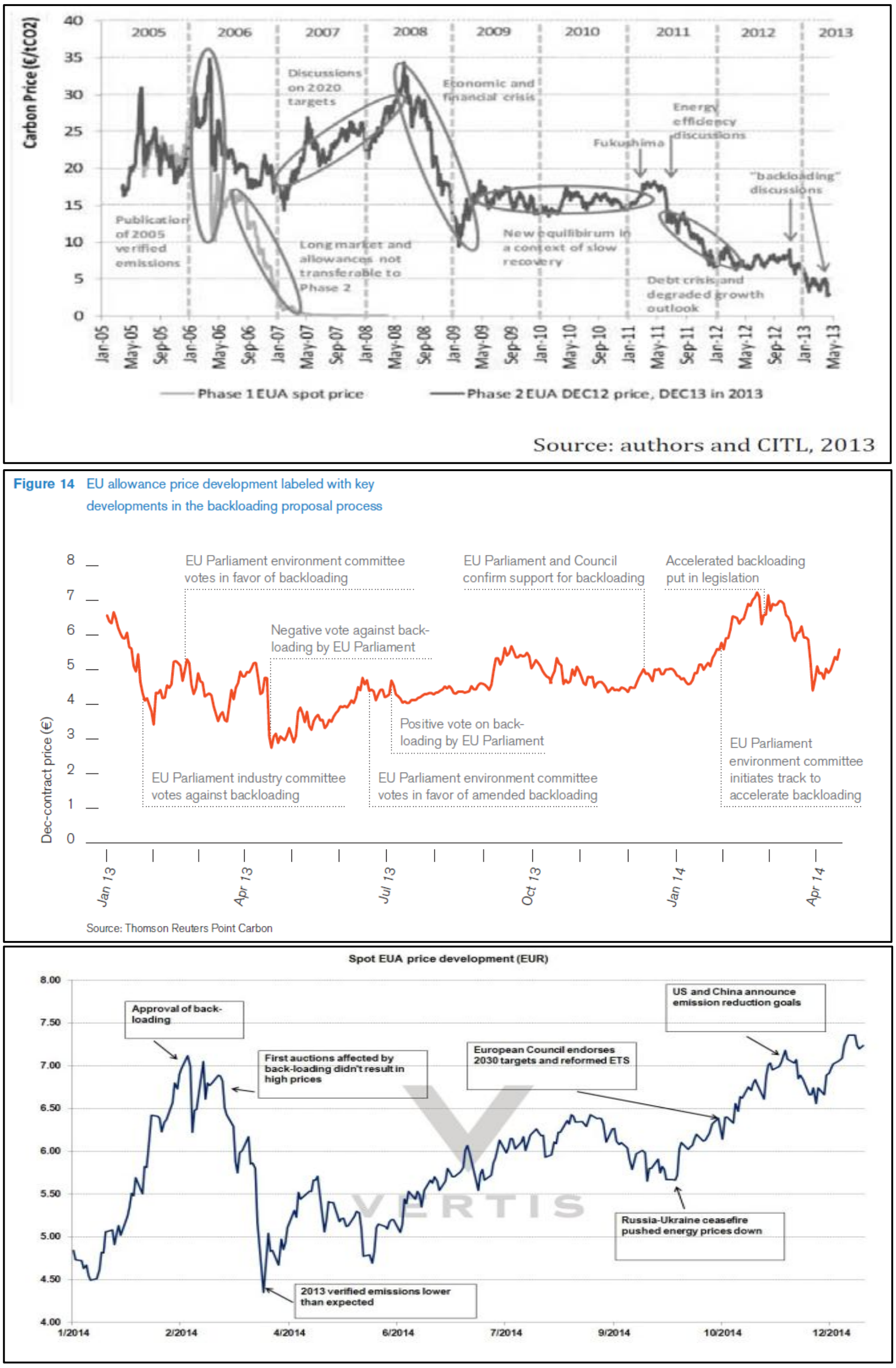

Figure 12: Development of the carbon price in the EU ETS with potential explanations from different sources (top: De Perthuis and Trotignon[142], middle: Worldbank[143], bottom: Vertis[144])

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[142] C. de Perthuis and R. Trotignon, "Governance of CO_2 markets: Lessons from the EU ETS", Energy Policy 75, 2014, 100–106, Download under http://www.sciencedirect.com/science/article/pii/S0301421514003322; Also found in Les Cahiers de la Chaire Economie du Climat, 2013, Download under

To put the fluctuations of the CO_2 price into context, it is helpful to look to other markets, like e.g. the market for crude oil, a very mature market. Figure 13 demonstrates the rather strong price fluctuations of the oil price, both over shorter and longer periods of time. In 2008, these prices dropped by 78% within a 6-month period, compared to a roughly 83% drop in carbon prices in the EU ETS over a 5-year period starting in 2008.

A further parallel exists in market interventions that are occasionally carried out in the oil market by OPEC to align market supply and demand. Based on those considerations, it cannot realistically be expected that the carbon market can avoid price fluctuations altogether.

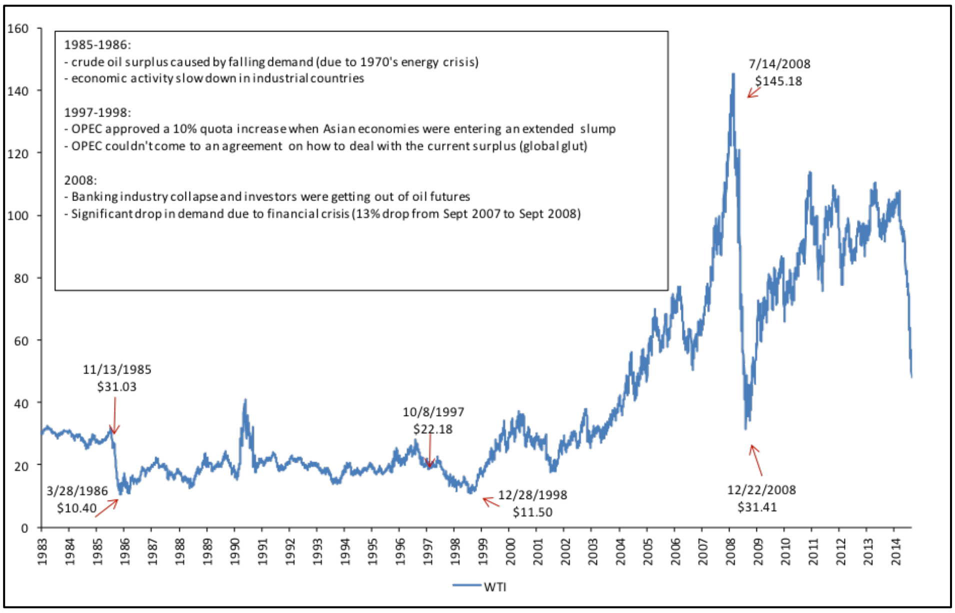

Figure 13: Fluctuations in crude oil (WTI) prices over time (Source: Blog of ICG team)[145]

http://www.chaireeconomieduclimat.org/wp-content/uploads/2015/06/13-09-Cahier-R-2013-07-De-Perthuis-Trotignon-EU-ETS-Governance-HQ.pdf

[143] World Bank, 2014, State and trends of carbon pricing, World Bank, Washington DC, Download under http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286_20140527095323/Rendered/PDF/882840AR0Carbo040Box385232B00OUO090.pdf

[144] Vertis, Download under http://blog.vertis.com/?p=1768; based on data from ICE (www.theice.com).

[145] https://www.icgteam.com/index.php/icg-solutions-blog/22-projects-are-opportunities-looked-at-differently

3.2.4.2 The short-term environmental goal

The EU-wide cap in 2013 was 2 084 Mt CO_2(e)[146], or 5% below the average (scope-corrected) annual Phase II cap, with the cap in 2020 17% below Phase II levels (the *average* Phase III cap is 11% below the Phase II average)[147]. As such, the approach in the revised Directive has clearly led to a strengthening of the short-term environmental goal in the EU ETS.

The reference scenario for the 2030 Impact Assessment[148] assumes that the 2020 cap for the EU ETS would be met, taking into account the 'temporal flexibility' (potential use of banked allowances). While only limited ex-post data are available for Phase III, this is so far supported by the latest report by the European Environment Agency, as shown in Figure 14[149].

According to the EEA, EU ETS emissions in 2013 were 4.6% below the annual cap (i.e. the amount of allowances allocated for the year) and 18% below (scope-corrected) 2005 levels[150]. On the basis of projections submitted by Member States under the Monitoring Mechanism, the EEA estimates that emissions in the EU ETS will further decrease by 8% between 2013 and 2020[151]. As such, ETS emissions would remain below the decreasing linear cap during the whole trading period, thus keeping the EU ETS on track to meet its target for 2020. As a result, the EU ETS is also contributing its share to meeting the EU overall 2020 GHG target.

Here it must be noted that because of the unlimited banking allowed under the EU ETS, the cap does not *guarantee* the short-term environmental objective in the year 2020 is met (EU ETS or EU-wide). In case economic growth would rebound more strongly than is currently expected[152], there is a possibility that banked allowances (both within Phase III, as well as those banked from Phase II) will allow emissions to exceed the 2020 target for the EU ETS (see also Figure 14). It does, however, at the moment seem unlikely that emissions will grow so strongly that the cap for the 3rd trading period (cumulatively) as a whole will be exceeded.

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[146] 2 084 301 856 allowances in accordance with Commission Decision 2013/448/EU. Source: http://ec.europa.eu/clima/policies/ets/cap/faq_en.htm

[147] EEA EU ETS data viewer: http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer

[148] European Commission, 2013, EU Energy, Transport and GHG Emissions Trends to 2050 Reference Scenario 2013, European Commission Directorate-General for Energy, Directorate-General for Climate Action and Directorate-General for Mobility and Transport, http://ec.europa.eu/clima/policies/strategies/2030/docs/eu_trends_2050_en.pdf

[149] EEA, "Trends and projections in Europe 2014; Tracking progress towards Europe's climate and energy targets for 2020", EEA Report No 6/2014, European Environment Agency, Oct 2014, http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2014. Note that the figure is based on Member State projections that do not yet take into account the implementation of the MSR.

[150] Including Norway, Iceland and Liechtenstein. Looking at EU Member States only, the reduction amounted to 19%.

[151] Stationary installations only, under existing policies and measures.

[152] or other large-scale unforeseen events take place, e.g. strongly influencing power sector generation portfolio

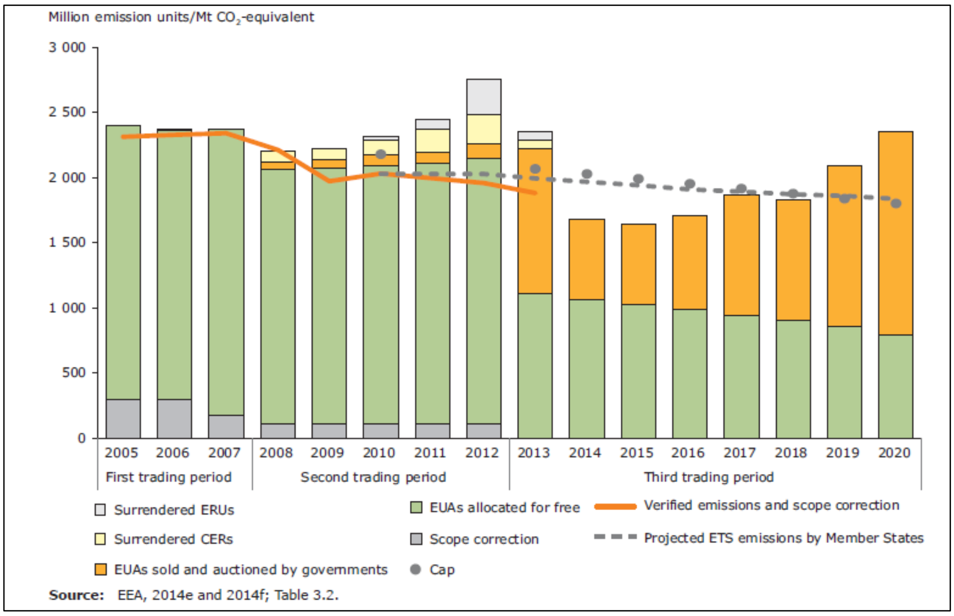

Figure 14: Cap compared to (projected) emissions in the EU ETS 2005-2020 (stationary installations only). Projections are based on 'With existing measures' scenarios from Member States[153]. Source: EEA[149].

3.2.4.3 The long-term environmental goal

Stakeholders may have different views on whether the EU ETS should be judged solely on its short-term effectiveness as discussed in the previous section or not. However, it is undisputed that emission reductions beyond those resulting from a reduction in activity levels are required to achieve permanently lower emission levels and meet longer-term targets. It is also a widely shared view that a shift towards more low-carbon investments and practices requires a more robust carbon price than is currently provided by the EU ETS[154]. This is

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[153] The allocation also shown in this graph includes the effect of back-loading of auctioned allowances, but not of the Market Stability Reserve[151].

[154] See e.g. Public consultation on the structural reform, Download under
http://ec.europa.eu/clima/consultations/docs/0017/main_outcomes_en.pdf
European Commission, 2011, Impact Assessment: A Roadmap for moving to a competitive low carbon economy in 2050 (SEC(2011) 288, 289), Download under http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011SC0287&from=EN
European Commission, 2012, Commission Staff Working Document: Proportionate Impact Assessment: Commission Regulation (EU) No …/.. of XXX amending Regulation (EU) No 1031/2010 in particular to determine the volumes of greenhouse gas emission allowances to be auctioned in 2013-2020. Download under:
http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/swd_2012_xx2_en.pdf
G. Erbach, Prospects for the EU Emissions Trading System, Library Briefing, Library of the European Parliament 25/06/2012, Brussels, Download under
http://www.europarl.europa.eu/RegData/bibliotheque/briefing/2012/120323/LDM_BRI(2012)120323_REV1_EN.pdf
DECC, 2014, UK Vision for EU ETS Phase IV, UK Dept of Energy & Climate Change, London, Download under
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/329841/EU_ETS_vision_for_phase_IV_final_version.pdf
CEPS, 2012, Reviewing the EU ETS Review? Report of the CEPS Task Force 'Does the ETS Market Produce the 'Right' Price Signal?, Download under
http://aei.pitt.edu/37854/1/TF_Report_Reviewing_the_EU_ETS.pdf

also supported by many analyses of marginal abatement costs of various mitigation measures[155].

As highlighted in the 2013 report 'Assessing the effectiveness of the EU Emissions Trading System'[156], untangling the effects of the economic crisis and structural emission reduction measures is very complex, and limited attention has been paid to systematic synthesis of the growing literature on ex-post evaluations of the EU ETS. Methodological challenges have resulted in limited ex-post evaluations covering the period after 2008. Given the time lag due to analyses and publication, even less sources cover 2013, the sole year of Phase III for which verified emission data are available.

The 2013 CCCEP study came to the conclusion that the existing literature[157] points to annual average emission reductions attributable to the EU ETS in the period before the economic crisis in the range 40-80 Mt CO_2/year, or 2-4% of the total capped emissions. It must be noted that these numbers also include short-term (reversible) measures such as fuel shift (including switching between different generating capacities in the power sector[158]). The few studies they analysed on the impact of the EU ETS post-financial crisis mostly assess the immediate years after the crisis hit (2009-10), though with similar conclusions: The EU ETS has led to some small levels of abatement – despite concerns over allowance prices[159]. A 2014 analysis by IREA evaluates the effect of the EU ETS on industrial emissions over the whole of Phase I and II, estimating the

CCCEPS, 2013, Assessing the effectiveness of the EU Emissions Trading System, T. Laing, M. Sato, M. Grubb and C. Comberti, January 2013, Centre for Climate Change Economics and Policy & Grantham Research Institute on Climate Change and the Environment, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf

Sandbag, 2014, Slaying the dragon - vanquish the surplus and rescue the ETS: the environmental outlook for the EU Emissions Trading System, , Download under https://sandbag.org.uk/site_media/pdfs/reports/Sandbag-ETS2014-SlayingTheDragon.pdf

155 IPCC, 2007, Fourth Assessment Report – WG III report, http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4_wg3_full_report.pdf

McKinsey, 2009, Pathways to a low-carbon economy; version 2 of the global greenhouse gas abatement cost curve, McKinsey & Company:

http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves

UK Treasury, 2010, Carbon price floor: support and certainty for low-carbon investment, HM Treasury, London, December 2010:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42639/consult_carbon_price_support_condoc.pdf

Poyry, 2013, Technology supply curves for low-carbon power generation; a report to the Climate Change Committee: http://www.theccc.org.uk/wp-content/uploads/2013/05/325_Technology-supply-curves-v5.pdf

156 CCCEP, 2013, Assessing the effectiveness of the EU Emissions Trading System, T. Laing, M. Sato, M. Grubb and C. Comberti, January 2013, Centre for Climate Change Economics and Policy & Grantham Research Institute on Climate Change and the Environment, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf

157 The review included detailed analyses of about 10 studies covering the period from 2008-2011, including authors such as Deutsche Bank, Point Carbon, New Carbon Finance, Egenhofer et al, and Ellerman and Buchner (2011).

158 See e.g. MIT, 2008, CO_2 Abatement in the UK Power Sector: Evidence from the EU ETS Trial Period, authors: M. McGuinness and D. Ellerman, Massachusetts Institute of Technology: http://dspace.mit.edu/bitstream/handle/1721.1/45654/2008-010.pdf?sequence=1

159 It is as yet unclear whether this would also hold when low prices remain over a long period of time, with no expectations of higher levels in the future.

emissions reduction attributable to the EU ETS to be about 21% of the total emission reductions over that period[160].

An analysis of available Phase III ex-post data, available for 2013 only, provides little insight into whether the changes in Phase III as a result of the revised Directive have had a significant impact[161]. A comparison of the cap (or total allocation) to emission ratio between Phase II and Phase III might in principle provide some indication of a reduced over-allocation under the new rules. However, while the nominator (cap/allocation) is determined by the new rules, the denominator (emissions) is heavily impacted by the economic crisis. So it is not clear which part of the change in the ratio is due to the changed approach in cap-setting in Phase III (and the inherently linked harmonised allocation rules), and which is due to the recession-induced over-allocation in Phase II (see also Section 3.2.6 for more discussion on this issue).

The NGO Sandbag has called the new system, including the harmonised approach to cap-setting, 'a big improvement from an environmental perspective'[162]. At the same time, the ETS was not designed to react to strong economic downturns and thus the market has been strongly impacted by the economic crisis in 2012, as the World Bank in its 2014 report[163] concludes while recognising the ongoing efforts to address this. The resulting surplus in allowances continuing into Phase III so far overshadows the positive impacts of the changed approach to cap-setting and the longer trading period. In the meantime, the necessary discussions on potential structural reforms to address this have hampered the predictability.

The 2013 Thomson Reuters Point Carbon survey among EU ETS operators indicated declining importance of the carbon price for investment decisions: 20% of the operators surveyed said that EU ETS no longer had a significant impact on emission reductions[164]. Various respondents to the Commission's public consultation on Post-2020 Carbon Leakage provisions stated that carbon prices are less significant than other costs in company decision-making and that energy costs have a bigger impact[165]. This is also confirmed in other surveys and analyses[166].

[160] IREA, 2014, Industrial Emissions Abatement: Untangling the Impact of the EU ETS and the Economic Crisis, Germà Bel and Stephan Joseph, Research Institute of Applied Economics Working Paper 2014/22 1/23, Download under http://www.ub.edu/irea/working_papers/2014/201422.pdf

[161] Own analyses (see also Section 3.2.6) and e.g. Sandbag, 2014, Slaying the dragon - vanquish the surplus and rescue the ETS: the environmental outlook for the EU Emissions Trading System, October, 2014, Download under https://sandbag.org.uk/site_media/pdfs/reports/Sandbag-ETS2014-SlayingTheDragon.pdf

[162] While stressing that structural measures to address the surplus are crucial.

[163] World Bank report 2014, p. 17; see footnote 143

[164] As quoted in the IA for the MSR proposal: European Commission, 2014, Impact Assessment - Proposal for a Decision of the European Parliament and of the Council concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC (SWD(2014) 17), Download under http://ec.europa.eu/clima/policies/ets/reform/docs/swd_2014_17_en.pdf

[165] Amongst others refineries, glass industry, Post-2020 CL stakeholder consultation summary: http://ec.europa.eu/clima/consultations/docs/0023/stakeholder_consultation_carbon_leakage_en.pdf

[166] See e.g. Rogge (2010), Aghion (2009), (ISI-Frauhofer 2010)

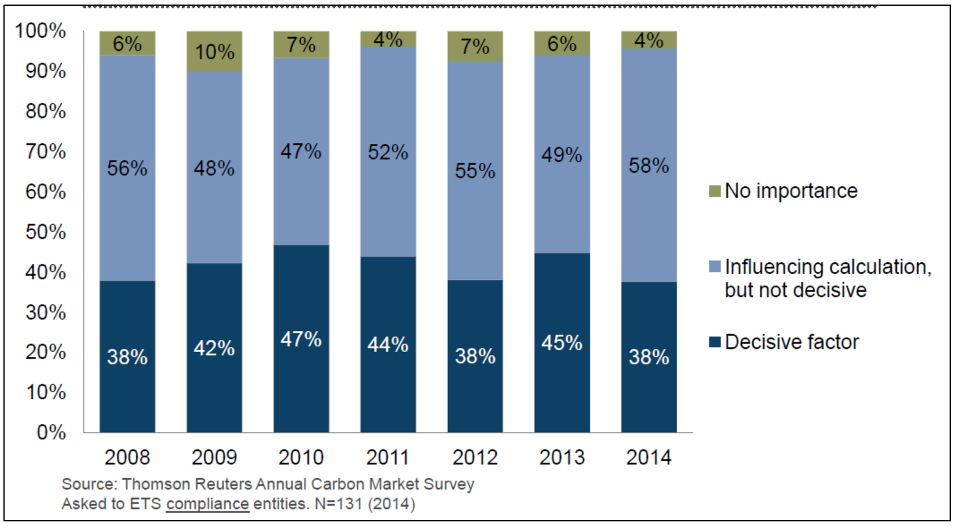

Figure 15: Views of ETS participants in the Thomson Reuters Point Carbon Market Survey over the years on the importance of 'a long-term carbon price' for their company's investments[167].

However, in the latest (2014) Thomson Reuters Point Carbon survey 38% of the respondents indicated that 'a *long-term* carbon price' is a 'decisive factor' in their company's investments (see also Figure 15)[168]. This is down from 45% in 2013, but the same as during some earlier years. The development over time does not show a clear relation with carbon prices, though carbon price expectations (as a result of economic and political developments) may have played a role in this. This is in line with a meta-analysis of studies in this area[169] which concludes that "*the carbon price has contributed to bringing the issue into the framework of managers – but uncertainty about the level, and importantly the existence of, the future carbon price may reduce some clarity in relation to investment decisions*."[170]

With regard to the above discussion, it needs to be noted that various sources suggest that a distinction should be made between short-term, small-scale investments and long-term, large-scale investments[171]. This distinction is also

[167] Thomson Reuters Point Carbon, 2014, 'Balancing supply & demand: Price or volume management – Special focus: Market Stability Reserve', ETS Training course, 30 January 2015, Mexico City, presentation by Marcus Ferdinand, Head of EU Carbon Analysis Thomson Reuters. http://climate.blue/wp-content/uploads/2015-01-30_DAY5_Presentation-Ferdinand_Balancing-supply-and-demand-in-the-European-ETS.pdf

[168] The views are, logically, quite different for small and large emitters. Among small emitters (defined in the survey as <1 Mt CO_2/year), only 5% of the respondents indicate the long-term carbon price is a decisive factor in investments, while 67% indicate it influences calculations but is not decisive and 28% attach no importance to it. For large emitters (defined here as >5 Mt CO_2/year), these shares are 71% (decisive), 29% (not decisive) and 0% (no importance).

[169] Analysing a range of studies over the 2007-2011 period: Neuhoff K, 2011, "Carbon Pricing for Low-Carbon Investment: Executive Summary", Climate Policy Initiative and Climate Strategies Network, Download under http://climatestrategies.org/publication/carbon-pricing-for-low-carbon-investment-executive-summary/

[170] Lack of clarity about the use of international credits is also specifically mentioned in this regard.

[171] Hoffman V, 2007, "EU ETS and Investment Decisions: The Case of the German Electricity Industry", European Management Journal 25(6) 464-474;

Neuhoff K, 2011, "Carbon Pricing for Low-Carbon Investment: Executive Summary", Climate Policy Initiative and Climate Strategies Network, Download under

made in a 2012 CEPS Task Force that analysed whether the EU ETS establishes the right incentive[172]. It concludes that the EU ETS drives short-term profitable investments, where the cost-benefit ratio is mainly determined by the allocation and the carbon price – quantities that are deemed to some degree 'knowable' during a trading period. For the longer-term, however, uncertainties are large and it is more difficult for market participants to form long-term views and make long-term investment decisions[173]. The investment cycle (including decision-making, permitting, construction and operational lifetime of the plant) in the power sector and energy-intensive industries takes up to 40 years[174].

So, while literature suggests that the ETS is likely to have had a small effect on emission reductions beyond reduced activity levels, the effect on long-term capital projects required to meet long-term emission reduction goals or to stimulate innovation so far seems more limited. Regarding the latter, this is not strange, as it usually takes 20-30 years for new technologies to reach mass market and innovations to be incorporated in subsequent inventions[175].

Patents are often regarded as indicator for innovation. An analysis of patent applications in the EU shows a strong increase in low-carbon technology patents among EU firms since 2005, the year the EU ETS started[176]. However, this seems to follow more closely the development of crude-oil prices over time, as shown in Figure 16[177]. The high importance of energy costs for ETS participants seems also to account for another observation: While only 1 in about 5,500 firms is regulated by the EU ETS, they account for about 1 in 12 low-carbon patents filed in the 5 years before the start of the EU ETS[178]. The study suggests that the EU ETS increased low-carbon innovation (with the number of low-carbon patent applications as a proxy indicator) among regulated firms by as much as 10%, resulting in almost a 1% increase in total European low-carbon

http://climatestrategies.org/publication/carbon-pricing-for-low-carbon-investment-executive-summary/

T. Laing, M, Sato, M. Grubb, C. Comberti, , 2013, "Assessing the effectiveness of the EU Emissions Trading System", Centre for Climate Change Economics and Policy, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf

[172] CEPS Taskforce, 2012, Reviewing the EU ETS Review? Report of the CEPS Task Force 'Does the ETS Market Produce the 'Right' Price Signal?, CEPS, Download under http://aei.pitt.edu/37854/1/TF_Report_Reviewing_the_EU_ETS.pdf

[173] Here the report specifically mentions the uncertainty about a global climate change agreement and the risks of banking at current low price levels given the uncertainty about future prices.

[174] CEPS, 2005, Business Consequences of the EU Emissions Trading Scheme, CEPS Task Force Report No. 53, February 2005, Download: http://www.ceps.eu/system/files/book/1200.pdf

[175] Figures refer to innovations in the energy sector, Chatham House, 2009. The patenting process itself can already take up to 3 years.

[176] R. Calel, A. Dechezlepretre, 2013, "Environmental Policy and Directed Technological Change: Evidence from the European carbon market", Grantham Research Institute on Climate Change and the Environment, London School of Economics, Centre for Economic Performance, London School of Economics, February 2013, Download under http://personal.lse.ac.uk/dechezle/Calel_Dechezlepretre_2013.pdf

[177] Another question relates to the extent to which renewable energy is included in the low-carbon patents analysed here, and to which extent these are stimulated by the EU ETS and/or renewable energy policies. An analysis of 57,000 patent applications around the world over a 30-year period shows a strong increase in renewable energy patents as of the late 1990ies. Source: B. Lee, I. Iliev, F. Preston , 2009, "Who Owns Our Low Carbon Future? Intellectual Property and Energy Technologies", Chatham House, , Download under https://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Energy,%20Environment%20and%20Development/r0909_lowcarbonfuture.pdf

[178] The study does not seem to recognise that ETS participants are by definition not representative of all firms, as they are – by design – the more energy-intensive sectors.

patenting. Notwithstanding those observations[179], the study concludes that the system in its current form might not be providing the economy-wide incentives necessary to bring about low-carbon technological change on a sufficiently large scale.

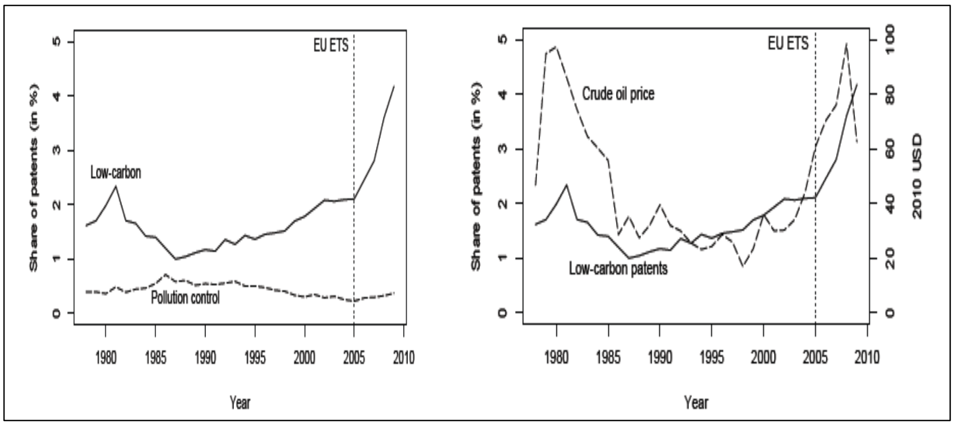

Figure 16: Development of the share of low-carbon technology patents in the total number of patents (left) and crude oil prices (right) over time. Source: Calel, Dechezlepretre, 2013[176].

3.2.4.4 Effectiveness – Conclusions

With the revised Directive in operation for only 2 years, and emission data available for only 1 year, limited quantitative observations are available for evaluating the performance of the EU ETS during Phase III. Consequently, conclusions on the extent to which the revised Directive has resulted in improved performance compared to Phase I and II are even more limited. Emissions during 2013 are below the cap, and the most recent projections predict this to remain the case until 2020. This means the EU ETS is on track to meet its 2020 target. The extension of the scope in Phase III has resulted in a larger number of participants and a larger amount of emissions covered, leading to a somewhat larger, more liquid market. Low prices and relatively high volatility have, however, persisted during the first years of Phase III. It is still too early to draw conclu-

[179] Note that the analysis leaves some questions open. For one, it concludes that the EU ETS did not result in low-carbon patents in non-ETS companies, arguing that such patents are more likely to occur in ETS companies. This is, however, debatable. While innovations in large core process technology is more likely to occur within the ETS companies (e.g. strip-casting in steel companies (Luiten, 2001), many other technologies are likely to be developed by technology suppliers such as ABB, Siemens, General Electric, Mitsubishi, etc. This includes energy generation, energy & waste recovery, energy exchange and storage, furnaces used in various sectors, etc., with the driving factor of (technology) market expectations. In addition, this conclusion also does not seem to be supported by graphs included in the study that show trends in low-carbon patents for ETS-regulated and non-regulated firms over time to be very similar. The analyses are furthermore limited to the EU, while innovations can also take place outside of the EU. The Chatham House 2009 analyses cited in footnote 177 shows the US and Japan to be important sources of patents, with 40-70% of various energy generation technologies submitted by multinational companies.

Luiten, 2001, "Beyond energy efficiency: Actors, networks and government intervention in the development of industrial process technologies", PhD thesis, Utrecht University, Utrecht: http://dspace.library.uu.nl/bitstream/handle/1874/746/full.pdf

sions on the impact of the revised Directive on longer-term, structural emission reductions, investments and innovation.

It is clear that the approach in Phase III in terms of cap-setting on an EU level and longer-term certainty on the supply of allowances in principle represents an improvement over the decentralised and more short-term approach of Phases I and II. All else being equal, those improvements would lead to a more effective (tighter cap, higher price signal), cost-effective and predictable legislative regime. At the same time it is fair to recognise that, in practice, these system improvements have not had the chance to fully materialise yet in terms of stimulating more structural emission reductions through a stronger price incentive and reduced uncertainty for investors. The unprecedented economic crisis since 2008 has resulted in unexpected low carbon prices with impacts lasting into Phase III. This necessitated political discussions and policy interventions, both negatively impacting predictability in practice. However, when the discussion on potentially necessary structural readjustments has run its course, it may be well expected that the increased trading period length will result in a more stable, and therefore more predictable legislative regime. In terms of the timing of investments and emission reductions, though, the trading period length is expected to be of little influence, due to the banking allowed in the system and many other factors influencing investment decisions.

3.2.5 Efficiency

With respect to the criterion of Efficiency, the following evaluation questions are addressed:

- Are the (administrative) efforts for cap setting and management of the transition between trading periods justifiable / reasonable for administrators and participants?
- Has the change of approach between 2nd and 3rd phase lead to an improvement of administrative efforts?

Limited quantitative information is available on the administrative effort required in relation to setting the EU-wide cap for Phase III, as well as for the decentralised process in Phase I-II. However, some conclusions can still be drawn by comparing the activities that needed to be carried out in the different phases.

For Phase II, the efforts of cap-setting and allocation cannot be separated, as the cap was determined by the sum of the allocations. So in order to establish the cap, all Member States had to prepare their draft National Allocation Plan (NAP) in accordance with guidance from the European Commission[180]. For Phase II, this included additional guidance prepared by the Commission on the 'maximum allowed cap'. The draft NAPs were evaluated by the Commission, following discussion with the Member States in the Climate Change Committee. In most cases, the draft NAPs had to be revised by the Member States, some-

[180] While Member States could build on the work done for Phase I, this still meant a considerable amount of effort in terms of updating projections, renewed decisions on the distribution of efforts between ETS and non-ETS sectors, potential adjustment of the allocation rules on the basis of Phase I experiences and progress towards Kyoto targets, calculation of installation-level allocations and public consultation of the NAP.

times after extensive discussions between the Commission and the Member State, after which additional public consultations in some of the Member State where needed.

Under the revised Directive, setting the cap has required the determination of the basis of the current cap, i.e. 'the mid-point of the period from 2008 to 2012', or the average annual cap during Phase II[181] and the linear reduction factor. The former was known as a result of the cap-setting & allocation process during Phase II. However, the extension of the scope of the EU ETS to additional gases and activities as of Phase III needed to be taken into account in the cap in line with Article 9a. For this purpose, the competent authorities had to identify the additional installations and ensure their emission data for the base period was independently verified.

One area where more effort was spent in Phase III than in Phase II, is the analysis of impacts of the proposed new cap-setting approach (and the choice of the linear reduction factor) and the associated public consultation on this element of the revised directive. This is however more the result of more rigorous policy development & appraisal requirements at the EU level and the availability of better impact assessment tools compared to pre-Phase II than of the policy design choices made in the revised Directive. At the same time, the choice for an EU-wide cap did result in the need to agree with all Member States on the level of the cap, which was part of the extensive negotiations on the revised Directive. Given the gains the approach under the revised directive brings in terms of increased transparency and harmonisation and a more level playing field than in Phase II, these additional efforts seem well justified.

So in conclusion, it can be said that the change in the cap-setting approach in Phase III has led to reduced overall administrative efforts compared to Phase II though with more attention to impact assessment, consultations and negotiations. Here it must also be noted that, due to the inherent link between the EU-wide cap and the harmonised allocation rules, this came at the expense of significant administrative efforts required in the allocation process (see Section 3.4 for further discussions). In addition, a (future) gain in efficiency comes from the fact that much of the cap setting effort for the third phase was a one-off exercise. Any further caps in the future in principle need only a new determination of the linear reduction factor.

3.2.6 EU-added value

With respect to the criterion of EU-added value, the following evaluation question is addressed:

- What is the additional value resulting from EU-wide harmonised cap setting?

While a lot of effort was spent on identifying the problems with cap-setting in Phase I-II and assessing the impacts of the EU-wide cap in Phase III ex-ante, no quantitative ex-post assessments of the experiences in Phase III have been found. Qualitatively, though, a number of conclusions can be drawn regarding

[181] 'The total quantity of allowances issued by Member States in accordance with the Commission Decisions on their national allocation plans for the period from 2008 to 2012', Article 9 of the revised Directive.

improvements achieved through the implementation of the revised Directive. Some quantitative considerations are provided at the end of this section.

The 2008 EU ETS review Impact Assessment lists the following problems with the cap-setting process before Phase III:

- National caps set higher levels than environmentally efficient ('prisoners' dilemma'[182]);
- Lack of a level playing field;
- Uncertainty and lack of predictability (timing of decision-making);
- Undue volatility of allowance prices, negative impact on the functioning of carbon markets;
- Complexity and lack of transparency;
- Negative impact on the credibility of the EU vis-à-vis third countries;
- High administrative costs.

With the EU-wide cap, the prisoners' dilemma for Member States has been removed, eliminating the distortion of a level playing field by different Member State approaches. Under the economic circumstances during the EU ETS review in 2008, the linearly decreasing cap was considered environmentally efficient. Due to the unprecedented economic crisis starting in 2008, the current cap has – unexpectedly – turned out higher than environmentally efficient, with negative impacts on the carbon market (and potentially credibility). However, this is the result of the economic crisis, not the cap-setting approach. Or rather, the impacts of the crisis would have been the same under the old cap setting rules.

With respect to the uncertainty related to the timing and transparency of the decision-making, the situation in Phase III has substantially improved compared to earlier phases. While decision-making on the National Implementation Measures (NIMs) was also more drawn out over time than expected in advance, in some cases beyond the start of the trading period, this affected only individual allocations, not the cap as a whole (or the associated carbon price). The ambition level of the cap for Phase III has been known since the publication of the Commission's EU ETS review proposal[183] in January 2008 (five years in advance of the period)[184]. During Phase I-II, the overall cap was only known when the last of the NAPs was finalised, well into the respective trading periods[185].

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[182] "Where each individual Member State recognises the collective interest to set restrictive caps for optimal reduction of emissions in the EU, but also has an interest to maximise the national cap" (2008 EU ETS review Impact Assessment).

[183] COM(2008) 16 final. Note that the definition of the cap in Article 9 was not changed during the Co-decision process, Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0016:FIN:en:PDF

[184] The precise definition of the third phase cap became available only after the end of Phase II, which is a reason why the precise and final number was published by the Commission only in September 2013 together with the Decision on the Member States' National Implementation Measures (NIMs): Commission Decision 2013/448/EU of 5 September 2013 set the total cap in 2013 to 2 084 301 856 allowances. It must be noted that preliminary data was already published in Decision C(2010) 4658 (July 2010) amended by Decision 2010/634/EU in October 2010, which took into account the scope extension in line with Article 9a. At that time the cap for 2013 was defined as 2 039 Mt CO_2(e).

[185] The last NAPs were approved in 2005 for Phase I (Poland, Czech Republic, Italy, Greece) and in 2009 (Norway) and 2011 (final decision for Poland, Estonia) for Phase II: http://ec.europa.eu/clima/policies/ets/pre2013/nap/index_en.htm.

The decoupling of cap-setting and allocation in Phase III has also led to increased transparency, and reduced complexity[186] as different Member State approaches were avoided and the cap was not derived from BaU[187] scenarios. As stated before, the current approach is more efficient as the cap calculation does not have to be carried out again.

An attempt has been made by the project team to quantitatively compare the results of the cap-setting approach across EU ETS phases in terms of emissions and cap (or total allocation) levels. However, this has not led to meaningful conclusions, given the many factors influencing both emissions and allowances across Member States and phases.

3.2.7 Conclusions

Availability of ex-post information on the performance of the EU ETS in terms of cap-setting under the new rules of the revised ETS directive is limited, due to the recent entry into force and the time delay in publication of data and subsequent empirical analyses. However, comparing the approaches in Phase I-II and Phase III, (qualitatively) assessing the developments since 2013 and an analysis of stakeholder views allows drawing the following conclusions regarding the cap-setting approach under Phase III rules:

- Splitting the EU GHG emission reduction target into separate targets for the ETS sectors and for the non-ETS sectors, in combination with an EU-wide cap during Phase III has improved the cap-setting approach compared to earlier phases, leading to increased harmonisation across Member States, a more level playing field and more transparency in the cap-setting process;
- The lengthening of the trading period in Phase III has ensured coherence with internationally agreed GHG targets for 2020;
- The length of the trading period is mostly relevant in terms of the stability of the legislative regime. Compared to the first two phases, the extension of the linear reduction beyond the next period has provided further guidance to investors about the direction of long-term trends;
- For stimulating investment decisions, the length of the trading period is less relevant due to the current banking rules, though many other factors also play an increasingly important role;
- The EU ETS has been effective in establishing a liquid market and carbon price, resulting in trading and flexibility, facilitating cost-effectiveness. However, carbon prices have remained low and relatively volatile due to unprecedented unforeseen events, hampering the predictability and effectiveness of price incentives which the new cap-setting approach aimed for;
- The *short-term* environmental target of keeping GHG emissions below the cap is on track, with emissions below the cap in 2013 and projections indicating that this will be the case for the whole period up to 2020. Meeting the EU stand-alone target defined for 2020 cannot be fully *guaranteed,* because banking rules (and credit use) could allow ETS emissions to increase above the cap in some years (including the target year 2020);

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[186] As mentioned before, this has to a certain extent been exchanged for a more complex allocation process.

[187] "Business as Usual"

- The *long-term* environmental target of stimulating low-carbon investment is not sufficiently met yet, due to the low carbon prices. It is still too early to draw conclusions on the impact of the revised Directive on longer-term, structural emission reductions, investments and innovation separate from the effect of the economic crisis;
- The revised Directive contains provisions for adjustments in the cap-setting approach, but these take time, and are not suited for dealing with large shocks quickly. Impacts of such shocks can be long-lasting due to the banking rules, maintained in the revised Directive from before. Measures to address these impacts are currently being discussed and/or implemented;
- Administrative efforts under the revised Directive are lower than during the earlier phases, though with more effort for Impact Assessments (IAs), public consultation and negotiations. This was in part due to an improved legislative process (IA, consultation) and in part due to the chosen design (putting the result into EU legislation, which requires some negotiations). The increased effort was justified by gains in transparency, increased harmonisation and a more level playing field. For future phases, the administrative effort will be further reduced, as the basis for the cap-setting does not have to be established again;
- The harmonised approach at the EU level has provided the added value of an increasingly levelled playing field and increased transparency, reduced uncertainty due to timing and reduced administrative efforts. Other objectives of the harmonised approach (increased environmental efficiency/reduced over-allocation and its effect on carbon prices and credibility of the system) have not yet been fully met. Here it must be noted that this is mainly caused by the effects of the economic crisis, with no visible effects of design choices made in the revised Directive (i.e. effects would have been the same under old cap-setting rules).

Summary

Cap setting is found highly **relevant** for the EU ETS and EU climate policy in general. Without a defined cap the EU ETS would have no environmental target, and no stable carbon price could evolve. It is also found highly **coherent** with the EU climate policy framework and international framework (Kyoto commitment periods).

There is also clear evidence for the **effectiveness** of the cap setting as part of the EU ETS: A functioning carbon market has evolved. The cap has achieved its purpose, i.e. establishing a CO_2 price, albeit the economic downturn since 2008 could have made the cap less stringent, as some argue. Despite a lack of full consensus in literature, it may be concluded that the low CO_2 price evolving as a consequence is a proof that the EU ETS follows market fundamentals.

Regarding the environmental *short term* effectiveness of the cap, it must be noted that in individual years (including the target year 2020) the emissions could theoretically be higher than the cap, due to temporal flexibility. However, the cap (i.e. the desired environmental outcome) for the third trading period cumulatively will likely be met. When it comes to the *long term* effectiveness, there is consensus that a stronger price signal is needed to provide incentives for investments in the sustainable transition to a low-carbon economy. Studies show that current GHG reductions are not solely attributable to the economic down-

turn, but also to climate policies like in particular the EU ETS. In this regard, the EU ETS and its cap proved effective. Nevertheless, continued investments in low-GHG technology are required in the future. Whether the new way of setting the cap from the third phase onwards has changed the situation, cannot be judged yet based on existing data. However, it is expected that the upcoming MSR will contribute to increased CO_2 prices and will thereby strengthen the existing mechanism of cap-setting. The long term effectiveness of the ETS will improve then, too.

The process of cap setting has become **more efficient** compared to Phase II. Less administrative effort was needed in the third phase due to a central data management instead of handling 28 National Allocation Plans (NAPs). Further improvement comes from the fact that cap setting has become a one-off exercise, which will not have to be repeated in coming trading phases.

EU-added value is high, i.e. Member State level interventions would be less favourable. Transparency and predictability have strongly increased as consequence of the 2008 EU ETS review. In combination with EU-wide allocation rules (see 1.3.4 and 3.4), a level playing field for industry across the EU has been established.

3.3 Auctioning

3.3.1 Introduction

With the third trading period, auctioning has become the default method of allocation[188] in the EU ETS. As a consequence, a total of 7.5 billion allowances are expected to be auctioned between 2013 and 2020. The sheer volume of allowances and the resulting revenues involved makes auctioning an important ETS aspect to evaluate. This evaluation focuses on auctions in Phase III, as they played only a minor role in earlier phases. While auctions are being used to allocate both general allowances (EUAs, which can be bought by anyone and surrendered for compliance by stationary or aircraft operators) and for aviation allowances (EUAAs, which can be bought by anyone and surrendered for compliance only by aircraft operators), the volume and frequency of EUAA auctions is far below the levels for EUAs, mostly due to fact that EUAAs are limited to one sector only, but also the high level of free allocation in the aviation sector and the reduced coverage of flights in accordance with the 2014 scope Regulation[189] (following the "stop-the-clock" Decision[190]). Thus the conclusions in this section apply primarily to EUA auctions, but to the extent that EUAAs are sold on the same platforms and following the same rules/procedures, they may apply to them as well[191].

The revised EU ETS Directive contains the following main requirements regarding auctioning of allowances in Article 10:

- All allowances which are not allocated for free and which are not placed into the market stability reserve are to be auctioned;
- A specific [politically agreed] split of auctioning amounts (and thus of the revenues) among the Member States;
- A (non-binding) requirement for Member States to use at least 50% of the revenues or equivalent in financial value of these revenues for certain climate-related purposes, and to report to the Commission about the use of revenues;
- The requirement for the Commission to adopt a Regulation on timing, administration and other aspects of auctioning to ensure that it is conducted in an open, transparent, harmonised and non-discriminatory manner.

[188] Although it is the default method, auctioning is not the way most of the allowances in the EU ETS are allocated on a volume basis due to the continuing (but decreasing) amount of free allocation: It is estimated that during Phase 3 around at least 48% of allowances will be auctioned, see http://ec.europa.eu/clima/policies/ets/cap/auctioning/index_en.htm

[189] Regulation (EU) No 421/2014 of the European Parliament and of the Council amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in view of the implementation by 2020 of an international agreement applying a single global market-based measure to international aviation emissions. Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R0421

[190] Decision No 377/2013/EU of the European Parliament and of the Council derogating temporarily from Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community. Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:113:0001:0004:en:PDF

[191] Note that at the time of writing, no secondary market has yet been developed for trade in allowances for aviation.

Since this evaluation relates to the EU ETS Directive, the very detailed requirements of the Auctioning Regulation[192] adopted in line with that last bullet point are not evaluated in detail. However, the principles of auction design listed in Article 10(4) of the revised EU ETS Directive (and further elaborated by the Auctioning Regulation) are inevitably at the core of the evaluation. According to these principles auctioning should:

- be conducted in an open, transparent, harmonised and non-discriminatory manner;
- ensure that all operators – particularly Small and Medium Enterprises (SMEs) and small emitters – have full, fair and equitable access;
- ensure that all participants have access to the same information at the same time.

In the case of auctioning several of the general evaluation criteria such as "relevance" and to some extent "efficiency" and "coherence" do not lend themselves to empirical analysis. This would require counterfactual scenarios (such as an ETS without auctioning for comparison) or information from non-public sources such as interview results or Member State-specific case studies. Such information gathering is beyond the scope of this evaluation. The criterion most conducive to evaluation is "effectiveness", as it pertains to the individual components of auctioning and whether those components currently function as planned or intended. The intervention logic as laid out below can be applied most directly to that section, and thus it comprises the longest and most thorough part of the following evaluation.

3.3.2 Intervention logic

- Needs:
  - Efficient allowance allocation mechanism through which those allowances not allocated free of charge will be allocated with the lowest transaction costs and on the basis of an efficient price signal.
- Objectives:
  - Appoint auction platforms, which ensure open, transparent, harmonised and non-discriminatory auctions;
  - Prevent market abuse, insider dealing, money laundering and other criminal activity within the auctions (as in the secondary carbon market);
- Inputs:
  - Allowances: Between 2013 and 2020, a total of 7.5 billion allowances are expected to be auctioned.
- Actions:
  - Procure the auctioning platform(s), to ensure that the auctions are performed,

[192] Commission Regulation (EU) No 1031/2010 of 12 November 2010 on the timing, administration and other aspects of auctioning of greenhouse gas emission allowances pursuant to Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowances trading within the Community; Latest consolidated version: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1426079293788&uri=CELEX:02010R1031-20140227

  - Procure the auctioning monitor to ensure appropriate monitoring of and reporting about auctions.
- Expected and intended results/impacts:
  - Efficient allocation of allowances through auctions;
  - Fair access to allowances (including for SMEs and small emitters) at auctions;
  - Revenues for Member States, and the use of those revenues for climate change mitigation and adaptation purposes – including innovation support and support of low-income households with regard to energy efficiency.

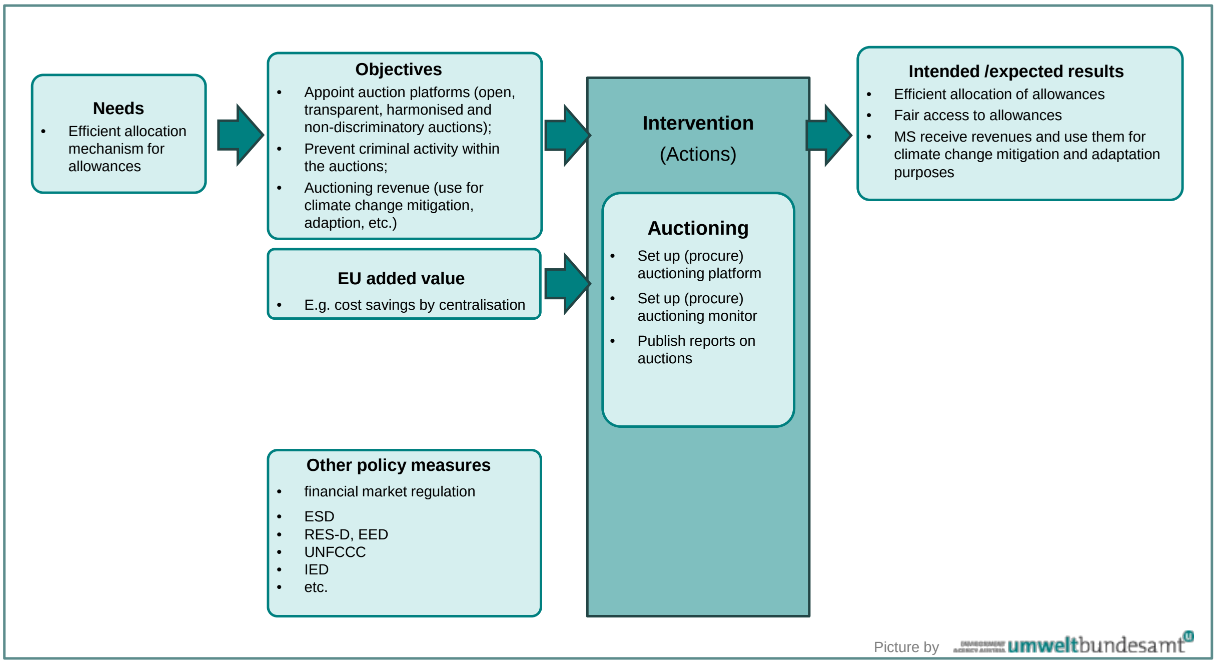

Figure 17: Detailed intervention logic for the evaluation area "auctioning".

3.3.3 Relevance

The relevance of the EU ETS auctioning system is evaluated on the basis of the following question:

- To what extent does the allocation method of auctioning correspond to the goals of the energy and climate policy framework?

The EU climate policy strongly relies on the EU ETS, which in turn requires an efficient allowance allocation mechanism with the lowest transaction costs and working on the basis of an efficient price signal (as discussed e.g. in the impact assessment for the EU ETS review in 2008). Auctioning not only fulfils this need, it constitutes the means by which the need is fulfilled. The act of auctioning allowances in Phase III of the EU ETS embodies the very principles set out in the revised ETS Directive: Recital 15 of Directive 2009/29/EC requires that the EU ETS "operates with the highest possible degree of economic efficiency and on the basis of fully harmonised conditions of allocation within the Community. Auctioning should therefore be the basic principle for allocation, as it is the simplest, and generally considered to be the most economically efficient, sys-

tem." Auctioning is the default method of allocation, and the extent to which it is used is set to grow until and beyond 2020, thus increasingly fulfilling the objective of cost-efficiency in allocation.

3.3.4 Effectiveness

The effectiveness of the EU ETS auctioning system is evaluated on the basis of the following questions:

- Do the auction platforms function as planned?
- Have the auctions resulted in the allocation of the planned amounts of allowances?
- Have the auctions been conducted in an open, transparent, harmonised and non-discriminatory manner?
- Is SME and small emitter access ensured in full, fair and equitable manner?
- Have revenues been used as suggested? Has the share of revenues used for the suggested purposes been in line with the 50% target?
- Has the Auction Monitor been set up and are its duties being performed?
- Have the auction platforms published auction results in a timely manner and have national authorities submitted periodic reports in a timely manner?

The effectiveness criterion pertains to the individual components of the practical implementation of auctioning rather than the approach as a whole, and whether those components currently function as intended. In the following sections the evaluated components are grouped by the extent to which they are found to contribute to the effectiveness of the EU ETS.

Auction platforms have been appointed. A competitive tendering process resulted in EEX being appointed to implement the transitional common auction platform (TCAP) for 25 Member States – its contract extends until August 2016. The Leipzig-based exchange now runs the single-round, sealed bid, uniform price auctions of allowances in the form of spot products, with auctions of general allowances occurring three days per week and auctions of aviation allowances occurring less frequently. This transitional platform will be succeeded by a common auction platform, for which the tendering procedure is currently underway following a June 2014 prior information notice announcing e.g. eligibility requirements and a November 2014 restricted call for a competitive dialogue procedure. Germany and the UK, which opted out of the transitional common auction platform in favour of selecting other ones, currently auction their allowances following the same rules as the TCAP, but with weekly and fortnightly frequency, respectively. Germany uses the EEX opt-out platform (separate from TCAP) while the UK's opt-out platform is implemented at the London-based ICE. Poland opted out of the TCAP as well, but did not appoint an auction platform and therefore also sells allowances via the TCAP with a monthly or lower frequency. Auctions of aviation allowances are also done by TCAP on EEX on behalf of 25 Member states and Poland, on EEX on behalf of Germany and on ICE on behalf of the UK, at a less than monthly frequency.

Auctions have resulted in the allocation of the planned amounts of allowances. The auction platforms (EEX and ICE) have published and continue to

publish yearly auction calendars listing the volumes to be sold at each auction in a given year several weeks before the start of that year – these are publicly available on the websites of the EEX[193] and ICE[194], respectively. The calendars reflect the planned amounts of allowances based on EUAs and EUAAs "left over" for auctioning after all types of free allocation are accounted for (see *efficiency* and *coherence* sections for more on this split between free allocation and auctioning). Based on data provided by the auction platforms in written reports, discussions and regular meetings with the Commission, the Commission (on behalf of all Members States in TCAP and Poland) has published and continues to publish regular (monthly) TCAP auction reports, which are also publicly available on the Commission's website[195]. Germany and the UK also have published and continue to publish regular auction reports based on data from their opt-out platforms in EEX and ICE, respectively[196]. These auction reports show the results of the auctions – they reveal that the volumes up for sale were indeed purchased by bidders. In the few cases where auctions were cancelled[197], the volume was – in line with the Auctioning Regulation – evenly distributed over the following scheduled auctions.

Auctions have been conducted in an open and transparent manner. The websites of the respective exchanges contain all information pertinent to *access for bidders*, as well as *guidance documents* and relevant contact information to ensure non-discrimination. As concerns transparency, all platforms provide full details of the auction results (subject to the confidentiality obligations under the Auctioning Regulation) within 15 minutes of their closure, as required by the Auctioning Regulation. Moreover the platforms provide on their websites details of how the clearing price is determined (following the rules established under the Auctioning Regulation), how all participants have access to the same information at the same time, and the EUA and EUAA contract specifications. The websites also provide links to relevant pricing data for EUAs and EUAAs in the secondary market.

Due to the fact that there are three platforms on two exchanges, auctions are not completely harmonised. The EEX (both TCAP and opt-out) and ICE have the same access conditions to the allowance auctions, but different fees (see discussion of exchange membership pricing under the efficiency criterion below) and different procedural requirements for registering and participating in allowance auctions. One prominent example is the ICE's lack of "auction-only" membership option discussed below.

The *timeliness* of the monthly auction report publication could be improved. Although all the essential elements of the results of each auction are

[193] https://www.eex.com/en/market-data/emission-allowances/auction-market/european-emission-allowances-auction/european-emission-allowances-auction-download

[194] https://www.theice.com/emissions/auctions

[195] http://ec.europa.eu/clima/policies/ets/cap/auctioning/documentation_en.htm

[196] Germany's emissions trading authority (DEHSt) publishes an auction report every month, as well as quarterly and annual compilation reports. The UK's Department of Energy and Climate Change publishes reports every reporting period, which ranges from one to several months depending on frequency and volume, as UK's yearly auction volumes are about half those of Germany.

[197] Auctions were cancelled 3 times, all before early 2013– in accordance with the provisions of Article 7(6) of the EU Auctioning Regulation, two German and one UK EUA auctions were terminated because the auction clearing price would have been below the reserve price. Their volume was evenly distributed to the four subsequent German or UK EUA auctions in accordance with Article 9 of the EU Auctioning Regulation.

always published in the auction platforms' websites within 15 minutes of closing of each auction (as mandated by the Auctioning Regulation), at the time of writing this evaluation report (March 2015), the most recent auction report for the TCAP presented results of November 2014. For being considered a *timely* reporting, a delay of less than three months would be more appropriate. Therefore this criterion appears not sufficiently fulfilled. Germany and the UK perform slightly better in this regard, with Germany's 4th quarter and annual reports for 2014 (thus including December) having been available already in February 2015 and the UK having published the report[198] for the auctioning period January 2015 by this time.

Efforts to include small and medium enterprises and small emitters at auctions are made to the highest extent possible. Data from 2014 show that SMEs and small emitters have preferred to cover their allowance needs through intermediaries[199] and to avoid the high learning curve (and fixed costs) associated with establishing their eligibility for auction participation and obtaining electronic-based access to the auction. The institutions involved can be shown to have provided information about and access to the auctions for SMEs and small emitters specifically. Any lack of direct participation in auctions on the part of SMEs and small emitters thus cannot be characterised as failure on behalf of the regulator to ensure fair auction access specifically to these entities – the evaluation on this point concerns the degree of effort made by the Commission and auctioning platforms to inform and involve smaller emitters. That degree of effort is high, with the EEX offering since mid-2012 an "auction only" exchange membership category that exempts participants from obligations applying to larger exchange members[200]. Auction reports for the TCAP auctions specify the number of such auction-only participants: Throughout 2014, the number of "auction-only bidders" ranged from 2 to 5 with the total number of eligible bidders at each auction ranging from 62 to 67. Thus at least some (possibly) smaller firms have taken advantage of this option.

Relevant data for non-TCAP auctions are less definitive, with recent research on German ETS participants suggesting that most firms are not aware of the advantages of the auction-only membership[201]. The German auction reports do not specify numbers of auction-only participants, and the ICE – on which UK auctions are conducted – does not offer an auction-only participation route.

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[198] The content of these reports to a large extent overlaps with the information on auction outcomes which is made public for all platforms shortly after the auction takes place.

[199] A forthcoming publication (Grünig, Max; Lund, Sabine; Weiß, Jan; et al: Support and Evaluation of the Implementation of the EU-Auction-Process for the Trade Period of 2013-2020 and for the Period of 2012-2020 in the Aviation Sector from an Economic Perspective, Berlin: DEHSt) contains a survey-based analysis of the auction participation rate and rationale of (variously sized) emitters, concluding that SMEs generally prefer to obtain allowances through intermediaries rather than sacrifice their own personnel, time and resources for this purpose. However, the survey was conducted in mid-2014. Since then, efforts to promote the "auction-only membership" option on the EEX, as well as familiarity with auctioning in general among emitters, may have increased participation rates of smaller players.

[200] These include appointing authorised traders who have passed the EEX Trader Exam and establishing a technical connection to the trading systems of the exchange. The auction-only access is further subdivided into a direct "trader access" with full functionalities and an indirect "free access" where bids can be placed, but not modified. See https://www.eex.com/en/products/environmentals/emissions-auctions/access-to-the-auctions

[201] A survey of 235 German EU ETS participants conducted in mid-2014 showed that only 15% of respondents were familiar with the advantages of the auction-only option – see Grünig et al, p. 126, cited in footnote 199.

Further information on the type of bidders, needed to ascertain whether SMEs and small emitters are adequately represented at auctions, is difficult to obtain in consistent form because the three auction reports (Germany's, the UK's, and that of TCAP) differ in the specificity by which they describe bidder categories. While the latter report provides information on some of the auction data divided into three bidder categories – "operators", "investment firms", and "credit institutions"[202] – those of the UK and Germany do not. This only allows for partial data gathering as to participation rates of various types of entities at EUA auctions. Figure 18 presents the breakdown of the share of allowances bought by category and month, as well as the average number of participants in the auctions by month in 2013 and 2014.

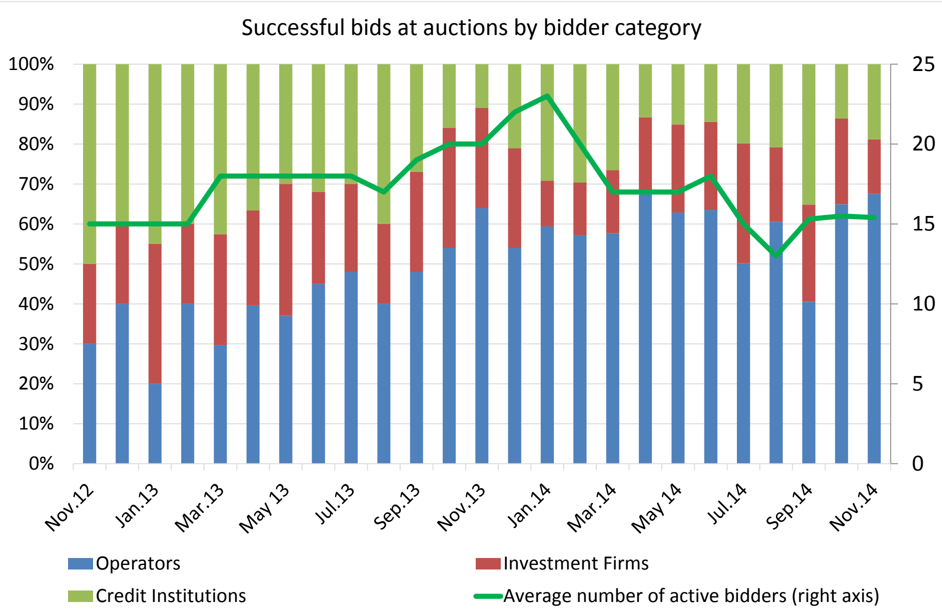


Figure 18: Participation in TCAP Auctions according to bidder category in 2013 and 2014. Source: Ecologic Institute based on TCAP auction reports[203].

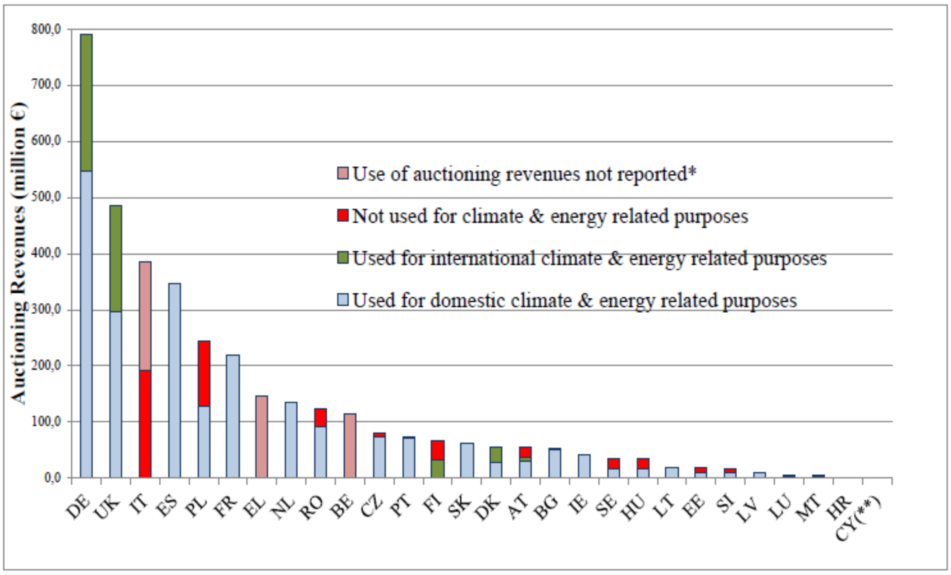
The figure reveals a trend toward increasing the share of allowances bought by *operators*, the category containing all SMEs and small emitters[204] rather than investment firms or credit institutions bidding on their own or on behalf of operators. The average number of active bidders per month ranged from 13 to 23 during this time period but did not correlate with the percentage of operators' success: auction participation grew overall throughout 2013 but peaked in January 2014 and declined thereafter, while the percentage of auctioned allowances bought by operators remained high over this time. This points to a "success" in terms of spurring auction participation by the emitters. The success is also illustrated by increasing number of operators participating in the auctions.

[202] "Operators" include business groupings and thus may involve associations of companies, "investment firms" include traders doing business on their own account or on behalf of clients, and "credit institutions" are entities trading on their own account or on behalf of clients.

[203] Available at http://ec.europa.eu/clima/policies/ets/cap/auctioning/documentation_en.htm

[204] Although credit institutions and investment firms also bid on behalf of clients, this has typically covered small proportion of bids placed.

It is not given that auction revenues have been used as foreseen by the Directive. The EU ETS Directive suggests that Member States use at least half of the auction revenues for purposes related to climate change adaptation and mitigation as listed in article 10(3). However, since the legal text does not set a binding obligation in the implementation of this, the extent to which revenues from allowance auctions have been put toward those goals varies by Member State. Also, the way in which the use of funds is calculated and reported varies greatly, despite a standardised reporting requirement on this issue. Under the Monitoring Mechanism Regulation[205], Member States were requested to report for the first time by 31 July 2014 on the amounts and use of the revenues generated by the auctioning of ETS allowances in the year 2013. The total revenues for the EU were 3.6 billion €. The results of these reports, compiled in the progress report[206] on Kyoto and the EU's 2020 goals published in October 2014, show the breakdown of 2013 auction revenue use as reported by Member States (see Figure 19). Data on the use of 2014 auction revenues has not yet been compiled in this way.



* IT, EL: split between domestic and international use not reported. BE: no information on the use of auctionning revenues provided.

** No reporting provided.

Source: European Commission

Figure 19: Reported revenues from the auctioning of EU ETS allowances (millions of Euros) in 2013 and share of these revenues or the equivalent in financial value used or planned to be used for climate and energy related purposes.

[205] Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No. 280/2004/EC. Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:165:0013:0040:en:PDF

[206] COM(2014) 689 final and SWD(2014) 336 final. Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0689 and http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014SC0336

According to this report, *more* than the suggested 50% of auction revenue has been earmarked for climate-friendly purposes. Therefore the auction revenue use component can be evaluated positively as “fulfilled”. On the individual Member State level, however, the non-binding requirement of earmarking 50% of auction revenue for these purposes cannot be evaluated in all cases. Some Member States failed to report auction revenue use on time altogether or reported only partially. In other cases all auctioning revenues are accounted to the overall state budget. A relevant amount used from that budget for climate and energy investments during the year was then reported as being attributable to auctioning amounts. However, this practice has been criticised by NGOs for insufficient transparency[207].

The Auction Monitor has not been set up and is not performing its duties. As per Article 25 of the Auctioning Regulation, an auction monitor is to report on the auctions conducted on all platforms. However, the tendering process for this entity – conducted in 2012 and again in 2013 – both times did not result in awarding of the contract. In the absence of a monitor, the detailed auction reports discussed above contribute to auction transparency by presenting the results of the auction, including assessment of fraudulent activity (or lack thereof). Also, by virtue of the Auctioning Regulation, the auction platforms must be “regulated markets” under the meaning of Markets in Financial Instruments Directive (MiFID), and as such subject to market oversight by the MiFID National Competent Authorities on whose jurisdiction they stand. Moreover, the Auctioning Regulation charges the relevant National Competent Authorities with supervising the functioning of the auctions to ensure that they are free of Market Abuse and Money-laundering and Financing of Terrorist Activities. Thus the missing monitor has so far not been critical to the functioning of auctions or their fairness. However, hiring an independent body for this purpose – as is common practice in other emission trading systems, including the Regional Greenhouse Gas Initiative and the California/Quebec programme in North America – would likely increase overall confidence in the level of harmonization to which the control measures in place are applied in all jurisdictions.

3.3.5 Efficiency

The efficiency of the EU ETS auctioning system is evaluated on the basis of the following questions:

- In what ways has auctioning been more cost-effective than free allocation?
- To what extent have inefficiencies been observed?
- Have there been significant structural premiums or discounts on auction prices, compared to secondary market prices?

[207] See CAN Europe, Greenpeace and WWF. “Stronger Together – Investment support and solidarity mechanisms under the EU's 2030 climate and energy framework”. Brussels: September 2014. Download under http://www.greenpeace.org/eu-unit/Global/eu-unit/reports-briefings/2014/20140908%20Stronger%20Together%20CAN%20WWF%20Greenpeace.pdf

The efficiency criterion is meant to assess costs associated with auctioning and whether they have been justified, given the cost-saving effects auctioning has achieved. Since the alternative to auctioning is free allocation, the efficiency criterion in this case asks in what ways auctioning has been more cost-effective than free allocation – and to what extent inefficiencies have been observed. As with the relevance criterion, the efficiency criterion is in essence already met by the fact that auctioning is used at all.

The fact that auctioning as a method of allowance allocation is more cost-effective in theory than any of the free allocation methods, and counteracts the problem of "windfall profits", is the very basis for the Commission's decision to propose auctioning as the default allocation method and to increase the degree to which it is used throughout Phase 3. Findings from economic studies conducted over a decade ago showing auctioning to be the most cost-effective allocation method (e.g. Harrison and Radov 2002, pp. 68)[208], combined with more recent ones showing that auctioning the power sector's share of allowances cuts the chances of "windfall profits" for electricity companies (e.g. Keppler and Cruciani, 2010)[209], demonstrate the efficiency criterion for auctioning in theory. In practice, the administrative time and resource use involved in setting benchmarks and determining free allocation amounts by assessing NAPs (and later NIMs) is eliminated to the extent that auctioning is used, as the latter involves letting external entities (exchanges) handle the largely self-regulating procedure of allowance disbursement.

However, exact cost savings of auctions are not easily measured as it is not the sole allocation method but it does get compared to a scenario in which free allocation is the sole allocation method. Auctioning is only the *default method* of allocation in the EU ETS, with free allocation (and all the time and financial resources it requires) still taking place – especially outside the power sector. The administrative and financial resources auctioning does require (selection of exchanges to run auctions, oversight of the auction process and procedures associated with the aforementioned reports etc.) thus come *in addition to* those already spent on other allocation procedures. Because the appointment of auction platforms and their oversight are essentially "sunk costs", the percentage of total allocation auctioned does not correspond directly with overall cost savings from auctioning. However, the cost savings from auctioning are due to increase over the course of Phase III, as the percentage of the total allowances freely allocated declines.

In contrast to the above described costs to regulators, **costs to auction participants are by definition higher than under free allocation** (at least if costs for baseline data collection and verification are not taken into account). Having to buy allowances rather than getting them for free is of course more expensive, but the cost of doing business on the respective exchange that constitutes the auction platform is also significant. Entities that wish to participate only in the

[208] See Harrison, D. and Radov, D. (2002). "Evaluation of Alternative Initial Allocation Mechanisms in a European Union Greenhouse Gas Emissions Allowance Trading Scheme". London: National Economic Research Associates with Jaakko Poyry Consulting. Download under http://www.merlin-project.de/restricted/sr_workspace/EU%20Emission%20Trading%20evaluation.pdf

[209] Keppler, J.H. and Cruciani, M. (2010). Rents in the European Power Sector Due to Carbon Trading. *Energy Policy* Vol 38.

EUA auctions on the EEX must pay a fee of € 1 200 per year[210] for auction only electronic access, or obtain free access for indirect bidding via EEX's Market Supervision. Trading fees on the ICE vary by membership category, with General Participants paying a one-time payment[211] of $ 4 500 plus another € 2 500 for the Emissions Trading Privilege in addition to annual fees of $ 11 500 and € 2 500 for the membership and Emissions Trading Privilege, respectively. Exchange membership as an Individual Participant requires a one-time payment of $ 800 plus € 2 500 for the Emissions Trading Privilege, in addition to annual fees of $ 600 for membership plus € 2 500 for the Emissions Trading Privilege[212]. Given that power sector entities are the ones most likely to purchase allowances at auctions (industrial entities still receive most of their allowances for free due to leakage and competitiveness concerns), these exchange fees represent a relatively small additional financial burden for most of the companies involved: Power sector players regularly participate in exchange trading of electricity products in addition to being active in the secondary market for emissions allowances and offsets via exchanges, so they are very likely to have paid the requisite fees already. However, for SMEs these fees may constitute an effective barrier to participate in auctions. They may find it more economical to access the auctions via intermediaries or to obtain allowances in the secondary market.

There have not been significant structural premiums on auction prices compared to the secondary market. Each TCAP auction report for each month 2013-2014 states that "the auction clearing price was in line with the price signal in the secondary market". The UK's and Germany's reports specify this relationship using the ICE EUA spot ("daily future") settlement price as the relevant secondary market reference price. The TCAP report compares the auction clearing prices with EEX secondary market for spot emission allowances. In no report does the difference exceed 2 % of the auction clearing price until 2013 and 1% in 2014. Two percent of the auction clearing price can be considered a valid threshold for a "premium" for the purpose of this analysis. The German annual auction reports even include tables illustrating the relationship of EUA spot auction clearing prices to secondary market prices over time – see Table 1 and Table 2 below. The maximum deviation was 1.54 % once in March 2013, which is still below 2 %.

[210] Access to the auctions can also be obtained as part of a broader package giving access also to secondary markets of emission products, for a higher fee of €5 000.

[211] ICE is part of CME Group, a US-based company operating exchanges on several continents. Thus General Participants in CME group's trading pay their fee in $. The Emissions Trading Privilege applies to EUAs, which are handled in €. At EEX, on the other hand, all fees are expressed in € only.

[212] For an even more detailed breakdown of the costs of exchange membership, see pages 33-37 of Grünig et. al. 2014

Table 1 : Auction vs. secondary market prices[213] in the EU ETS Phase 3 (2013)
Source: DEHSt, German annual auctioning reports 2013[214]

Date	Contract	Closing price	Deviation from lead market	
			Best bid ICE daily future	
			Absolute*	%
January	EUA Spot 3rd TP	**€4.71	€0.02	0.34%
February	EUA Spot 3rd TP	*€4.14	€0.05	1.20%
March	EUA Spot 3rd TP	*€4.12	€0.06	1.54%
April	EUA Spot 3rd TP	*€3.88	€0.05	1.41%
May	EUA Spot 3rd TP	*€3.46	€0.03	0.81%
June	EUA Spot 3rd TP	*€4.29	€0.03	0.59%
July	EUA Spot 3rd TP	*€4.17	€0.02	0.49%
August	EUA Spot 3rd TP	*€4.43	€0.02	0.41%
September	EUA Spot 3rd TP	*€5.28	€0.02	0.38%
October	EUA Spot 3rd TP	*€4.86	€0.02	0.31%
November	EUA Spot 3rd TP	*€4.54	€0.05	0.99%
December	EUA Spot 3rd TP	**€4.77	€0.02	0.31%
Mean absolute deviation			**€0.03**	**0.75%**

* Simple Average ** Volume weighted average

Table 2 : Auction vs. secondary market prices in the EU ETS Phase 3 (2014).
Source: DEHSt, German annual auctioning reports 2014[214]

Date	Contract	Closing price	Deviation from lead market	
			Best bid ICE daily future	
			Absolute*	%
January	EUA Spot 3rd TP	*€5.02	€0.02	0.44%
February	EUA Spot 3rd TP	*€6.61	€0.03	0.38%
March	EUA Spot 3rd TP	**€6.17	€0.02	0.38%
April	EUA Spot 3rd TP	*€5.18	€0.03	0.66%
May	EUA Spot 3rd TP	*€5.06	€0.01	0.28%
June	EUA Spot 3rd TP	*€5.58	€0.02	0.32%
July	EUA Spot 3rd TP	*€5.89	€0.01	0.21%
August	EUA Spot 3rd TP	*€6.23	€0.02	0.29%
September	EUA Spot 3rd TP	*€5.96	€0.02	0.34%
October	EUA Spot 3rd TP	*€6.24	€0.02	0.36%
November	EUA Spot 3rd TP	*€6.80	€0.01	0.15%
December	EUA Spot 3rd TP	**€6.65	€0.04	0.60%
Mean absolute deviation			**€0.02**	**0.35%**

* Simple Average ** Volume weighted average

[213] Reference prices from the most liquid trading venues served as appropriate benchmarks for evaluating the auction clearing prices achieved on the EUA spot auctions. The reference contract for the auctions is the daily futures traded on the London ICE, whose product specifications are comparable with the spot-product of the auctions. The trade price immediately before the end of the bidding period was used as a reference price. If no trades took place immediately before the end of the bidding period, the last best bid was used as a reference price.

[214] http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/ger_report_2014_en.pdf

3.3.6 EU-added value

The EU-added value of the EU ETS auctioning system is evaluated on the basis of the following questions:

- What is the value of having a common auction platform rather than separate auctions run individually by each Member State?

The fact that only three countries out of 31 EU ETS participants have chosen to make use of the opt-out provisions for auctioning, show the **clear added value of harmonising auctions at the EU level**. The differing metrics, frequencies and timeframes of auction reports among the German, UK and TCAP reports exemplify the added value of having one harmonised platform. The benefits of harmonisation are underlined by the fact that precisely Germany and the UK have their own auctions. As those are the highest-emitting Member States, the size of their auction volumes can justify separate auctions in terms of administrative resources, whereas creating individual platforms and reporting systems for auctions of the allowances of Member States with smaller amounts to be auctioned such as e.g. Latvia and Cyprus would clearly constitute an unnecessary administrative resource burden. Moreover, the literature on auctioning in multi-party emission trading systems supports harmonisation: In 2007 a study[215] was carried out for recommending how to structure auctions in North America's Regional Greenhouse Gas Initiative (RGGI) made on behalf of the participating US States, the first ETS to auction significant share of the volumes covered (>90% of its annual allowance budget). Those auctions also informed the model on which other ETS have based their auction design. That study argues that "*...multiple auctions almost certainly will raise the administrative costs of making allowances available to the market and the transaction costs for firms seeking to acquire them.*" RGGI is implemented by a group of separate states in the USA that could in theory each administer separate allowance auctions. They are therefore in a similar situation as the EU Member States. However, they have preferred holding joint auctions for the reasons cited above.

3.3.7 Coherence

The coherence of the EU ETS auctioning system is evaluated on the basis of the following question:

- To what extent are auctioning, and the allowance volumes auctioned, coherent with the other parts of the EU ETS Directive – particularly with free allocation?

Auctioning as a measure, and specifically the allowance volume auctioned, is by definition coherent with the other parts of the EU ETS Directive relating to allocation. Since all allowances not freely allocated are auctioned, exact coherence with elements of free allocation discussed in the other chapters of this evaluation is given. This coherence, however, in the early stages of auctioning was linked to practical difficulties for auction platforms and potential bidders in terms of uncertainty around the exact timing with which auction volumes were brought to auction in 2012 and early 2013. The expected amount to be auc-

[215] C. Holt, W. Shobe, D. Burtraw, K. Palmer, J. Goeree, "Auction Design for Selling CO_2 Emission Allowances under the Regional Greenhouse Gas Initiative Final Report", 2007, Page 81. http://www.rggi.org/docs/rggi_auction_final.pdf

tioned for each year during Phase 3 was already part of the public information on auctioning made available by the Commission before the start of Phase 3. However, for a precise calculation of the amount to be auctioned, first the amount to be allocated for free had to be determined. The EU ETS Directive's provisions against carbon leakage ensure that a significant (though decreasing) number of allowances is allocated for free. For this purpose Member States and EEA-EFTA countries submitted national implementation measures (NIMs) specifying the allocation to each installation covered by the EU ETS within their territory. The Commission (or EFTA surveillance authority) assessed those NIMs regarding compliance with the EU wide harmonised rules. Because the amount of free allocation on the basis of the cumulative NIMs exceeded the maximum amount of free allocation available, the Commission had to determine a cross-sectional correction factor (as provided for in Article 10a(5) of the revised ETS Directive). Only after this process the amount of auctioning could be determined by the Commission. An additional number of allowances was then deducted from the amount to auction to be given out for free in eight Member States (rather than being auctioned) for investments in the electricity sector, under the option to derogate from the general principle of auctioning, as provided for under Article 10c of the Directive. How many of these allowances will be allocated and when depends on the projects they fund – the remainder will be auctioned, again affecting the final number of allowances offered at individual auctions. Finally, any allowances not given for free are proposed to be placed in the Market Stability Reserve. The calculation of auction volumes is thus adjusted yearly, on the basis of a complex method and taking into account a multitude of factors prescribed in the legislation.

The complexity of guidance documents on this point is telling: the UK's introductory document to emissions trading[216] for emitters, available on the government's website, spends several paragraphs and tables with links explaining the allocation amounts as foreseen in the original NIMs, the amounts in the revised NIMs, the changes due to the cross-sectoral correction factor, and the changes made as recently as April 2014 due to partial cessations, significant capacity reductions or new entrants.

Moreover given the many factors having a bearing on the computation of the amounts to be auctioned on each given date, there was some uncertainty on the exact timing on which a small portion (less than 10%) of the volumes to be auctioned in 2012 and 2013 would be released. Moreover, the Commission's own information on auctioning explains that administrative steps to allow auctioning of EUAs were not completed on time in many Member States, such that the expected volumes from some Member States were withheld and included in the volumes to be auctioned in subsequent years – while some Member States began auctioning in 2012 before the start of Phase III, others (including Poland and the Czech Republic) did not begin until mid-2013. Those delays in auction start dates are mainly due to the different time Member States took to set up their auctioning arrangements with the platform. The practical difficulties associated with the uncertain breakdown between free allocation and auctioning may have also impacted the auction start, although to a much lesser extent as the volumes to be auctioned by Member States were all known at the same time. Nevertheless, it is to be noted that these uncertainties have not been an

[216] https://www.gov.uk/participating-in-the-eu-ets

issue from 2014 onwards, and in any event the exact total amounts to be auctioned in 2012 and 2013, as well as the exact timing for over 90% of the volume to be released during a given year have been made public by the auction platforms at least 2 months before the start of each year.

External coherence of auctioning with other interventions that have similar objectives is less straightforward. Since financial market law applies indirectly to the auctioning of allowances[217], the possibility that financial market law may not be applied in a fully harmonized way among Member States could slightly decrease the external coherence of auctioning in the EU ETS. To the extent that there are developments in financial markets law that apply to secondary markets – including spot emission allowances – the provisions regulating auctions may need to be amended to ensure continued coherence with financial markets law. Moreover, developments in other policies with an impact on the ETS can also impact the coherence of auctioning.

3.3.8 Conclusions

Auctioning has been found highly **relevant**, as it supports the goal of the EU ETS of being an efficient means of GHG emission reduction. Auctioning is regarded the most efficient allocation system. There are several elements fully **effective** already: Auction platforms have been appointed. The planned amounts of allowances are being auctioned. Auctions have been conducted in an open and transparent manner. Some concern may be raised about some delays in reporting on some non-essential elements for some auctions, and findings that access by SMEs and small emitters could be improved in some platforms. In this regard, the main area through which access could be facilitated would be through improved access to information.

More than 50% of auction revenues are used for the purposes listed in the EU ETS Directive, with the major share contributed by Germany, which uses 100% of auction revenues for the appropriate climate-related purposes. However, a couple of Member States failed to report on revenue use in 2013, and for some Member States the figures lack transparency. A (non-crucial) issue remains the lack of an appointed auction monitor. If this were solved, confidence could be further increased regarding the level of harmonization to which of the supervision of auction platforms is applied in all auctioning jurisdictions.

Auctioning is the most **efficient** allocation system, leading to the most efficient CO_2 price formation according to theory. While administration of auctioning is cheaper than setting up a benchmark-based free allocation system (see section 3.4.5.3), the full benefit of this efficiency is currently not reaped, since both systems co-exist simultaneously in the EU ETS. Particular costs may occur for operators from membership in the auction platforms, but these are relatively negligible compared to the value of purchased allowances, at least for those operators aiming to buy significant amounts of allowances. Moreover two of the three auction platforms covering 90% of the auctioned volumes provide auction-only and minimal function access to the auctions with reduced costs. No significant structural premiums on auction prices have been found compared to the sec-

[217] E.g. by virtue of requiring that auction platforms be regulated markets supervised by the national competent authorities.

ondary market, further underlining the efficiency of auctioning under the EU ETS.

Regarding **EU-added value** it has been found that administrative costs are limited by the EU-wide action for both authorities and EU ETS participants, compared to running 31 parallel systems.

Coherence of auctioning with other elements of the EU ETS Directive (internal coherence), in particular free allocation, is well established within the Directive. This has led to some practical issues (caused by extensive data requirements for free allocation) and, in the early stages of auctioning, some delays in establishing a small portion of the volumes covered in the auctioning calendars. However, after the start of the third trading period remaining uncertainties are limited. External coherence of auctioning with other interventions that have similar objectives is less straightforward. Since financial market law applies indirectly to the auctioning of allowances, the possibility that financial market law may not be applied in a fully harmonized way among Member States could slightly decrease the external coherence of auctioning in the EU ETS. To the extent that there are developments in financial markets law that apply to secondary markets – including spot emission allowances – the provisions regulating auctions may need to be amended to ensure continued coherence with financial markets law. Moreover, developments in other policies with an impact on the ETS can also impact the coherence of auctioning.

3.4 Free allocation and carbon leakage

3.4.1 Introduction

3.4.1.1 The meaning of "carbon leakage"

The EU ETS' central characteristic is that it puts a price on the emissions of Greenhouse Gases (GHG). Because carbon dioxide (CO_2) is the most important GHG, this has been termed "carbon price", and the resulting costs are termed carbon or CO_2 costs[218]. The impact assessment for the carbon leakage list[219] defines carbon cost as: "*the estimated maximum cost faced by a sector induced by the implementation of the EU ETS. It is calculated as the sum of:*

- *The direct costs associated with direct emissions, i.e. the emissions not covered by free allocation;*
- *The indirect costs associated with cost of indirect emissions (emissions from electricity consumption) as the result of potential increase of electricity prices induced by the inclusion electricity production in the scope of the ETS.*

The possibility of certain sectors to (partly) pass through the ETS costs to their customers and any state aid provided pursuant to Article 10a(6) of the ETS Directive are not taken into account."

The evaluation in this section is built upon this definition[220]. However, while the impact of indirect costs is taken into account for the definition of carbon leakage exposed sectors, measures for mitigating the effect of indirect costs are discussed separately in section 3.5. Furthermore it must be noted that the definition takes into account free allocation as factor which reduces carbon costs. Since this section discusses the impact of free allocation, sometimes it is important to refer to "total" carbon costs which assume costs *as if no free allocation were granted*. Such level of carbon costs represents the total of factual *and* opportunity costs (in other words the total financial incentive to reduce emissions to zero).

Ever since the EU has planned to set up the EU ETS, concerns have been raised that unilateral action – in particular in the form of costs for GHG emissions – may pose a competitive disadvantage to EU energy-intensive industries. This might ultimately incentivise relocation of production outside of EU territory, with associated negative impacts on economic growth and employment. Such relocation would mean that also the GHG emissions attached to the production

[218] The term "CO_2 costs" is preferred in this study, as scientifically the mass of CO_2 is 3.664 times the mass of carbon. At 10 € per t CO_2, the price for 1 t carbon would be only 2.73 €. Nevertheless, "carbon price" is usually a pure synonym for CO_2 price. The same is true for "allowance price" or "EUA price". It always refers to the costs for covering the emission of 1 tonne of CO_2(eq).

[219] SWD (2014) – "Impact assessment accompanying the document Commission Decision determining, pursuant to Directive 2003/87/EC, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage for the period 2015-2019", download under: http://ec.europa.eu/clima/policies/ets/cap/leakage/docs/20140502_impact_assessment_en.pdf

[220] For a precise treatment of "costs induced by the EU ETS", transaction costs should also be considered. These are costs occurring as pre-condition for trading allowances, such as information gathering on trading partners, fees at exchanges, MRV and administration costs etc. As transaction costs are usually low compared to allowance costs, they are not considered here. However, for low emitting installations, transaction costs can be significant, see section 3.10.

of industrial goods would relocate, i.e. it would “leak out of the EU”. Therefore this concept has become known as “carbon leakage” (CL)[221].

In order to safeguard against such market distortion, free allocation was used in Phase I and II of the EU ETS as the predominant allocation method. This was the main vehicle to limit the impact of the EU ETS on EU industry’s profitability and competiveness during these early phases. In Phases I and II, allocation plans setting out the free allocations to each participant were developed at the Member State level. Room for interpretation of the criteria in the EU ETS Directive (Annex III) led to different allocation approaches applied to participants in different Member States, resulting in a distortion of competitiveness within the EU[222]. As a further drawback, the generous free allocation is deemed to have led to limited incentives to reduce emissions and invest in low-carbon alternatives. Potential windfall profits due to the pass-through of the value of free allowances have also been criticised.

The impact assessment for the 2008 EU ETS review identified auctioning as the most favourable allocation method due to its simplicity and fairness in the absence of competitive distortions (within the EU), and due to its ability to raise revenues for Member States which can be spent for climate change mitigation and adaptation purposes. Moreover, the impact assessment concluded that auctioning enhances the system’s efficiency by avoiding perverse incentives and windfall profits. It is the only allocation method which fully implements the ‘polluter pays principle’. Therefore, it was adopted as the default allocation method in the revised ETS Directive.

However, it was acknowledged right from the start of the EU ETS that free allocation is a useful means for helping participating industries to accommodate to the new policy instrument and limit costs for participants, thereby also increasing political support. For the third ETS phase, free allocation was still considered a transitional instrument for allowing industries to maintain their position vis-a-vis competitors in jurisdictions which do not impose a carbon price or tax.

For understanding this competition argument better, it is helpful to look at the options an operator has to treat allowances (including those received for free) in an ETS:

- The operator can use the allowances for his compliance requirements, i.e. to cover his emissions. If he has enough allowances received for free, he does not face any CO_2 costs, and consequently does not have to increase his product prices. If he emits more than the free allocation, he faces some CO_2 costs, but still less than in a full-auctioning scenario, and the necessary price increase will be moderate. By not or only moderately increasing product prices, the operator will be able to maintain his market position. This was one of the reasons why free allocation in the first two phases was used to increase acceptance of the EU ETS among industry. However, such reasoning is primarily applicable in highly competitive industry sectors, as the economically

[221] More precisely, the term carbon leakage may be understood as the ratio between increases of emissions in outside-EU production and decreases of emissions in companies covered by the EU ETS due to asymmetries in prices.

[222] This happened because some Member States were more generous in their allocation than others. This was possible inter alia because of the different targets under the burden sharing agreement. See e.g. Impact assessment accompanying the proposal for Directive 2009/29/EC; SEC(2008) 52. Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008SC0053

more rational or favourable behaviour would be as described under the next point.

- The operator can consider the value of the allowances (even if allocated for free) as opportunity costs, representing the lost opportunity to generate revenues by selling the allowances. These costs can be fully included in the calculation of production costs, and the operator will (try to) increase his product prices accordingly. The increase of profits resulting from allowances received for free has gained significant attention under the term "windfall profits". A full price pass-through is only possible in markets where either all competitors face the same CO_2 constraints, or where operators possess sufficient market power. In such markets, the cost of allowances can be fully recovered and free allocation would not be required to prevent competitive distortions. During the EU ETS review in 2008, the electricity sector was identified to be in this position[223].

Most industries cannot be classified exclusively in either one of the above stated categories. They will tend to pass through costs to their customers to the extent feasible in order to maximise profits in line with common economic rationale. However, usually industries face competition to various extents from competitors who are facing no or at least lower CO_2 costs. This will lead to different degrees of price pass-through. For those industries where costs are higher than can be recuperated through price pass-through, profitability will decrease, or market share will decline. Therefore there is a risk that production and its related emissions may shift to producers outside the EU. This means that carbon leakage is expected to appear only in sectors where production costs increase *significantly* due to a price tag on GHG emissions and where a material fraction of those additional costs cannot be passed through to customers. Where relocation of production takes place without this condition fulfilled, the relocation should not be termed "carbon leakage", and it would have likely happened also in the absence of the EU ETS.

3.4.1.2 Provisions in the Directive

As mentioned before, the revised EU ETS Directive made auctioning the default allocation method. For industry participants, allocation free of charge has been foreseen as a transitional measure. Article 10a defines the cornerstones of the EU ETS allocation architecture as follows:

- The amount of free allocation – where granted – is to be determined based on EU-wide fully harmonised rules. Those rules are to be specified by the Commission. These "Community Implementing Measures" (CIMs) were laid down in the "Benchmarking Decision"[224]. To the extent necessary for understanding the effects of those rules, the detailed requirements of this Decision have been taken into account in the evaluation.

[223] See studies referenced in section 3.5.5 dealing with the relevance of indirect cost-compensation for electricity-intensive industries.

[224] Commission Decision 2011/278/EU of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council, download consolidated version under http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1427631325238&uri=CELEX:02011D0278-20140114

- Allocation rules shall be based on the following principles:
  - The aim is that allocation "provides incentives for reductions in greenhouse gas emissions and energy efficient techniques".
  - Use of *ex-ante Benchmarks*[225] which are *ambitious, but realistically achievable.* This principle is implemented by requiring that benchmarks are determined based on real data for "average performance of the 10 % most efficient installations in a sector or subsector in the Community in the years 2007–2008". Those benchmarks are product-based[226] and EU-wide applicable.
  - No free allocation shall – in principle – be made in respect of any electricity production[227]. Note that electricity generators can still receive free allocation for the amount of usable heat produced, e.g. in CHP plants (Combined Heat and Power generation).
- Because auctioning is considered the default allocation method, and the associated revenues are important for Member States, a "firewall" around the amount of free allocation has been introduced (Article 10a(5)). It ensures that the total free allocation to industry (i.e. "non-electricity generators") does not exceed an amount proportional to its share in the verified emissions[228]. If necessary, a "Cross-Sectoral uniform Correction Factor" (CSCF) is applied to reduce the allocations so that the "firewall" is not exceeded.
- For further reducing potential competitive distortions among ETS participants, new entrants in the EU ETS are entitled to free allocation using almost[229] identical allocation rules as for incumbents. Allowances are taken from an EU-wide NER (New Entrants Reserve) of 5 % of the total cap.
- To avoid over-allocation and/or windfall profits, allocations will be reduced in case of closure (or significant reduction) of production capacity[230].
- A differentiation is made between "normal" installations and installations in sectors which are found to be exposed to a significant risk of CL. Normal (or non-CL exposed) industrial installations receive 80 % of the free allocation calculated using the benchmark rules in 2013, which is to be reduced to 30 % in 2020, while CL-exposed sectors and subsectors receive 100% of the calculated value for the whole period up until 2020.

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[225] Benchmarks are a means of comparing the GHG efficiency of installations. "Ex-ante" means that the values are fixed before they are applied for calculating free allocations.

[226] This means that product benchmarks are expressed in terms of "t CO_2(e) per t of product". This is stressed in the Directive in order to prevent benchmarks of the form of "t CO_2(e) per input". "Input based" benchmarks would not exploit all elements of GHG efficiency, in particular use of GHG efficient fuels.

[227] There are some exceptions to this rule:
- The allocation for electricity produced from waste gases (e.g. blast furnace gas in the steel industry), which has been designed in a way that the CO_2 costs of such electricity will be comparable to costs faced by electricity producers using natural gas.
- The transitional allocation for the modernisation of the electricity system under Article 10c (see section 3.9).

[228] Due to the need of ex-ante calculation, verified emissions of the period 2005-2007 are used, adjusted for the new sectors and greenhouse gases included from 2013 onwards.

[229] The main difference is that new entrants do not have historical activity data as baseline. Instead, a capacity-based value is used.

[230] All those "corrections of the initial allocations" are summarised under the acronym "NE&C rules". NE (New Entrants) include greenfield plants and significant capacity extensions of existing installations, and "C" ("Closures") includes significant capacity reductions, partial cessations of operations (and recoveries thereof), and full cessation.

- The Directive also contains detailed rules for determining which sectors are deemed to be CL-exposed:
  - Article 10a(15) to (16) of the revised ETS Directive outlines how to identify CL sectors based on (the relation between) increased production costs due to the EU ETS and trade intensity of the specific (sub-) sector. The relevant quantitative criteria are:
    - EU ETS-induced costs exceed 5 % of the sector's Gross Value Added (GVA) *and* trade intensity is above 10 %; or
    - EU ETS-induced costs exceed 30 % of the sector's GVA; or
    - Trade intensity is above 30 %.
  - In addition to these quantitative criteria to assess exposure to a risk of carbon leakage, Article 10a(17) outlines a qualitative assessment methodology that can also be used.
  - Sectors for which eligibility has been demonstrated are placed on the so-called "Carbon Leakage list" (CL list[231]), which is adopted and periodically updated by the Commission with the aim to accurately reflect the exposure to a significant risk of carbon leakage over time.
- The Directive also acknowledges the fact that some industry sectors may face a risk of carbon leakage because of *indirect* CO_2 costs, i.e. costs passed through by electricity generators for the GHG emissions of the electricity generation process. In order to support those sectors, Article 10a(6) provides Member States with the possibility to provide *financial*[232] compensation to such (sub-)sectors. This option is described in detail in section 3.5 of this report.

Because free allocation is meant to prevent European industry from undue competitive disadvantages, it is possible that free allocation is not required anymore when carbon pricing (or other GHG mitigation measures with similar economic impacts) in other parts of the world reach a critical mass. Therefore the last sub-paragraph of Article 10a(1) requests the Commission to review the measures for free allocation in case of approval by the Community of an international agreement on climate change.

3.4.1.3 Implementing measures

Several daughter instruments of the EU ETS Directive are necessary for understanding the evaluation of CL and free allocation, while only the Directive is subject of the evaluation. These are:

- The list of sectors deemed to be exposed to a significant risk of carbon leakage (the "CL list")[233];

[231] The latest CL list is: Commission Decision 2014/746/EU of 27 October 2014 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019, Download under:
http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32014D0746
For the associated impact assessment see footnote 219.

[232] This is a significant different approach than free allocation. Notably, it is applicable also to installations which are not covered by the EU ETS themselves.

[233] The first list, its updates and the current list can be found at
http://ec.europa.eu/clima/policies/ets/cap/leakage/documentation_en.htm
More details are discussed in section 3.4.3.2.

- The Benchmarking Decision[224]. It covers:
  - Definitions, such as sub-installations and their system boundaries, historic activity levels, thresholds for significant capacity changes and partial cessation, start of normal/changed operation;
  - Rules for data collection of baseline data for the NIMs and for new entrants and closures (NE&C) cases and for third-party verification of those data;
  - The administrative process.

3.4.2 Intervention logic

- Needs:
  - Preserve competitiveness of European energy-intensive industries covered by the EU ETS and avoid carbon leakage without undue impact on the efficiency of the ETS.
- Objectives:
  - Establish a level playing field and eliminate competitive distortions within the EU; Avoid undue distributional effects;
  - Avoid unduly negative impacts on competitiveness and employment of the EU economy through the facilitation of a transition to a low-carbon economy;
  - Limit administrative costs to participants and authorities;
  - To the extent feasible, the allocation system should respect the 'polluter pays principle' enshrined in the Treaty on the Functioning of the EU. The allocation should promote the internalisation of external costs caused by GHG emissions in product prices[234].
- Actions:
  - Put in place CL criteria and a list of sectors based on those criteria;
  - Put in place rules for free allocation of allowances in line with the objectives stated above. Therefore apply a benchmark approach rather than grandfathering;
  - Perform the allocation based on the related data collection;
  - Regularly assess whether the conditions of CL are still met and the current approach and level of free allocation is still justifiable in that context.
- Expected results/impacts:
  - Less distortion of competition between participants in different EU Member States due to harmonised allocation rules;
  - Limited costs for ETS participants, while facilitating longer-term transition (transitional free allocation, carbon leakage provisions);
  - Preventing (undue) leakage of production/emissions/investments to outside the EU (carbon leakage provisions).
- Unintended effects:
  - A potential distortion of the CO_2 price signal may result from free allocation, leading to a reduced efficiency of the ETS, because operators who

[234] Impact assessment accompanying the proposal for Directive 2009/29/EC; SEC(2008)52, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008SC0053

get a significant share of their allowances for free may tend to delay GHG improvements;
  - Windfall profits for industry may occur, if allocation for free exceeds the level for preventing CL;
  - Member States will lose auction revenues;
  - The administration of free allocation, in particular the data collection for the development of benchmarks, and the NIMs and NE&C cases lead to administrative costs.
- External factors:
  - The main external factor is whether a significant share of industrialised countries and economies in transition put in place comparable GHG reduction measures which put a price on GHG emissions. If this happens, the risk of carbon leakage and the associated need for free allocation to EU ETS operators would gradually disappear.

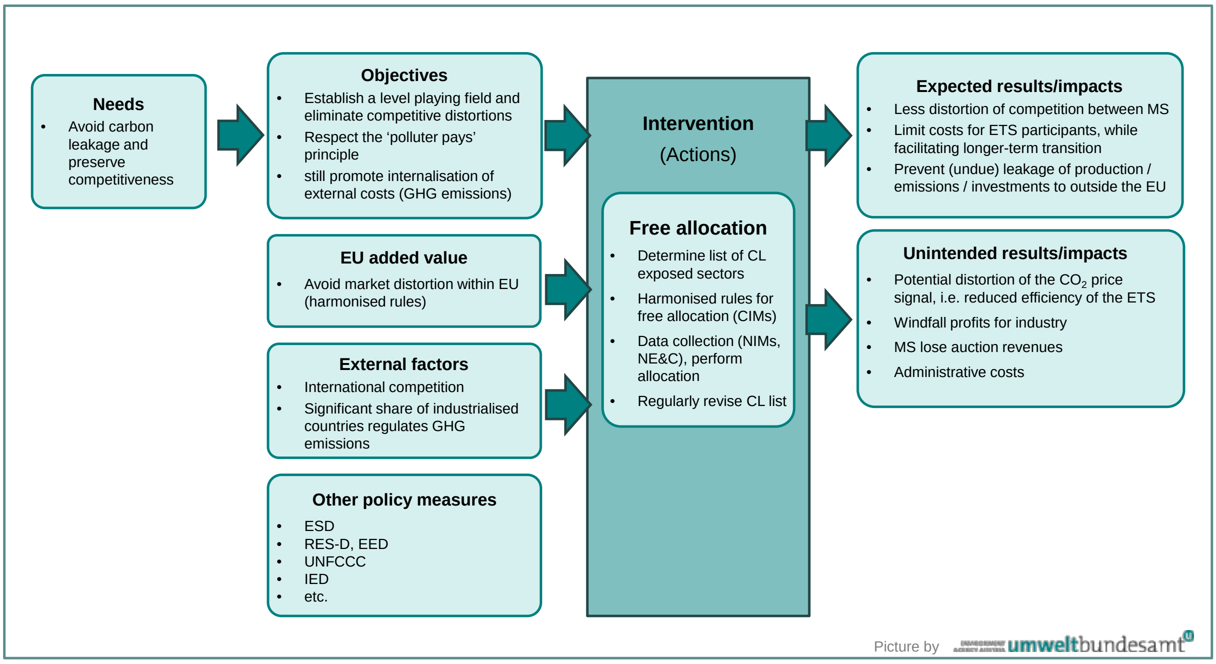

Figure 20: Detailed intervention logic for the evaluation area "free allocation and carbon leakage".

3.4.3 Relevance

The relevance of free allocation as measure for reducing the risk of carbon leakage is evaluated on the basis of the following questions:

- To what extent is the concept of carbon leakage valid in the context of the EU ETS?
- Is there evidence whether or not carbon leakage actually happened since the start of the EU ETS?

- Would CL likely have happened if the CO_2 price had been higher?
- Are carbon leakage provisions needed in light of observed (or expected) impacts of the EU ETS on the competitiveness of EU industry and trends in carbon (price) policies in other jurisdictions?

3.4.3.1 Preamble

In empirical studies, certain limitations will often be encountered when aiming to disentangle one influencing factor from others in a multi-causal environment to reach a level of statistical significance. The same can be said about finding empirical evidence for carbon leakage. Besides the carbon costs, other factors, such as energy, labour and intermediate consumption costs, geographical distance to market demand, supply and demand side changes along the value chain etc., are impacting trading patterns, competitiveness and investment decisions.

Moreover, it does not even become immediately clear from public discussion and stakeholder comments what effects are subsumed under the term carbon leakage. Is it to be understood as loss of market share of an EU ETS installation to an extra-EU competitor, lower investments made in the EU, physical relocation of industrial installations to outside EU, or does it cover more than one or even all of those aspects? Even if it became clear, the inherent difficulty remained to know how trends in these parameters would have evolved, if the EU ETS never had been implemented, i.e. creating a “counterfactual” scenario.

Definitions

The Commission’s guidance document defines CL sectors as “those sectors that may suffer a material competitive disadvantage against competitors located in areas outside the EU which do not have similar emission reduction commitments, which could in turn lead to an increase in greenhouse gas emissions”[235].

In 2007, the IPCC[236] defined carbon leakage as follows:

- It is defined as the ratio between increases of emissions in countries not regulated by the EU ETS and decreases of emissions under the EU ETS.

In 2008, an IEA study[237] identified the following three main channels for carbon leakage:

- The short-term competitiveness channel, where carbon-constrained industrial products lose international market shares to the benefit of unconstrained competitors;
- The investment channel, where differences in returns on capital associated with unilateral mitigation action provide incentives for firms to relocate capital to countries with less stringent climate policies; and

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[235] European Commission Guidance Document No.°5 on the harmonised free allocation methodology for the EU-ETS post 2012 - Guidance on carbon leakage. Final version issued on 14 April 2011 and updated on 29 June 2011. http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/gd5_carbon_leakage_en.pdf

[236] IPCC Fourth Assessment Report: Working Group III: Mitigation of Climate Change, 2007, Download under http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4_wg3_full_report.pdf

[237] J. Reinaud, “Issues behind Competitiveness and Carbon Leakage: Focus on Heavy Industry”, International Energy Agency Information Paper, 2008, Download under http://www.ictsd.org/downloads/2008/11/iea-paper-on-issues-behind-competitiveness_and_carbon_leakage.pdf

- The fossil fuel price channel, where reduction in global energy prices due to reduced energy demand in climate-constrained countries triggers higher energy demand and CO_2 emissions elsewhere, all things being equal.

In 2009, Dröge[238] identified a fourth channel:

- Technological spill-overs, which are to be understood as diffusion of efficient technologies triggered by carbon pricing to outside EU competitors. In contrast to the other three channels, this constitutes a beneficial (i.e. “CL antagonistic”) effect. However, this effect is outside the scope of this evaluation.

From the definitions of carbon leakage above, it becomes clear that it covers a wide range of effects to be discussed, including i.e. losses in market share, relocation of production, influencing factors for investment decisions, as well as impact of indirect carbon costs experienced in intermediate products or electricity (see section 3.5 on indirect costs). Still, some ambiguity remains on whether or not carbon leakage can be identified, in particular whether there is a clear causality link to asymmetric climate policies.

Chapter structure

In the following sections, first the current list of sectors deemed exposed to a significant risk of carbon leakage (“the CL list”) is discussed. Next the short-term aspects (3.4.3.3) and the longer-term aspects (3.4.3.4) are discussed. The evaluation of relevance of CL measures is completed by considering the impact of expected higher CO_2 prices in the future (3.4.3.5).

3.4.3.2 Sectors currently deemed exposed to a CL risk

The first list[239] of sectors deemed exposed to a significant risk of carbon leakage was adopted by the Commission in December 2009. It was updated several times thereafter by adding further sectors to the list[240]. In 2011, the European Commission started a bigger revision process of the list by commissioning a study[241] on this matter. Based on this study, the Commission adopted a Decision[242] listing the sectors deemed to be exposed to such risk for the period 2015 to 2019 and an accompanying impact assessment[219]. The sectors analysed are part of the economic categories ‘mining & quarrying’ and ‘manufacturing’ according to NACE rev 2 classification[243]. They accounted for around 13 % of both

[238] S. Dröge, “Tackling Leakage in a World of Unequal Carbon Prices”, Climate Strategies, 2009; http://www.centre-cired.fr/IMG/pdf/cs_tackling_leakage_report_final.pdf

[239] Commission Decision 2010/2/EU of 24 December 2009 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage. Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:001:0010:0018:EN:PDF

[240] All amendments are listed at http://ec.europa.eu/clima/policies/ets/cap/leakage/documentation_en.htm

[241] Ökoinstitut & Ecofys, “Support to the Commission for the determination of the list of sectors and subsectors deemed to be exposed to a significant risk of carbon leakage for the years 2015-2019 (EU Emission Trading System)“, 2013, Download under http://ec.europa.eu/clima/policies/ets/cap/leakage/docs/carbon_leakage_list_en.pdf

[242] Commission Decision 2014/746/EU of 27 October 2014 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019. This Decision is referred to as the “*current CL list*” in this report. Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014D0746

[243] http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=&StrLayoutCode=&IntCurrentPage=1

gross value added (GVA) and employment in the EU-28 in 2012[244] and for about 14 % of the total emissions[245]. Out of these sectors, Figure 21 shows the sectors with the highest (direct and indirect) CO_2 costs per GVA (more than 3%) and their importance in terms of total contribution to the EU's GVA.

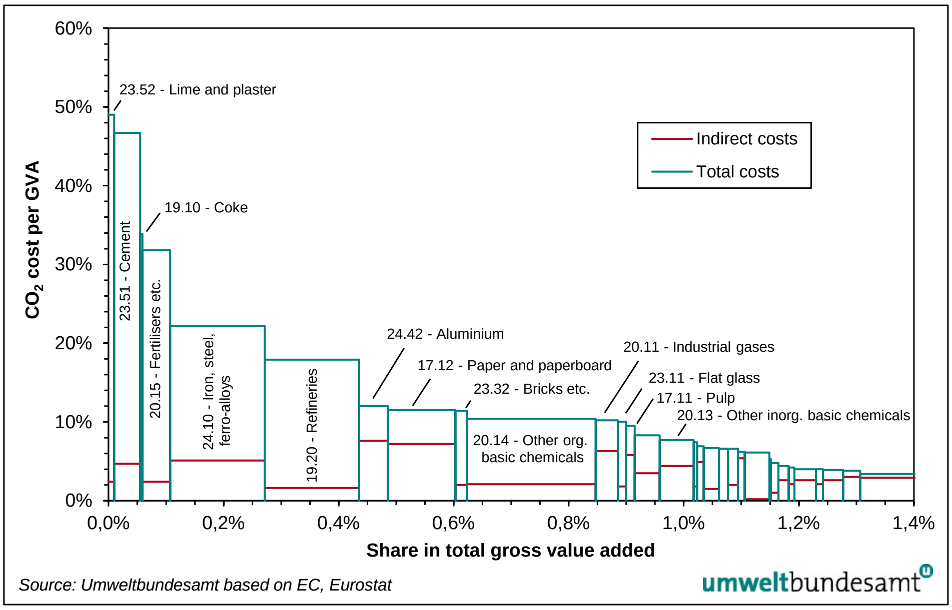

Figure 21: Total and indirect costs at 30 €/t CO_2 per GVA compared each sector's share of value added at factor costs in the EU-28 gross value added in 2012 (NACE 4-digit). Sources: European Commission, Eurostat [sbs_na_ind_r2], [nama_gdp_c]

Before discussing the relevance of CL criteria and the free allocation for mitigating the risk of carbon leakage, it is worth looking at the reasons why sectors have been put on the CL list. As listed in section 3.4.1.2, there are several options for identifying a sector as CL-exposed:

1. High carbon costs (>5 % of the sector's GVA) *and* high trade intensity (>10 %);
2. High carbon costs (>30 % of the sector's GVA);
3. High trade intensity (>30 %);
4. Qualitative criteria;
5. Similar criteria as 1 to 3, but on a more disaggregated level than 4-digit NACE.

The relative contributions of those criteria to the current CL list are listed in Table 3. As it can be seen, most of the sectors (more than half of the list) are on the list due to their high trade intensity only, and contribute a quarter of the CL

[244] Sources: GVA at factor costs and employment for all EU-28 NACE 4-digit sectors (B and C) in 2012 from Eurostat structural business statistics [sbs_na_ind_r2]; GVA at basic prices for EU-28 in 2012 from Eurostat [nama_10_gdp]; total employment in EU-28 in 2012 from Eurostat [nama_nace10_e].

[245] Average emissions 2009-2011 based on EUTL and EEA GHG data viewer.

exposed emissions in the EU ETS. Most important in terms of emissions is criterion 1, i.e. a combination of high carbon costs and high trade intensity. However, this accounts for only 13 sectors. Only two sectors are included due to high carbon costs. Notably, these two sectors account for nearly a third of total industrial emissions[246].

Table 3: Sectors on the CL list 2015 and the criteria for inclusion. Source: CE Delft 2013[247].

Total emissions	No. of sectors	Verified emissions^	In % of industrial emissions
Criterion 1	13	219,302,751	36%
Criterion 2	2	177,572,917	29%
Criterion 3*	133	157,232,891	26%
Criterion 4	6	14,435,748	2%
NACE 6 and beyond**	8	Max.5,778,713	Max 1%
Total industrial emissions	258	604,954,753	

Source: CITL, own calculations.

^ Average of 2005 and 2006 verified emissions

* Sixteen sectors that fall under Criterion 3 would also qualify for Criterion 1.

** In total sixteen subsectors qualified for free emissions, belonging to eight sectors at NACE 4 level. We cannot assess precisely how much free allocation these sectors received, but we give a maximum level here, which is equivalent to the verified emissions for the eight NACE 4 sectors to which these sixteen subsectors belong.

Figure 22 to Figure 24 put the importance of the analysed sectors further into perspective in terms of the Directive's criteria to determine the exposure to carbon leakage (CO_2 costs per GVA and trade intensity)[248]. Each circle represents a NACE 4-digit sector[249]. A distinction is made between sectors not deemed exposed to a significant carbon leakage risk[250] (shown in white areas of the figure), and sectors on the current CL list (shown in the coloured areas). Figure 22 illustrates each sector's relevance for the EU's economy: the bigger the circle, the bigger the sector's contribution to total EU GVA. It shows that few sectors with high carbon costs per GVA have a relatively high GVA. Many sectors with higher GVA exhibit relatively low CO_2 costs per GVA. Therefore sectors with high GVA are mostly found CL-exposed only due to the trade intensity criterion.

Figure 23 is similar to Figure 22, but this time the circle size is proportional to the sector's GHG emissions (according to EU Transaction Log (EUTL) data). It becomes obvious that only a small amount of those sectors are responsible for most of the emissions. Those sectors also carry the highest costs of the

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[246] "Industrial emissions" means emissions in the EU ETS excluding electricity generators.

[247] S. de Bruyn, D. Nelissen, M. Koopman, "Carbon leakage and the future of the EU ETS market", CE Delft, 2013, Download under: http://www.cedelft.eu/art/uploads/CE_Delft_7917_Carbon_leakage_future_EU_ETS_market_Final.pdf

[248] As the scale is also the same across the diagrams, sectors are found at the same position in all three diagrams.

[249] The list of sectors deemed as exposed to a significant risk of carbon leakage also includes sectors on PRODCOM level. Therefore, diagrams at NACE 4-digit level (NACE Rev. 2) do not show the full picture but should serve as an indication of which sectors are relevant in terms of GVA, employment and emissions.

[250] according to the quantitative criteria

EU ETS, which means that only in those sectors free allocation will contribute significantly to reducing the CL risk. The high CO_2 costs can also be interpreted such that these sectors have the highest incentive and potential to reduce GHG emissions. In a situation without trade intensity as CL criterion[251], those sectors would likely remain on the CL list.

Finally, Figure 24 compares the sector's contribution in terms of employment (bigger circles mean more employees). On average, the sectors with highest CO_2 costs per GVA rank lower in this category. This means that only a relatively low share of persons are employed in the energy-intensive industries compared to the whole industry sector. This observation is consistent with the picture of the GVA distribution. When analysing policy impacts, the number of jobs at stake are always important. However, this is beyond the scope of this evaluation, in particular because pure sector statistics are unable to show the impact on whole value chains across sectors.

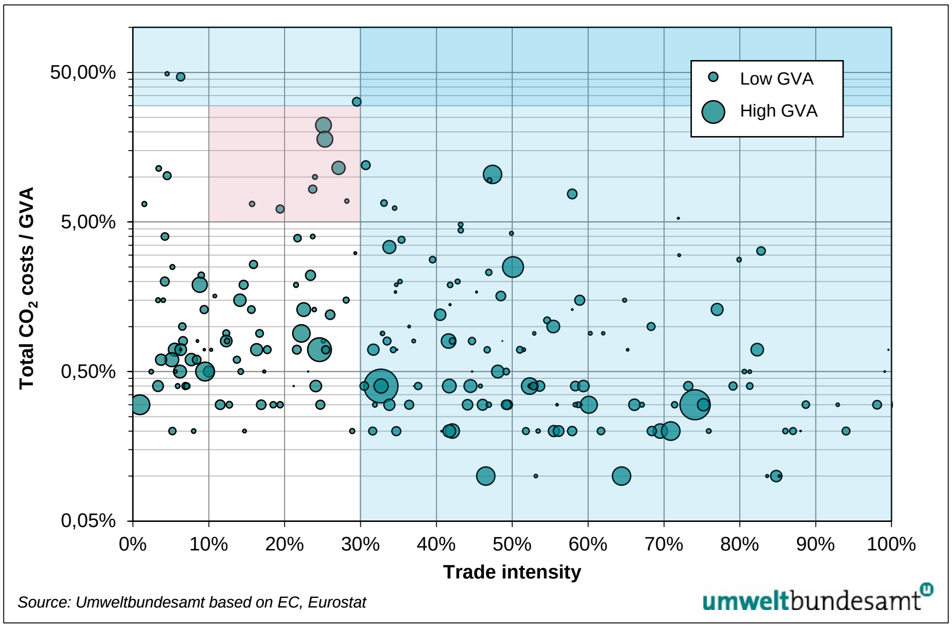

Figure 22: Sectors' contribution to GVA in relation to CL criteria, i.e. total costs per GVA compared to trade intensity for all sectors (NACE 4-digit). Coloured area indicates thresholds for the quantitative CL criteria. Size of bubble indicates contribution to GVA. (Source: European Commission, Eurostat [sbs_na_ind_r2]).

[251] The studies discussed in section 3.4.4.1 suggest that the trade intensity is not a useful criterion for identifying CL-exposed sectors. See in particular footnotes 255 and 284.

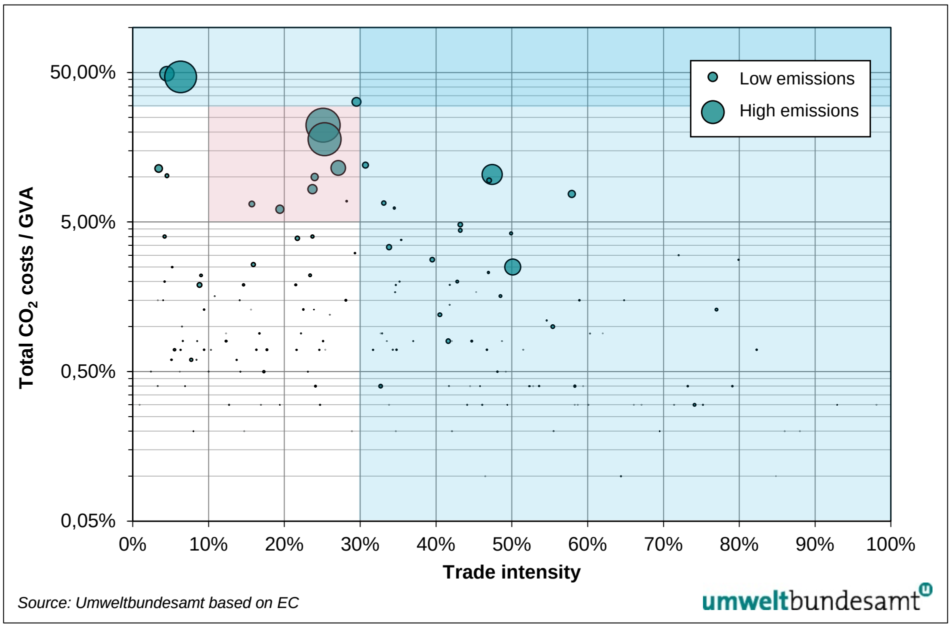

Figure 23: Sectors' GHG emissions in relation to CL criteria, i.e. total costs per GVA compared to trade intensity for all sectors (NACE 4-digit). Coloured area indicates thresholds for the quantitative CL criteria. Size of bubble indicates sectors' average annual emissions 2009-2011. (Source: European Commission, EUTL).

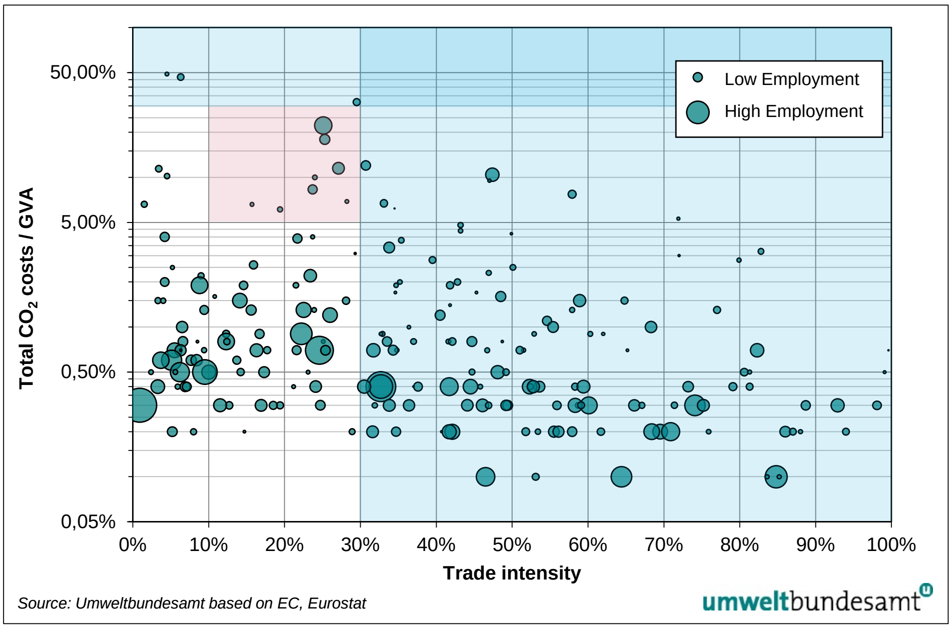

Figure 24: Sectors' employment rates in relation to CL criteria, i.e. total costs per GVA compared to trade intensity for all sectors (NACE 4-digit). Coloured area indicates thresholds for the quantitative CL criteria. Size of bubble indicates number of persons employed. (Source: European Commission, Eurostat [sbs_na_ind_r2]).

3.4.3.3 Evidence for carbon leakage – short-term aspects

Since the EU ETS started in 2005, concerns about its impact on competitiveness and carbon leakage, and about the need of free allocation were widely discussed, as a growing body of literature on this matter shows. This also includes reviews[241,252,253,254] of empirical literature.

The empirical studies reviewed by Vivid Economics & Ecofys[255] in 2014 can be classified as follows:

- Econometric trade analyses which use statistical data on trade, production and CO_2 prices to estimate relationships between these factors, and subsequently draw conclusions regarding carbon leakage. Due to the time period the EU ETS has been operational, those analyses only allow capturing short-term carbon leakage.
- Surveys and interviews which may allow drawing conclusions about long-term carbon leakage. This is because they are better suited to identify factors impacting investment and relocation decisions. Carbon leakage effects from those aspects may not yet be observable by retrospective analysis.

As in the above-mentioned study, the evaluation in this section is focussing on the short-term competitiveness and investments channel (as explained in 3.4.3.1). The latter is considered as a measure of long-term competiveness (see 3.4.3.4). Both aspects can be considered as directly linked impacts of the EU ETS.

In 2013, Ecorys and partners conducted a study[256] commissioned by the European Commission looking at energy intensive sectors such as iron and steel, non-ferrous metals, refineries, cement, lime, pulp and paper. The general conclusions of the study are that no evidence could be detected for the occurrence of carbon leakage as defined by the EU ETS Directive up until the end of Phase II. In addition, the study found that in some sectors increasing imports and/or decreasing exports were observed but those were mainly caused by global demand developments and input price differences.

Along the same lines, the studies by Vivid Economics & Ecofys[255] and Ökoinstitut & Ecofys[241] concluded that all reviewed retrospective and empirical studies failed to find convincing evidence of a clear causal relationship between the carbon price and loss of international market share of the EU industry. The au-

[252] M. Grubb, T. Lain, M. Sato, C. Comberti, "Analyses of the effectiveness of trading in EU-ETS", Climate Strategies 2012, Download under http://climatestrategies.org/wp-content/uploads/2012/02/cs-effectiveness-of-ets.pdf

[253] Varma, A., Milnes, R., Miller, K., Williams, E., de Bruyn, S., Brinke, L., "Cumulative impacts of energy and climate change policies on carbon leakage" AEA & CE Delft, 2012; http://www.ce.nl/art/uploads/file/CE_Delft_7450_Cumulative_Impacts_Energy_Climate_Change.pdf

[254] T. Laing, M. Sato, M. Grubb, C. Comberti, "Assessing the effectiveness of the EU Emissions Trading System", January 2013; Centre for Climate Change Economics and Policy Working Paper No. 126 / Grantham Research Institute on Climate Change and the Environment Working Paper No. 106, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf

[255] Vivid Economics and Ecofys, "Carbon leakage prospects under Phase III of the EU ETS and beyond, Report prepared for DECC", December 2013, https://www.gov.uk/government/publications/carbon-leakage-prospects-under-phase-iii-of-the-eu-ets-and-beyond

[256] H. Bolscher, V. Graichen et al., "Carbon Leakage Evidence Project - Factsheets for selected sectors", Ecorys, Öko-Institut, Cambridge Econometrics, TNO, 2013, Download under: http://ec.europa.eu/clima/policies/ets/cap/leakage/docs/cl_evidence_factsheets_en.pdf

thors however argue that this lack of evidence may be due to too short time series data used for econometrical trade analyses.

A recent study from Dechezleprêtre et al.[257] evaluated multinational companies' carbon emissions and compared it with financial information obtained from the Carbon Disclosure Project ("CDP"[258]). They conclude that carbon leakage due to the EU ETS is unlikely to have been an economically meaningful concern until 2009 and this issue might have been exaggerated. However, they acknowledge that developments may have been different thereafter.

Another study[259] in 2013 investigated potential competitiveness-driven carbon leakage due to the EU ETS, focussing on the sectors cement and steel in Phases I and II. Using econometric analysis of net imports and carbon prices, the study found that net imports of goods in those sectors are mainly demand-driven[260], but found no evidence for carbon prices to have any significant effect. As a result, the authors conclude that there is no current evidence of carbon leakage in these sectors. Nevertheless, the authors noted that they could not draw conclusions about the role of free allocation in the absence of carbon leakage.

These empirical findings are also consistent with responses on surveys[261] among EU ETS companies in 2009. Respondents confirmed that the EU ETS had not imposed significant costs yet compared to other factors. Furthermore, there was no major impact on competitiveness, as no relocation of operations, loss in market shares or reduced workforce occurred, while carbon prices were considered in the respondents' decision making. Respondents believe that this effect can be attributed to free allocation, preventing any potential negative impacts on competitiveness. The only concern raised by the survey's respondents was the case of primary aluminium production, where carbon costs passed through by electricity generators was deemed to potentially negatively impact the sector's competitiveness (see section 3.5 on indirect cost compensation). By contrast, an empirical study[262] by CDC Climat Research in 2012 found no hard evidence that the EU ETS led to carbon leakage in the EU primary aluminium sector (covering the period up until 2011). The study does however emphasise that results have to be treated with caution, as long-term contracts for electricity purchase may have disguised negative impacts.

More recently, the 2014 Thomson Reuters Annual Carbon Market Survey among ETS participants also concludes that carbon leakage does not seem to

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[257] A. Dechezleprêtre, C. Gennaioli, R. Martin, M. Muûls, "Searching for carbon leaks in multinational companies", Centre for Climate Change Economics and Policy Working Paper No. 187, 2014 Download under http://personal.lse.ac.uk/dechezle/Working-Paper-165-Dechezlepretre-et-al-2014.pdf

[258] http://www.cdp.net

[259] F. Branger, P. Quirion, J. Chevallier, "Carbon leakage and competitiveness of cement and steel industries under the EU ETS: much ado about nothing", CIRED, 2013, Download under http://www.centre-cired.fr/IMG/pdf/CIREDWP-201353.pdf

[260] This implies that the imported products could not be produced within the EU, e.g. because of a lack of capacity.

[261] Kenber M., Haugen O., Cobb M., "The Effects of EU Climate Legislation on Business Competitiveness: A Survey and Analysis", 2009 Download under http://www.theclimategroup.org/_assets/files/The_Effects_of_EU_Climate_Legislation_on_Business_Competitiveness.pdf

[262] O. Sartor, "Carbon Leakage in the Primary Aluminium Sector: What evidence after 6 ½ years of the EU ETS?", CDC Climat Research, 2012, Download under http://www.cdcclimat.com/IMG/pdf/12-02_cdc_climat_r_wp_12-12_carbon_leakage_eu_ets_aluminium-2.pdf

be a big issue. More than 80% of respondents in 2014 indicate carbon leakage is not an issue. 15% of respondents indicate they are considering moving production, and 4% of respondents indicate they have already moved production[263] (see also Figure 25). Note that no causality is indicated in the latter responses.

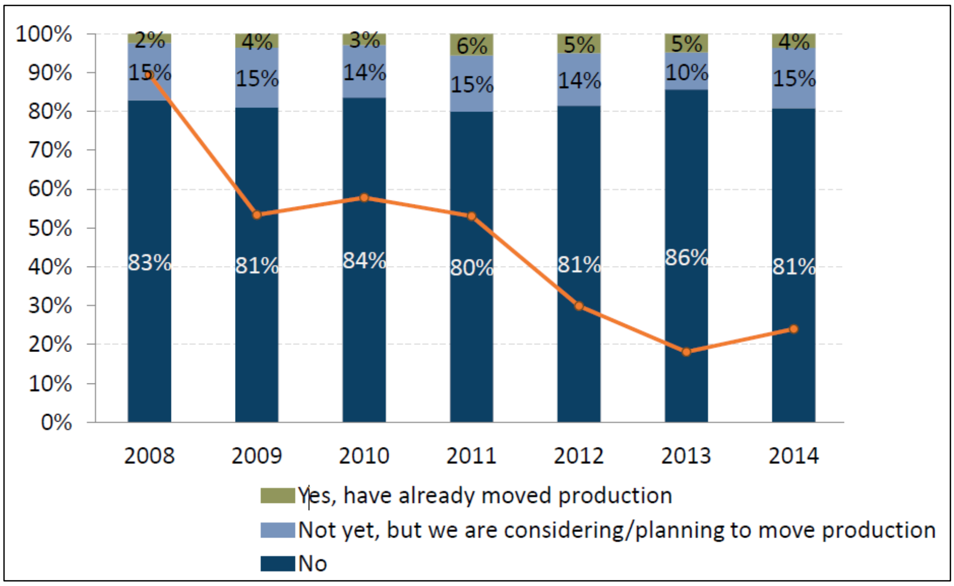

Figure 25: Importance of carbon leakage according to respondents to the 2014 Thomson Reuters Annual Carbon Market Survey among ETS participants. Source: Thompson Reuters[263].

3.4.3.4 Evidence for carbon leakage – long-term aspects

As noted in the previous section, the findings of the mentioned studies do not constitute conclusive evidence on the long-term aspect of carbon leakage. Two difficulties arise regarding the evaluation. Firstly, impacts may only be observed after longer timeframes due to long investment cycles[264]. Secondly, gathering quantitative results from econometrical analyses of historical developments is hampered by the inability to produce counterfactual scenarios, in particular in light of the financial crisis[265].

This is confirmed by the Ecorys study[256] which also highlights difficulties in finding investment patterns based on historic trends. Moreover, this study emphasises that companies' investment decisions are based on expected prices not on actual or past prices. Expectations regarding future prices could therefore af-

[263] Thomson Reuters Point Carbon, 2015, 'Balancing supply & demand: Price or volume management – Special focus: Market Stability Reserve', ETS Training course, 30 January 2015, Mexico City. Download: http://climate.blue/wp-content/uploads/2015-01-30_DAY5_Presentation-Ferdinand_Balancing-supply-and-demand-in-the-European-ETS.pdf

[264] Investments in new industrial installations usually require several years from planning and permitting until the start of operations. The expected lifetime of major investments ranges from up to 10 years in some industries to several decades for bigger investments such as power plants, integrated steel mills or refineries.

[265] M. Grubb, T. Laing, M. Sato, C. Comberti, "Analyses of the effectiveness of trading in EU-ETS", Climate Strategies 2012, Download under http://climatestrategies.org/wp-content/uploads/2012/02/cs-effectiveness-of-ets.pdf

fect investment decisions. Based on industries' statements, the study mentions a shift in consumption to other regions (e.g. Asia) as a strong underlying driver of changing market shares. Most industries indicated that closeness to market was a major factor for investments in production capacity. Where investments are made outside Europe due to market closeness, no link to carbon costs is given. Furthermore, as Asian markets grow, a stable amount of production in Europe means that the global share of the European production shrinks even without reducing production in Europe. Therefore global market shares are only of limited value for assessing carbon leakage.

Nevertheless, literature reviews exist which also deal with studies based on surveying companies on changes in their investment behaviour due to the EU ETS. Grubb et al.[252] and Laing et al.[254] summarised surveys and interviews carried out up until the end of Phase II. They conclude that the EU ETS seems to mainly impact smaller investments such as new machinery, fuel switch or energy efficiency improvements but fails to change how manager run business and drive innovation, despite the fact that EU ETS is now common topic in board rooms.

The above findings mirror the conclusions drawn by Neuhoff[266], that it remains unclear whether the EU ETS in its current form is sufficient to drive longer-term reduction decisions. This also confirms the results obtained by Bruegel[267] in 2011, finding that the EU ETS did not significantly influence affected companies' profits, employment or added value during the first phase and the beginning of the second phase.

Although the general focus of the surveys and interviews was on the extent that carbon prices are considered in decision making and are triggering innovation, some conclusions can also be drawn on the risk of so-called investment leakage. The observations suggest that carbon prices do not significantly alter the way businesses are operated (yet). This also implies that the carbon price effective in the EU currently does not seem to drive investments to outside the EU.

3.4.3.5 Carbon leakage rates at higher CO_2 prices

Addressing the question whether carbon leakage would have occurred at higher carbon prices requires the use of modelling, because empirical evidence alone is per definition not able to provide the answer. Modelling approaches and assumptions can consequently have an important impact on how the above question is answered.

Vivid Economics & Ecofys[255] reviewed existing studies that used general or partial equilibrium or econometric models to estimate carbon leakage rates as a function of carbon prices. They state that theoretical literature generally suggests that leakage rates could be fairly substantial. In addition, they are indicating that there are substantial differences in predictions between general equilibrium and partial equilibrium models:

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[266] K. Neuhoff, "Carbon Pricing for Low-Carbon Investment Executive Summary", Climate Policy Initiative, 2011, Download under http://climatepolicyinitiative.org/wp-content/uploads/2011/12/Carbon-Pricing-Exec-Summary.pdf

[267] J. Abrell, G. Zachmann, A. Ndoye, "Assessing the impact of the EU ETS using firm level data", Bruegel, Working Paper, 2011, Download under http://www.beta-umr7522.fr/productions/publications/2011/2011-15.pdf

- Partial equilibrium models state carbon leakage rates of 0 to 100% with carbon prices ranging from (20 to 100 €/ t CO_2) for cement and 9 to 75% (20 €/ t CO_2) for steel.
- Computable general equilibrium models produce carbon leakage estimates generally in the range 5 to 15% (14 to 27 €/t CO_2).
- Econometric studies show leakage estimates of only 0 to 5%. For those estimates relatively high CO_2 prices (up to 90 €/t CO_2) were used. Thus they hardly confirm any causal relationship between carbon prices and production.

The authors further cite a study[238] that used a partial equilibrium model and found that leakage rates would be 10% on average under full auctioning at carbon prices of 14 €/t CO_2 in 2016 (including 20% for cement, 39% for steel and 21% for aluminium). However, they also referenced an econometric model used by Cambridge Econometrics[268] which showed that losses in EU production in most sectors are contained to below 1.5% and the leakage rates were generally estimated to be below 25% under a full auctioning scenario.

The results obtained by the models are not consistent with the empirical observations and they also vary significantly between models used. This confirms findings from another study[253] which states that papers reviewed are in general making specific assumptions about the market structures they cover, climate policies and availability of abatement technologies and their progress. They also lack in reflecting uncertainties associated with assumptions and parameters appropriately. The models are frequently very sensitive to the substitutability of factors[252,253,269].

In 2014, Sato & Dechezlprêtre[270] estimated the impact of bilateral trade flows from differences in industrial energy prices across countries. They found that changes in those prices used in the model show a statistically significant effect on imports, albeit a very small one. They argue that a 10% increase in energy prices increases imports by 0.2%. Though slightly larger, the impact remains small in heavy industries according to the authors, suggesting that trade in energy-intensive sectors may be more resilient to higher energy prices than they previously thought. Their simulations predict that a carbon price of 40 to 65 €/t CO_2 in the EU ETS would increase Europe's imports from the rest of the world by less than 0.05% and decrease exports by 0.2%. They conclude that

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[268] P. Summerton, "Assessment of the degree of carbon leakage in light of an international agreement on climate change Department of Energy and Climate Change", Cambridge Econometric, 2010, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47920/471-carbon-leakage-ce-report.pdf

[269] For instance, the elasticities of substitution between foreign and domestically produced products, the Armington elasticities, are often key parameters for estimating leakage rates. In that regard, the authors cite a study by Monjon & Quirion (s. below) which found that that under full auctioning of carbon allowances, a high Armington elasticity (3 for cement, 3.5 for aluminium and 5 for steel) implies carbon leakage of 11.4%, compared to 4.5% with low elasticities (1.5 for cement, 2 for aluminium and steel). Similar considerations apply to the exchangeability of technologies applied and fuels consumed.
S.Monjon, P. Quirion, "Addressing leakage in the EU ETS: Results from the CASE II model, Climate Strategies, Download under http://climatestrategies.org/wp-content/uploads/2009/03/3-cs-cired-working-paper-final.pdf

[270] M. Sato, A. Dechezleprêtre, "Asymmetric industrial energy prices and international trade", Centre for Climate Change Economics and Policy Working Paper No. 202 Grantham Research Institute on Climate Change and the Environment Working Paper No. 178, 2015, Download under http://www.lse.ac.uk/GranthamInstitute/publication/asymmetric-industrial-energy-prices-and-international-trade/

concerns around short-term impacts on carbon leakage and competitiveness are not entirely ungrounded, but may have been overstated.

The overall observations suggest that carbon leakage is likely not to have been a major issue so far. This confirms findings from previous studies[237,241,252,253,254,255]. Feedback from companies and modelling results however indicate that this may not hold true for the future. The outcome will depend on future climate policies and measures for safeguarding against leakage. In that regard and in addition to what has been said above, the models' may exhibit limitations to appropriately reflect abatement cost curves and the way free allocation impacts price formation and decision making in reality. This may cast some doubts on the extent that the results mirror reality[253].

3.4.3.6 Carbon pricing outside the EU

An overview of ongoing initiatives in other countries can be found in Annex 1 (section 5.1). The number of jurisdictions implementing or considering carbon markets or taxes for future implementation is steadily growing. So are initiatives which help spread EU ETS experience among those policy makers, such as ICAP[271], the Worldbank's PMR[272] and other bi-/multilaterally funded capacity building initiatives (EuropeAid, EBRD, Asian development bank, etc).

The study by Ökoinstitut & Ecofys[241] also provides an overview of ongoing action in countries outside the EU to combat climate change. It concludes that countries in the West-Pacific area are moving strongly forward in this regard, either by putting in place an Emissions Trading Scheme or ambitious energy efficiency benchmarks. Moreover, all of these countries currently shape their policies, possibly raising ambitions for GHG reduction. The authors conclude that these measures could be considered qualitatively comparable to the EU ETS in terms of potential price signals and their mandatory nature. The study also shows that countries like China and India give signals of tackling climate change, yet it acknowledged that an assessment of whether these are comparable to the EU ETS would require further detailed technical analysis. In contrast to this, the authors highlight that other countries such as Brazil, Indonesia and South Africa show less stringent policies, using voluntary emission saving measures to fight climate change.

On a broader scale, a recent study by Neuhoff et al.[273] found that in addition to pricing carbon, a diverse group of countries and regions is now advancing policies to enhance energy efficiency in the building, industry and transport sectors as well as to increase deployment of industrial capacity in renewables. Despite these policies covering sectors outside the sectors competing with EU ETS firms, they may have indirect effects on them by inducing changes along the supply-chain such as demand-side mitigation.

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[271] https://icapcarbonaction.com/

[272] https://www.thepmr.org/

[273] K. Neuhoff, W. Acworth, A. Dechezleprêtre, S. Dröge, O. Sartor, M. Sato, S. Schleicher, A. Schopp, "Staying with the leaders Europe's path to a successful low-carbon economy", Climate Strategies, 2014, Download under http://www.swpberlin.org/fileadmin/contents/products/fachpublikationen/Droege_staying_with_the_leaders_AcrobatNochmal2.pdf

It is concluded that currently the EU ETS is far ahead of other initiatives in size and maturity. Therefore it is too early to use the emerging carbon pricing systems as argument that carbon leakage is not relevant any more.

3.4.3.7 Conclusions on relevance

The results of the previous sections (3.4.3.3 to 3.4.3.6) suggest that carbon leakage seems not to have actually occurred so far. And even where some relocation of production may be observable, it is still to be proven, whether a causal link with carbon pricing can be established. Therefore some studies argue that CL effects need to be studied over a longer timeframe. However, the following points prevent from drawing final conclusions on CL:

- Since the mentioned studies are only reflecting the situation before the start of Phase 3, it remains to be seen how free allocation, also as of 2013, may have safeguarded against negative impacts on competitiveness and whether the allocation rules have the potential to further prevent or at least reduce the risk of carbon leakage (this issue will be tackled in section 3.4.4).
- Carbon leakage will be of lesser concern if extra-EU competitors put in place similar policies. Although there is a growing and encouraging number of jurisdictions implementing or considering carbon markets or taxes, it is too early to use them as argument that carbon leakage is not relevant any more.
- The absence of evidence of carbon leakage occurring may be caused by the low CO_2 price observed for much of the period covered in the analyses.

Thus, the evaluation shows that the risk of carbon leakage is hitherto not confirmed by evidence. The overarching caveat to this evaluation, however, is that industry stakeholders have not yet stopped claiming that effective measures against carbon leakage are required[274], in particular with a view to an increasing CO_2 price. Therefore relevance is given at least for the political process when amendments to the Directive are planned.

3.4.4 Effectiveness

The effectiveness of free allocation as a means to limit carbon leakage is evaluated on the basis of the following questions:

- Do the current carbon leakage eligibility rules and criteria correctly identify the (sub-) sectors with a significant risk of carbon leakage? (This question is also relevant for the "relevance" and "efficiency" criteria.)
- Are the current allocation rules and carbon leakage provisions effective in preventing the occurrence of carbon leakage?
- Are conclusions possible whether CL would likely have happened if the CO_2 price had been higher and/or no carbon leakage measures had been in place?

[274] See results on stakeholder consultation on EU ETS post-2020, which can be found under http://ec.europa.eu/clima/consultations/articles/0024_en.htm

3.4.4.1 Do CL criteria identify the correct sectors?

Current criteria in the Directive

The coverage of sectors by the current criteria in Article 10a of the EU ETS Directive has been discussed in section 3.4.3.2. As was shown there, many sectors are on the CL list due to their trade exposure, while relatively few sectors are covered due to emissions intensity alone. This has led to some criticism (in particular from NGOs) that too many installations receive too high amounts of free allocation, i.e. more free allocation than required to avoid carbon leakage.

A study[275] by Anderson et al. concluded that free allocation results in additional income for EU ETS industries in the order of 7 to 9 billion € annually (using 30 €/t CO_2). It must be noted that these prices are far from actually observed levels[276]. Furthermore, a substantial (though decreasing) part of the free allocation would still occur in case less sectors were qualified as CL exposed. Still, even with these caveats, an unfocussed CL list potentially leads to significant windfall profits for industry that is incorrectly designated as CL exposed. It also leads to a loss of auctioning revenues for Member States, and ultimately complies insufficiently with the polluter pays principle.

In the following sub-sections it is evaluated to which extent conclusions based on current knowledge are possible whether the Directive's criteria adequately identify the "really CL exposed" sectors.

Cost pass-through ability

As discussed in section 3.4.1.1, carbon leakage only exists where carbon costs are a decisive factor for competitive disadvantages, in particular if the carbon costs cannot be passed on to customers and thereby impact profitability or market shares negatively. Therefore several authors have focussed on the cost pass-through abilities of the sectors deemed at risk of carbon leakage.

Grubb et al.[252] and Laing et al.[254] published reviews on existing literature on the possibility to pass through carbon costs in the EU ETS sectors for Phase I and II. The majority of reviewed studies were focussing on the power sector. This sector's ability to pass on costs and the resulting windfall profits during Phase I-II[277] has led to auctioning as the allocation approach for electricity production as of Phase III. Although other sectors received less public scrutiny, the reviewing study found that they may have also enjoyed windfall profits. Based on studies using econometrics and interview-based approaches they conclude that robust evidence is provided on firms' abilities to pass on costs from as low as 30% for some sectors to as high as over 100%[278] for others. Furthermore, empirical studies support the theory that cost pass-through is higher in mono- and oligopolistic markets as well as in markets where demand is more inelastic, e.g. due to high product differentiation or other trade barriers.

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[275] B. Anderson, J. Leib, R. Martin, M. McGuigan, M. Muûls, L. de Preux, U. J. Wagner, "Climate Change Policy and Business in Europe Evidence from Interviewing Managers", 2011; http://cep.lse.ac.uk/pubs/download/occasional/op027.pdf

[276] As shown in section 3.4.5.1, this is a strong overestimate. For 2013 the more credible value is 1 billion Euros.

[277] J. Sijm, K. Neuhoff, Y. Chen, "CO_2 Cost Pass Through and Windfall Profits in the Power Sector", 2006, Download under http://www.eprg.group.cam.ac.uk/wp-content/uploads/2008/11/eprg0617.pdf

[278] I.e. those sectors are found to be able to pass-through costs even higher than the given CO_2 costs.

Such findings are consistent with the literature reviewed by Varma et al.[253] in 2012. They analysed studies[279,280,281] from several sectors and regions, finding that cost pass through and windfall profits occurred in many industrial sectors (see Table 4).

Table 4: Cost pass-through abilities of some EU ETS sectors as found by Varma et al.[253] via literature review (ranges refer to different studies).

Sector / product	Region	Cost pass through
Refineries	UK	50 to 75%
Organic chemicals	EU	42 to 100%
Inorganic chemicals	EU	0 to 50%
Pulp & Paper	DE	0 to 38%
Glass	DE	0 to 60%
Cement	DE, FR, IT, GR, PT, UK	0 to 37%
Ceramics	EU	30 to 100%

A study by Vivid Economics & Ecofys[255] has shown that most sectors are able to pass through costs substantially at 15 €/t CO_2, based on Vivid's Industrial Market Model (Figure 26). The authors do however emphasise that high cost pass-through rates should not automatically suggest that a sector is robust against cost shocks[282] such as introduction of a CO_2 price. High cost pass-through rates for a given cost shock could still cause large reductions in profitability, where profit margins are low.

Against this caveat, the study concludes that cost pass-through rate should not be the focus of attention for policy makers. On the other hand, ignoring a sectoral distinction regarding abilities to pass on costs, as is done in the EU's quantitative carbon leakage criteria, is also questioned. Therefore, pass-through rates should rather be seen as an intermediate calculation step to come up with factors on which carbon leakage criteria should be based.

[279] U. Oberndorfer, V. Alexeeva-Talebi, A. Löschel, "Understanding the Competitiveness Implications of Future Phases of EU ETS on the Industrial Sectors", 2010, Download under http://ftp.zew.de/pub/zew-docs/dp/dp10044.pdf

[280] V. Alexeeva-Talebi, "Cost Pass-Through in Strategic Oligopoly: Sectoral Evidence for the EU ETS", 2010, Download under ftp://ftp.zew.de/pub/zew-docs/dp/dp10056.pdf

[281] S. de Bruyn, A. Markowska, F, de Jong, M, Bles, "Does the energy intensive industry obtain windfall profits through the EU ETS? An econometric analysis for products from the refineries, iron and steel and chemical sectors", CE Delft, 2010, Download under http://www.ce.nl/publicatie/does_the_energy_intensive_industry_obtain_windfall_profits_through_the_eu_ets/1038

[282] As the study uses modelling, the influence of the CO_2 costs is analysed by introducing the CO_2 price as "shock" after the model has found an equilibrium without the CO_2 price.

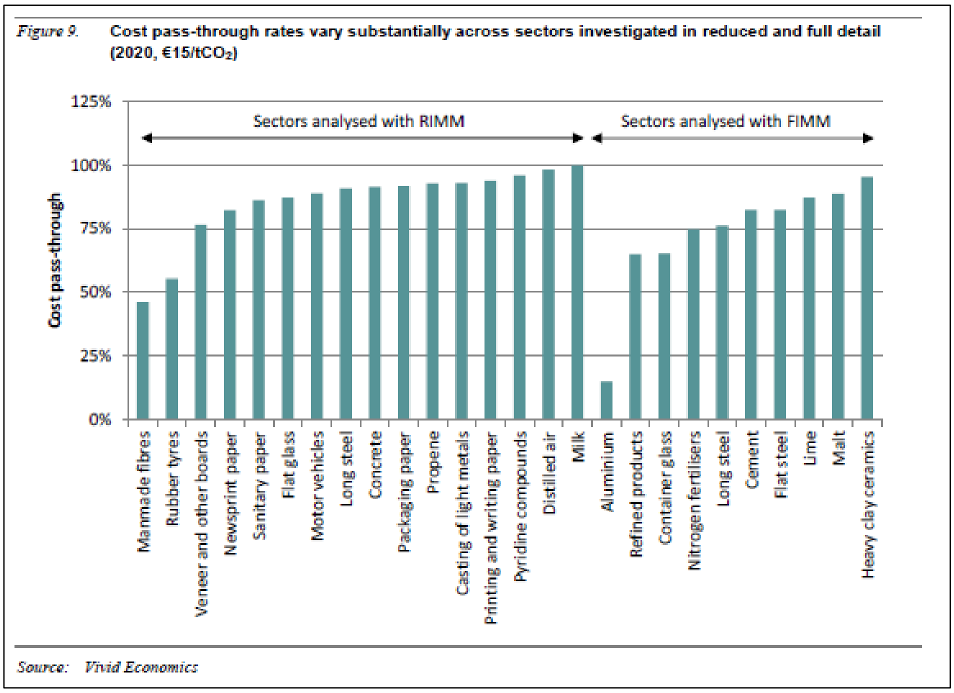

Figure 26: Cost pass-through rates until 2020 at 15 €/t CO_2; Source: Vivid Economics[255]; Results shown from the Full Industrial Market Model (FIMM), which incorporates information on individual facilities within the market, and the Reduced Industrial Market Model (RIMM), which is more aggregated.

Vulnerability score

In the search for alternative measures for carbon leakage, a study[283,284] by Martin et al. was based on interviews with almost 800 managers of manufacturing plants in BE, FR, DE, HU, PL and the UK. The following question was asked:

"Do you expect that government efforts to put a price on carbon emissions will force you to outsource part of the production of this business site in the foreseeable future, or to close down completely?"

The authors translated the answers to this question into an ordinal 'vulnerability score' (VS) on a scale from 1 to 5. A score of e.g. 3 was given if the manager expected that at least 10% of production and/or employment would be outsourced in response to future policies. As a next step, they investigated for each sector, based on regression analysis, whether or not a correlation exists between the scores and the outcome of the carbon leakage criteria used by the European Commission for the same sectors (see 3.4.1.2 and 3.4.3.2). This was assumed to provide a good measure of the effectiveness of the carbon leakage

[283] R. Martin, M. Muûls, U. J. Wagner, "Policy Brief: Still time to reclaim the European Union Emissions Trading System for the European tax payer", 2011, Download under http://cep.lse.ac.uk/pubs/download/pa010.pdf

[284] R. Martin, M. Muûls, L. B. de Preux, U. J. Wagner, "Industry compensation under relocation risk: a firm-level analysis of the EU Emissions Trading Scheme", American Economic Review 104(8); 2014, Download under https://www.aeaweb.org/articles.php?doi=10.1257/aer.104.8.2482

criteria to identify sectors that are indeed exposed to a significant risk of carbon leakage.

Carbon intensity

The carbon intensity criterion in the Directive shows a significant correlation with the 'vulnerability score' developed by Martin et al. and therefore, the authors suggest it to be a good measure of the risk of carbon leakage within the meaning of downsizing or relocating production.

The study by Vivid Economics & Ecofys[255] agrees with the current rules that full direct and indirect costs should be considered. However, the authors question the suitability of allocation principles and the use of GVA as denominator. On the former, the authors criticise that the allocation is based on historic output as opposed to current or future output. The authors however seem not to address that under current rules additional allocation can be claimed where production capacities are increased. On the latter, the study points out that using GVA is questionable, hinting at profits being the most relevant metric, or alternatively, the cost share of carbon in all production costs or revenues.

Along the same lines, a study[285] by CEPS agreed on the appropriateness of using carbon costs but recommend using other approaches such as costs over margins, or over EBIDTA. The authors suggest that this would be more relevant and easier to understand than other financial-type tests used in other jurisdictions (e.g. carbon intensity over revenue). Nevertheless, they admit that such approaches fail to capture other criteria such as abatement potential and the cost of abatement.

Trade intensity

Martin et al.[283] found that trade intensity is a particular poor measure of carbon leakage risk. They therefore recommend repealing of the "trade intensity above 30%"-only criterion from future assessments. Alternatively, the trading criterion may be either split by groups of trading partners (e.g. by development status), or replaced by the share of competition from outside the EU, a measure showing strong correlation with the 'vulnerability score' those authors developed.

Along those same lines, the authors of the Vivid Economics & Ecofys study[255] are critical of the trade intensity criterion and recommend either to repeal it, or to change the denominator to 'inside market share'. The study[285] by CEPS argues that while the trade intensity test clearly captures heavily traded products, it does not capture all risk factors associated with pass-through ability, such as market power and concentration.

Further criteria

Furthermore, Vivid Economics & Ecofys[255] recommend using profits or revenue, and exclude data for production outside the EU ETS instead of using GVA as the denominator for the carbon intensity criterion. They also suggest using carbon prices that are more closely linked to recent price developments or are updated more regularly.

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[285] A. Marcu, C. Egenhofer, S. Roth, W. Stoefs, "Carbon Leakage: Options for the EU", Centre for European Policy Studies, 2014, Download under http://www.ceps.eu/system/files/CEPS%20Special%20Report%20No%2083%20Carbon%20Leakage%20Options.pdf

Stakeholder views

In 2014 the Commission invited stakeholders to share their views with the 'consultation on Emission Trading System (ETS) post-2020 carbon leakage provisions'[286]. The analysis[287] of this consultation showed that almost all (98 %) industry stakeholders support measures meant to protect EU industry and strongly believe (88 %) free allocation to be an adequate instrument in this sense. 56 % of industry stakeholders are in favour of maintaining the current two-category approach (exposed/not-exposed) stating predictability by lowering uncertainty and complexity as rationale for this view. 15 % are opposing such a 'one size fits all' approach arguing that the rules applied should reflect differences in the degree of exposure in more detail. Those who believe all installations should be treated as exposed (21 %) highlight the fact that there is a global economy and that there are strong interconnections in terms of value chains (downstream and upstream links).

Similarly, 39 % of industry stakeholders support a continuation of the current carbon leakage criteria for the sake of predictability, simplicity and consistency. Among those stakeholders arguing for additional criteria, opinions vary on aspects to be taken into account:

- Cumulative costs (indirect costs, RES-related, environmental taxes etc.);
- Fuel mix (as well as accessibility and relative costs thereof);
- Impact of value chain effects, export and import competition;
- Possibility of using Gross Operating Surplus instead of Gross Value Added (GVA) in the calculations because of the labour costs included in the latter, which they argue penalises labour-intensive sectors.

Some industry stakeholders also claim that they are saving more energy and GHG emissions than used in the manufacturing phase, hence exhibit an overall positive carbon footprint in terms of their life-cycle assessment which should be reflected in the rules applied.

It must be noted that the above represents statements of parties with a financial stake in the outcome, i.e. they are likely to combine facts and political intent. As such it should be pointed out that no supporting evidence is submitted with the stakeholder responses. Also other sources, such as presentations during the Post-2020 Carbon Leakage stakeholder consultation meetings and briefing papers, are only anecdotal in character. In this context, the results of the stakeholder consultation should also be contrasted to the responses of ETS participants on this topic in the latest Thomson Reuters Point Carbon survey (see also Figure 25 in Section 3.4.3.3), where carbon leakage is deemed of little importance by the large majority of the respondents.

Summary of findings

Cost pass-through ability of industrial sectors ranges between zero and more than 100 % depending on methodology of the study and the sectors analysed. This suggests that some differentiation between sectors could be useful for avoiding windfall profits caused by CL compensation. However, real cost pass-

[286] http://ec.europa.eu/clima/consultations/articles/0023_en.htm

[287] Stakeholder consultation analysis to be downloaded under: http://ec.europa.eu/clima/consultations/docs/0023/stakeholder_consultation_carbon_leakage_en.pdf

through rates are difficult to determine in practice, and more operational criteria are preferred. The criterion of carbon costs in principle seems appropriate, although details regarding the denominator applied (currently GVA) as well as a more focussed calculation of the criterion and its threshold may be fruitful for the future[288]. The various analyses seem to support the conclusion that the trade intensity-only criterion is not effective in identifying carbon leakage exposure. On the other hand, there is a broad support by stakeholders to maintain current criteria, highlighting the benefits of predictability, simplicity and consistency. For the appropriateness of other criteria, the discussion in literature is still ongoing, and the basis for drawing conclusions is rather limited.

3.4.4.2 Effectiveness of free allocation (Article 10a)

The section on relevance concluded (see 3.4.3.7) that carbon leakage has not yet happened to a significant extent. However, the conclusion is drawn with two important caveats:

1. Free allocation has always been in place for industrial installations since the start of the EU ETS. Thus, operators never experienced full carbon costs and did experience the need to pass full carbon costs on to their customers[289]. More evidence for CL might exist if levels of free allocation had been lower in the period accessible to evaluation.
2. The CO_2 price is currently deemed too low for a significant impact on carbon leakage.

Without those caveats, two opposing conclusions on the effectiveness of free allocation would suggest themselves:

- Free allocation was not necessary because carbon leakage would not have occurred anyway (at least at the level of carbon prices currently observed).
- Free allocation was effective in preventing carbon leakage which would have occurred without it.

Such conclusions would be premature at the current point in time, where the new allocation rules have only been applied for two years. The following evaluation tries to give more solid answers. However, a more convincing conclusion will only be possible when longer time series and actual higher carbon prices will allow for more detailed models and evidence. Finally, it must be recalled that the sector-level aggregated findings – like all statistical data – do not allow conclusions on individual cases, where additional influencing factors (such as special market niches, access to outstanding raw materials, location, age and size of installations, etc.) may give a different picture than found for the whole sector.

[288] Notably, the evaluation only focusses on the current situation, and therefore does not further explore other options for future revisions of the CL criteria. Such work would have to be done within an impact assessment for the revision itself.

[289] This does not rule out that pass through of carbon costs happened in practice, leading to windfall profits.

In order to be able to come to at least an interim conclusion on the effectiveness of free allocation to prevent carbon leakage in this report, this section uses the following line of thought:

- It is assumed that the current criteria for being exposed to a significant risk of carbon leakage in accordance with the revised EU ETS Directive are fit for purpose, i.e. "correct", so that the sectors which are actually facing a CL risk are covered, but no other sectors.
- The Directive's measure against CL, the harmonised free allocation under Article 10a, aims at reducing the carbon costs faced by industry for preventing carbon leakage.
- Consequently, the measure must be deemed effective, if the carbon costs are reduced to a level where the carbon costs would not be the decisive factor for a sector to be deemed at risk of CL (i.e. the sector would be "removed from the CL list"). The evaluation attempts to identify sectors where this is the case.
- If the free allocation is higher than required for "removing" the sector from the CL list, the relevant sector would be deemed able to receive windfall profits at the expense of the ETS's overall efficiency. The "ideal" level of free allocation would therefore be a level which is just enough to meet the carbon cost threshold of the CL criteria in the Directive.

In a first step the percentage of free allocation compared to verified emissions in 2013 is determined[290] in order to estimate the extent to which free allocation reduces the carbon costs for the sectors covered by the EU ETS. Within the 221 sectors[291] exists a wide range of allocation levels. The majority of sectors received free allocation in the range of 50 to 150% of verified emissions. Only a couple of smaller sectors received less than 50% (about 40 installations totalling about 1 Mt CO_2 emissions), while 15 sectors (including sectors with very high use of biomass) received over 150% of their required allowances. Note that these figures may be distorted towards higher allocation rates by the recession of the recent years. Still, this effect is of limited impact, as the "partial cessation" rule provides for, to some extent, the alignment between allocation and economic activity level.

For giving an impression on the sectors carrying the highest carbon costs, the highest emitting sectors (above 10 million t CO_2(e) per year) are shown in Table 5. Those eleven sectors represent about 2 600 installations and one third of industry's emissions. In these sectors, allocation levels have typically been between 75 and 125% of emissions. Overall the fraction of CO_2 costs covered by

[290] Data sources and calculation approach:
Verified emissions are taken from the file "compliance data for 2013" (status of 1 May 2014; see http://ec.europa.eu/clima/policies/ets/registry/docs/compliance_2013_code_en.xls)
Free allocation (sum of NIMs and changes due to new entrant and closures) is taken from National allocation tables downloaded from EUTL on 4 February 2015, see http://ec.europa.eu/environment/ets/napMgt.do
Installations are attributed to 4-digit NACE sectors using the file http://ec.europa.eu/clima/policies/ets/cap/leakage/docs/installation_nace_rev2_matching_en.xls on DG Climate Action's website. Note that this file is based on an EUTL extract of 2012, i.e. installations covered only as of Phase 3 are not contained. Furthermore not all installations in this list have a NACE code attached. Consequently, NACE codes are available only for about 9 900 installations, which have been used for this evaluation. Verified emissions of 42.5 Mt CO_2 and free allocation under Article 10a in the range of 35.1 Mt CO_2 (4% of total) could not be attributed to NACE codes.

[291] Excluding the energy sectors (NACE codes starting with 35).

free allocation is in many cases higher than the range that according to the studies cited in section 3.4.4.1 cannot be passed through to clients. Thus, it can be concluded that the current rates of free allocation should be effective against carbon leakage, but could lead to some windfall profits.

Table 5: Industrial sectors with highest emissions (>10 Mt CO_2e in 2013), and the level of free allocation to the sectors.

NACE	NACE Name	Instal-lations	Verified Emis-sions 2013	Allocation 2013	%
06.10	Extraction of crude petroleum	169	29 029 011	18 598 639	64%
17.12	Manufacture of paper and paperboard	656	25 277 737	28 614 961	113%
19.20	Manufacture of refined petroleum products	144	132 723 189	109 418 584	82%
20.13	Manufacture of other inorganic basic chemi-cals	103	11 533 878	12 929 852	112%
20.14	Manufacture of other organic basic chemi-cals	302	55 285 347	53 497 475	97%
20.15	Manufacture of fertilisers and nitrogen com-pounds	118	39 443 223	32 575 178	83%
23.13	Manufacture of hollow glass	198	10 293 581	8 662 721	84%
23.51	Manufacture of cement	248	109 474 839	135 892 154	124%
23.52	Manufacture of lime and plaster	234	26 311 882	26 455 738	101%
24.10	Manufacture of basic iron and steel and of ferro-alloys	371	148 901 789	186 663 765	125%
24.42	Aluminium production	72	13 982 103	10 314 687	74%

In a next step, the sector-level free allocation rates calculated above are used to study the impact on carbon costs. For this exercise, the *direct* CO_2 costs per GVA (based on the impact assessment for the 2015 CL list, but assuming a carbon price of 30 €/t CO_2 at full auctioning) are reduced proportionally[292] to the level of free allocation. The result of this analysis is shown in Figure 27. The green circles (full carbon costs without free allocation) move downwards with decreasing carbon costs. The red circles are those with the reduced carbon costs. The corresponding circles can be identified by looking for circles of the same size and trade intensity (i.e. same x-value). As can be seen in the figure, several sectors (including some of the biggest emitters) would end up in the white region, i.e. they would not qualify as exposed to a significant risk of carbon leakage anymore.

The effect of reduced CO_2 costs per GVA brought about by free allocation is furthermore illustrated in Figure 28.

[292] In cases of more than 100% free allocation, costs are reduced to zero.

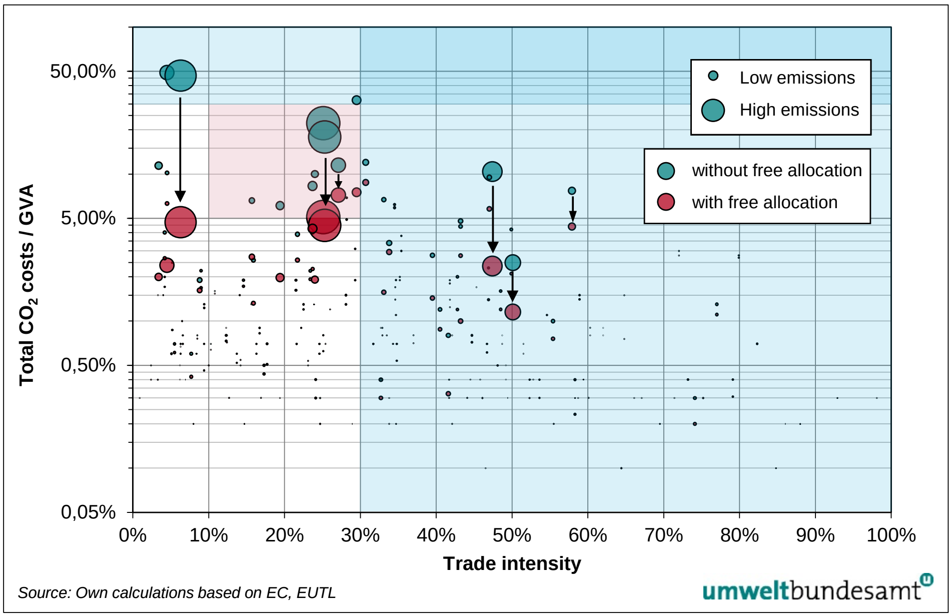

Figure 27: Impact of free allocation on whether industrial sectors comply with the Directive's CL criteria: Sectors (NACE 4-digit) are positioned according to total CO_2 costs per GVA (green: without free allocation, red: with free allocation) and trade intensity. Coloured area indicates thresholds for the quantitative CL criteria. Size of bubble corresponds to the sectors' average annual emissions 2009-2011. For further explanation see main text. (Source: European Commission, EUTL, own calculations).

For the following sectors the CO_2 costs would be reduced by free allocation to an extent that they would not be deemed CL exposed any more[293]:

- Sectors which are on the CL list only because of CO_2 costs: Due to free allocation, the CO_2 costs of two such sectors fall below 30% of GVA. Because trade intensity is low, CL risk must be assumed to be effectively abated. This applies to the sectors:
  - 23.51 Manufacture of cement;
  - 23.52 Manufacture of lime and plaster.
- Where trade intensity *and* CO_2 costs are the reason for being considered CL-exposed, the following sectors would fall off the CL list because their CO_2 would fall under 5% of GVA:
  - 08.93 Extraction of salt
  - 10.62 Manufacture of starches and starch products
  - 10.81 Manufacture of sugar
  - 19.20 Manufacture of refined petroleum products
  - 23.11 Manufacture of flat glass
  - 23.13 Manufacture of hollow glass
  - 24.43 Lead, zinc and tin production

[293] A similar assessment was carried out in 2010 by Carbon Trust: "Tackling carbon leakage. Sector-specific solutions for a world of unequal carbon prices", Download under https://www.carbontrust.com/media/84908/ctc767-tackling-carbon-leakage.pdf

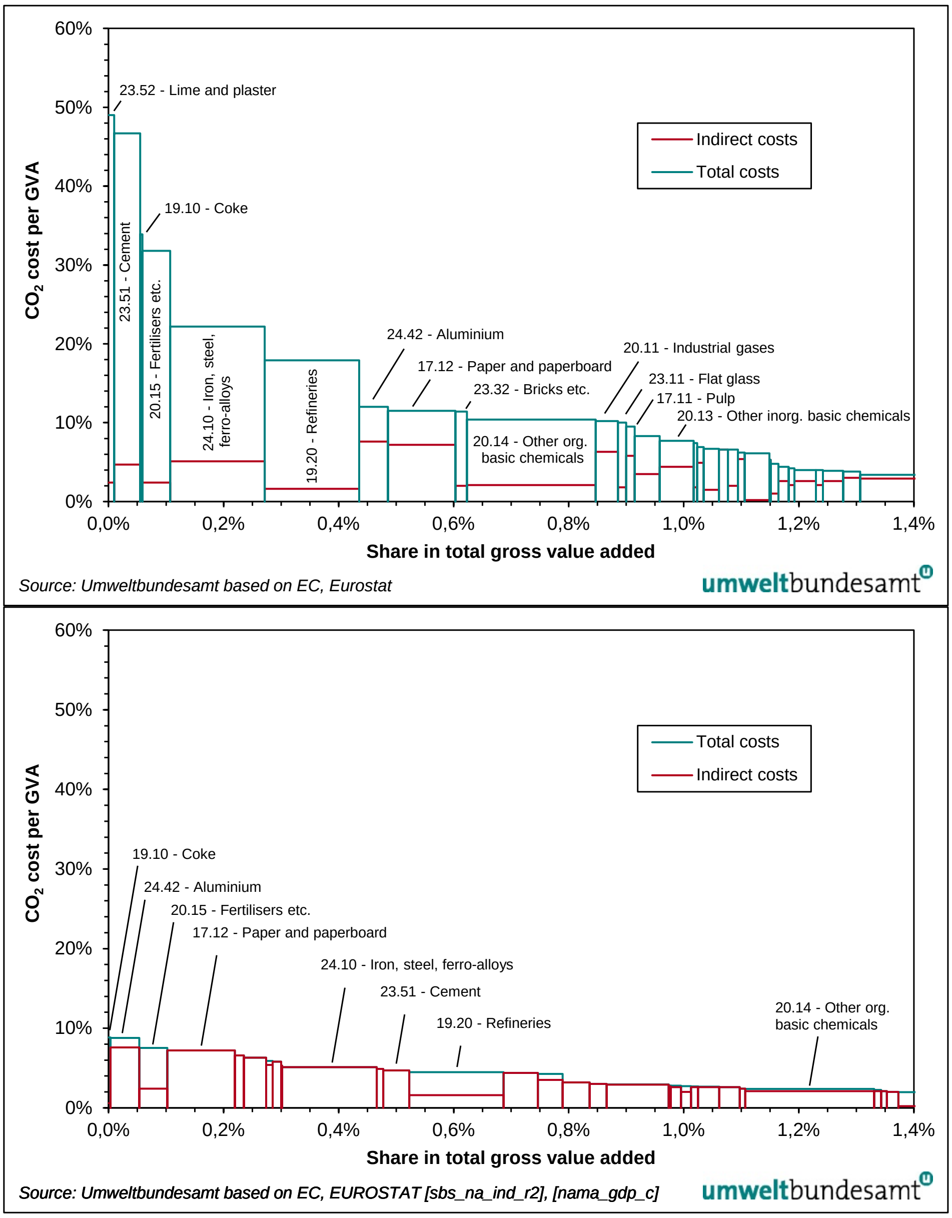

Figure 28: The influence of free allocation under current rules (for the year 2013) on total CO_2 costs on sectors with highest CO_2 as share of their gross value added (GVA). The x-axis illustrates the sector's contribution to the EU's total GVA. The upper graph shows the situation under full auctioning (no free allocation), the lower graph gives the situation with free allocation.

For those sectors listed it can be assumed that the risk of CL is effectively abated by granting free allocation according to current rules (i.e. by the increased allocation compared to non-CL sectors). For other sectors an assessment would be required whether the residual carbon costs are within the range of their cost pass-through ability[294]. A similar conclusion cannot be drawn for sectors which

[294] Such assessment is beyond the scope of this study.

are on the CL list only due to trade intensity above 30% while their CO_2 costs are limited even without free allocation. However, also for those sectors free allocation brings about significant CO_2 cost reductions. As discussed in section 3.4.4.1, some authors consider trade intensity as stand-alone criterion for CL exposure less appropriate than other criteria. In this light it is highly likely that free allocation is also effectively reducing the CL risk in those sectors.

Another possible interpretation of this analysis would be that the appropriate level of free allocation for each sector could be determined such that the sector falls just below the CO_2 cost threshold of the CL criterion. For the sectors that are only on the list because of the trade exposure criterion, the 5% cost threshold could be applied.

Conclusions

With current allocation rules and CL criteria, free allocation is currently at a level high enough so that for several important sectors the CL criteria would not be met anymore, in particular if some cost pass-through ability is assumed. Exceptions are sectors where trade intensity is the decisive CL criterion – a criterion, however, which is challenged by some authors. This conclusion is largely independent of the carbon price. The relative reduction of CO_2 costs per GVA will always be in the same order of magnitude (i.e. if free allocation covers 90% of the CO_2 costs, it will also be 90% in case of higher CO_2 prices). However, at higher CO_2 prices there may be some borderline cases which would require detailed assessment. A caveat applies: This conclusion applies at the level of the whole sector, while in case of individual installations there may exist exceptions to that rule. However, due to the benchmark-based design of the allocation rules, problems due to "low allocations" would exist predominantly at low-efficiency installations.

3.4.5 Efficiency

The efficiency of the measure of free allocation for reducing the risk of CL and avoiding competitive distortions is evaluated on the basis of the following questions:

- Are the current carbon leakage provisions only applied to those (sub-)sectors where it is necessary? (Not further discussed, because elaborated already under effectiveness, see 3.4.4.1.)
- Is the increased amount of free allocation due to the CL provisions cost-efficient, in particular with view to reduced auctioning revenues for MS? Is there evidence for significant cases of windfall profits, which would prove inefficiency in this regard?
- What are the impacts of the allocation rules and carbon leakage provisions on the administrative costs? Can improvements be observed by the harmonised rules compared to previous phases?

3.4.5.1 Windfall profits and loss of auctioning revenues

Section 3.4.4 already discussed that some sectors deemed exposed to a significant risk of carbon leakage according to the EU criteria in reality do not seem to be exposed to such a risk. Studies found costs may possibly be passed through and windfall profits for those sectors can occur[252,253,254]. In particular, the trade intensity criterion seems not to be correlated with the actual risk to any significant extent, according to studies[252,253,254].

Based on those findings, windfall profits are estimated[283,284] in the range of 7 to 9 billion € annually in Phase III. Since those calculations are based on carbon prices of 30 €/t CO_2, they are strongly overestimated. The lower value (7 billion €) can be translated into a more conservative estimate of 1 billion € at the average auctioning price of 4.45 €/EUA in 2013 (see section 3.1.5.5). That would mean that 233 million allowances (27% of the total free allocation under Article 10a[295]) could have been allocated for free in excess. Equally, the loss of auctioning revenues for Member States is 1 billion € due to the free allocation not targeted enough to CL sectors. Every year auctioning revenues could be higher by an equivalent amount compared to the current situation, while not significantly increasing the risk of carbon leakage for the sectors covered by the EU ETS.

3.4.5.2 Distortion of the carbon price signal

A cap & trade system is deemed most efficient for GHG reduction if this happens at the lowest economic costs, i.e. at the lowest equilibrium carbon price. Inefficiencies in this regard occur where the CO_2 price is distorted, which means it is higher than necessary. Here it is discussed if evidence can be found as to whether free allocation distorts the carbon price.

According to economic theory, profit maximisation or cost minimisation only depends on the level of carbon prices and not on the type of allocation. Companies will take decisions triggered by the opportunity costs of allowances, regardless of whether auctioned or received for free. However, Laing et al.[254] found evidence that investment and innovation responses are stronger in companies which face a shortage of allowances than in those with surplus (free) allowances. The authors argue that this observation, though at odds with classical theory, is consistent with theories of behavioural economics, which emphasise loss and risk aversion more than pure optimisation.

In 2011, Abrell et al.[267] further added to this issue by finding that initial allocation and ex-post emissions of EU ETS were correlated, i.e. the higher the allocation, the higher the emissions[296]. For this effect, the authors argued the most plausible explanation was that carbon markets seem to be deviating from the idealised market conditions. This is consistent with the conclusions Grubb et al[252] drew based on literature reviewed. The authors argued that already upon announcement of moving from free allocation to full auctioning in the power sector,

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[295] Total free allocation in 2013 was 862.1 million EUAs.

[296] This hints at operators of installations perceiving the allocation as an individual emissions cap, which is at odds with the market-based design which aims at all installations complying jointly with the one cap of the EU ETS. This is one of the misconceptions discussed in: P. Zapfel, M. Vainio, "Pathways to European Greenhouse Gas Emissions Trading History and Misconceptions" (2002). FEEM Working Paper No. 85.2002. Download under http://ssrn.com/abstract=342924

part of the perverse incentives to construct coal power plants has been reduced. Both findings hint to a distorted carbon price caused by free allocation.

Ecofys 2014[297] carried out a literature review and a consultation of stakeholders and experts in order to provide understanding of how investment decisions are made and how risks and uncertainties are dealt with in general. Regarding free allocation, they found that "*the industrial sectors overwhelmingly consider carbon costs as distinct from carbon prices. This is because the high quantity of free allowances available to firms relative to their current need, largely shields them from direct exposure to carbon prices, whereas they may be more strongly affected by policy decisions that impact on the quantity of free allowances allocated to them.*"

In practice, Neuhoff et al.[298] have shown recently that the partial cessation rules for free allocation[299] may lead to perverse incentives to increase production. This rule in principle constitutes an incentive to operate above certain thresholds in order not to see allowances withdrawn. This incentive is particularly pronounced where specific carbon costs are high, such as in cement clinker production. Cement companies' executives confirmed such practices to the authors in interviews, which were further confirmed by analysing EUTL data for 2012 emissions. Along those same lines, Branger et al.[300] carried out analyses on the cement sector's 2012 emissions and draw the same conclusions.

Summarising the finding of those studies, it can be concluded that free allocation does distort the CO_2 price signal to some extent, despite the theoretical independence between carbon price and abatement behaviour. This means that overall achievement of the GHG emission reductions as defined by the cap could be achieved at lower cost if no allocation were granted for free. However, a quantification of this effect has not been found.

3.4.5.3 Administrative costs

Depending on the CO_2 price assumed, free allocation in the EU ETS was worth up to nearly 60 billion € per year in Phase II[301]. At the beginning of the third phase, the free allocation to industry under Article 10a for 2013 was still worth 3.8 billion €[302]. It goes without saying that with such values at stake, allowances cannot be distributed among roughly 11 000 installations without significant ad-

[297] A. Gilbert, P. Blinde, L. Lam, W. Blyth, "Cap-Setting, Price Uncertainty and Investment Decisions in Emissions Trading Systems", Ecofys and Oxford Energy Associates, 2014, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311914/EU_ETS_cap-setting_project_REPORT.pdf

[298] Neuhoff et al., "Carbon Control and Competitiveness Post 2020: The Cement Report", Climate Strategies, 2014, Download under http://climatestrategies.org/wp-content/uploads/2014/02/climate-strategies-cement-report-final.pdf

[299] The partial cessation rules in accordance with Article 23 of Decision 2011/278/EU lay down that installations will only be issued half of the free allocation that reduced their production by at least 50%.

[300] F. Branger, J.-P. Ponssard, O. Sartor, M. Sato, "EU ETS, free allocations and activity level thresholds, the devil lies in the details", Centre for Climate Change Economics and Policy Working Paper No. 190, Grantham Research Institute on Climate Change and the Environment Working Paper No. 169, 2014, Download under http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/10/Working-Paper-169-Branger-et-al-20142.pdf

[301] For this figure the CO_2 price peak in mid-2008 is used, which was slightly over 30 €/EUA, with the total allocation (nearly identical to free allocation) was approximately 2 billion EUA/year.

[302] 862.4 million EUAs with an average value of 4.45€ based on average auctioning price, see section 3.1.5.5.

ministrative efforts. The distribution must be based on objective criteria (in particular where installation-level data is involved) and should be as transparent and robust against lawsuits as possible. Thus, this section will not evaluate whether the administrative costs by the allocation process could have been avoided. Instead an estimate is made only to identify the order of magnitude, compared to other transaction costs in the EU ETS (see section 3.10.3.3). This allows at least to state whether administrative costs are reasonably proportionate within the overall EU ETS administration.

In the first two phases Member States had to develop National Allocation Plans (NAPs). In that regard they were relatively free to decide on methodologies for calculating allocations, only limited by the criteria of Annex III of the Directive[303]. Despite all differences between national approaches, it can be safely assumed that in all Member States significant efforts at both operators' and competent authorities' side were required. The minimum was some data collection about historic and/or forecast emissions at installation level, studies and/or stakeholder discussions for developing the allocation approach, and consultations with individual operators. On the Commission's side the approval of the NAPs also required significant efforts by a dedicated task force over several months. Due to a lack of information and the heterogeneous character of that process, it is not possible to carry out a quantitative evaluation of administrative effort. However, it is not unlikely that at least the order of magnitude of the administrative effort is comparable to the current system.

From the third phase onwards, EU-wide harmonised rules have been defined. Due to their nature as based on ex-ante benchmarks, they are of considerable complexity. For correctly calculating the allocation in the "NIMs"[304], "sub-installation" level data is to be collected by operators, to be independently verified, checked by the competent authority, and to be approved by the Commission. Those rules have been agreed and put down in legislation at EU level. They are purely rule-based and with less elements where discretion of the Competent Authority (CA) is possible. Thus one important and time-consuming step has been substantially reduced, i.e. the negotiation between operators and CAs. This came at the cost of more detailed baseline data requirements. For increasing the credibility and robustness of the allocation system, third party verification of baseline data has become compulsory[305]. The system was facilitated by a wide range of support measures by the Commission, in particular guidance documents and an electronic template for the data collection, which helped to ensure the correctness and completeness of the collected data. Taking into account the complexity of the allocation rules (which to some extent was a result of political compromises), the most important potentials for reducing administrative costs without sacrificing credibility seem to be exploited.

Based on the authors' experience from being involved in the assessment of the NIMs on the side of the CA as well as the Commission, an estimate of the administrative costs has been made. This includes costs for operators, CAs in the

[303] Some guidance was given by the Commission on the development of NAPs and the interpretation of Annex III: COM(2003) 830 and COM(2005) 703, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52003DC0830 and http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0703:FIN:en:PDF

[304] National Implementation Measures pursuant to Article 11 of the Directive. Where not separately mentioned, similar approaches apply to "NE&C cases" (meaning "New Entrant & Closures", i.e. greenfield plants, significant capacity changes, partial and full cessations, or recovery thereafter).

[305] In the first two phases, baseline verification was used only in some Member States.

Member States as well as for the Commission and costs for the complete allocation system (i.e. NIMs and new entrant and closure cases throughout the trading period), but excludes the process of determining the benchmark values. The latter is considered part of the legislative process[306]. The summary of this estimate is given in Table 6. The assumptions for the estimate including the different activities to be performed can be found in Annex 1 (section 5.2).

Comparing the estimated costs to a hypothetical alternative system is difficult (under the condition that free allocation is desirable at all). For putting the results into perspective, the following considerations may be helpful:

- The technically simplest way of calculating the amount of free allocation (for incumbents) is grandfathering[307], i.e. allocation proportional to historic verified emissions. Every installation would receive an amount calculated as "historic emissions times a correction factor", where the correction factor would be derived from the cap (i.e. in the EU ETS in its current form, the linear factor pursuant to Article 9 would be used). Such an approach needs no data which is not available from the EUTL, and the calculation can be performed in a single spreadsheet. Therefore administrative costs would be close to zero.
- For comparing NIMs costs to the NAPs' costs, not enough information about the different allocation approaches is available. Such comparison is therefore not made here. However, as discussed above, the overall order of magnitude of the costs might be comparable to the current system (except for the determination of the benchmark values).
- According to economic theory, a pure ex-ante allocation system without updating would result in the least distorted CO_2 price signal[308], i.e. most cost-efficient GHG emission reductions in the EU ETS. If still based on benchmarks, the administrative costs of such a system would likely be in the same order of magnitude as given in Table 6 for the NIMs alone, i.e. costs would be less than half the costs of the current system.
- As some industry stakeholders[309] and studies[310] claim that ex-post allocation[311] would be more desirable for taking into account more recent activity levels for allocation, the administrative costs of such a system (with calculating allocation *every* year) are also estimated in Table 6 (for detailed assumptions see Annex 1, section 5.2). It comes out as the most expensive of the options discussed, mainly because it means that a process nearly as complex as the NIMs calculation has to be performed every year, while in the cur-

[306] In case the Benchmarking Decision contained a revision clause, the development of benchmark values would have to be included in the analysis.

[307] The biggest drawback of this approach is that the biggest emitter gets the biggest "reward" for the emissions, i.e. it runs counter the 'polluter pays principle'. This approach was therefore discarded during the EU ETS review of 2008.

[308] D. Harrison, D. Radov, P Klevnas, "Allocation and Related Issues for Post-2012 Phases of the EU ETS", NERA Economic Consulting for DG Environment, 2007, Download under http://ec.europa.eu/clima/policies/strategies/2020/docs/post_2012_allocation_nera_en.pdf

[309] See result of stakeholder consultation under http://ec.europa.eu/clima/consultations/articles/0024_en.htm

[310] B. Borkent, A. Gilbert, E. Klaassen, M. Neelis and K. Blok, "Dynamic allocation for the EU Emissions Trading System", Ecofys May 2014, Download under http://www.ecofys.com/files/files/ecofys-2014-dynamic-allocation-for-the-eu-ets.pdf

[311] This means that allocation is calculated *after* the emissions or production data of installations have become known. In the ongoing debate this is usually assumed to be a process to be performed every year.

rent system only a few installations (those with NE&C cases) undergo a similar procedure.

From Table 6 it can be seen that according to the estimate about 88% of the administrative costs for the total ex-ante system for the eight year period are to be shouldered by operators. More than 10% of the total administrative costs are incurred by the Competent Authorities and only a small fraction by the Commission.

Table 6: Estimate of annual *administrative costs for the free allocation under Article 10a. This includes allocation to installations exposed to significant risk of carbon leakage as well as to other installations. For evaluating if the system is cost-efficient, costs for a hypothetical ex-post allocation system (based on the current rules of the EU ETS, but assuming that allocation is re-calculated every year) is also included. Assumptions for the estimate are found in Annex 2 (section 5.2).*

Mio. € per year	**Operator**	**MS**	**COM**	**Total**
NIMs[312]	13.7	2.0	0.2	15.9
NE&C	17.6	1.6	0.4	19.5
Sum ex-ante system:	**31.2**	**3.6**	**0.6**	**35.4**
Full ex-post system	46.6	3.8	0.7	51.0

Here the total annual costs for administering the free allocation system have been estimated to around 35 million €. This is less than 1% of the value of allowances allocated for free even at the current low CO_2 price. With higher prices in the future, and better knowledge of all actors involved, the effort compared to the value allocated will further decline. The complexity of the current allocation rules is a result of a compromise after a lengthy political negotiation process[313]. Furthermore those rules were necessary to establish a level playing field between sectors[314]. Therefore the allocation rules should only be compared to other systems if they have similar features[315]. Under these conditions it is concluded from this estimate that the current allocation system in the EU ETS is cost-efficient to the extent feasible.

[312] The NIMs were a one-off exercise at the beginning of the third trading phase. For compatibility with the standard cost model used in the Commission's Impact assessments, the costs are deemed equally spread over the whole trading phase of eight years, i.e. values shown are 1/8 of the one-off costs.

[313] The Commission's website lists 29 technical working group meetings with Member State experts and 5 wider stakeholder meetings: http://ec.europa.eu/clima/policies/ets/cap/allocation/documentation_en.htm

[314] In particular a level playing field between product benchmarks and "fall-back" approaches.

[315] Similarity should include: Implementation of the 'polluter pays' principle (or rewarding GHG efficiency), provision of level playing field, and environmental performance (i.e. little distortion of the CO_2 price signal), political feasibility.

3.4.6 EU added value

The EU-added value of the free allocation rules for mitigating the risk of carbon leakage are evaluated on the basis of the following questions:

- What is the EU added value of harmonised allocation rules and carbon leakage provisions at EU-level, in particular compared to the MS level intervention during Phases I and II?
- More specifically, have the more harmonised allocation rules led to a decrease in intra-EU competitive distortion compared to Phase II?

Based on the lessons learned from the first trading period 2005-2007, the Commission published a Communication[316] putting particular emphasis on assessing national allocation plans in a consistent, fair and transparent manner. In the second trading period, 95 % of emission allowances were allocated for free. Allocation to industrial sectors was largely based on historic emissions ('grandfathering'), whereas for the electricity sector, a number of countries (e.g. Denmark, Germany or the United Kingdom) used benchmarks for free allocation. As a result, free allocation (relative to emissions) tended to be higher for industrial sectors compared to combustion installations[317].

The Commission scrutinised[316] national allocation plans considering the criteria given in Annex III of the Directive, in regards to the following:

- setting a cap consistent with each Member State's burden sharing commitment, emissions development and reduction potential;
- consistency with supplementary obligations (JI/CDM project credit limit);
- other issues specific to individual plans with a view to avoiding undue distortions of competition and of the internal market.

By respecting those aspects, the maximum allowed annual average cap (CAP_{MAA}) has been determined as follows:

$$CAP_{MAA} = (CIVE \times GTD \times CITD) + ADD$$

where:

- *CIVE = corrected independently verified emissions for 2005*
- *GTD = growth trend development 2005 to 2010*
- *CITD = carbon intensity trend development 2005 to 2010*
- *ADD = additional emissions covered by an extended scope of combustion installations[318].*

As can be seen from this approach, there are many parameters taking into account Member States' specificities and expected trends, such as Kyoto targets

[316] COM(2006) 725: Communication from the Commission to the Council and the European Parliament on the assessment of national allocation plans for the allocation of greenhouse gas emission allowances in the second period of the EU Emissions Trading Scheme accompanying Commission Decisions of 29 November 2006 on the national allocation plans of Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, Slovakia, Sweden and the United Kingdom in accordance with Directive 2003/87/EC, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52006DC0725

[317] European Energy Agency, "Trends and projections in Europe 2014 - Tracking progress towards Europe's climate and energy targets for 2020", EEA Report No 6/2014, 2014, Download under http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2014

[318] This was necessary because in the first trading phase different interpretations of the term "combustion installation" in Annex I of the Directive were used by Member States. This issue was fully harmonised only from 2013 onwards.

and forecasts on growth and efficiency improvement. The consequence thereof was that similar installations in the same sector in different Member States could face significant differences in allocation, even if the overall approach of the NAP was comparable. Therefore carbon costs, and consequently competitive positions could strongly differ between Member States. This contradicted the EU's aim of further promoting the internal market and avoiding undue distortion of competition therein.

The Communication concluded that a successful EU ETS is of vital importance to sustaining the EU's credibility in relation to the post-2012 climate regime. At the same time national allocation plans proposed to the Commission back then would not only endanger the achievement of Europe's Kyoto commitments, but would at the same time create undue distortions in the internal market.

Those conclusions demonstrate that fragmented action taken by Member States on the amount of allowances to be granted to installations for free was posing risks of market distortion between participants. Furthermore, this highlighted the need for more harmonised allocation rules to ensure a level playing field. The impact assessment for the EU ETS review again highlighted this issue. As the revised EU ETS Directive has changed the approach for cap setting as well as for allocation rules, with both being harmonised at the EU level, it can be concluded that the original problem of an unlevelled playing field is now solved. Such harmonisation would have been impossible without EU legislation.

3.4.7 Coherence

The coherence of the carbon leakage criteria and free allocation measure are evaluated on the basis of the following questions:

- Are the carbon leakage provisions consistent with the polluter pays principle enshrined in the Treaty, and with principles of the Directive such 'internalisation of external costs'?
- Are the carbon leakage provisions consistent with the other objectives of the revised Directive, such as a transition to low-carbon economy, harmonisation and reduced administrative costs?
- Are there other (legal) provisions in place also aiming at preventing industries from competitive disadvantages that might constitute double-subsidies?

3.4.7.1 Coherence with the polluter pays principle

Inherently, the 'polluter pays' principle set out in Article 191(2) TFEU[319] is hampered where polluters receive subsidies on their emissions. Free allowances in an ETS constitute such a subsidy, removing to a large extent the factual costs a GHG emitter – the polluter – has to pay. This conflict has to be seen in the context of an environment of unequal carbon prices in different jurisdictions and markets.

The fact that EU ETS participants receive a large share of their allowances for free does not necessarily mean that the internalisation of external costs is sup-

[319] Treaty on the Functioning of the European Union, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:12012E/TXT

pressed. The opportunity costs of each allowance will be the same, regardless of whether allowances have been acquired for free or not. Theory therefore suggests that solving the cost-minimisation problem will not depend on the allocation mechanism, since any excess allowances can be sold on the market. This also implies that free allocation will not impact whether or not companies will pass through the costs of carbon to consumers, driving demand-side mitigation decisions.

Thus, while factual costs are reduced for the polluter by free allowances, the effect of opportunity costs remains in place, so that the polluter has still an incentive to reduce the emissions and to become less polluting. Free allocation in this regard may not be the optimal solution, but in the light of the desire to prevent carbon leakage (which would mean that global emissions would increase with even less cost for polluters), the absence of free allocation could lead to an even worse outcome in that regard.

3.4.7.2 Coherence with the EU ETS objectives

Objective of GHG emission reductions: Economic theory suggests that the way allowances are allocated does not impact opportunity costs. Therefore it does not hamper driving decisions towards low-carbon measures. However, findings in section 3.4.5.2 show that this rationale may not completely hold in practice, following more the theory of behavioural economics. Furthermore, some design details of the free allocation rules may induce perverse incentives to increase emissions. Thus, the result of free allocation is a somewhat distorted price signal, but the overall objectives of the EU ETS are not hampered.

Objectives of cost-effectiveness and EU-wide harmonisation: The harmonisation brought along with the benchmarking rules in Phase III avoids fragmented action and competitive distortions. The rules have shown to be largely effective at reasonable administrative costs (see sections 3.4.4 and 3.4.5.2). In summary, the harmonised rules for free allocation and carbon leakage prevention ensure a level playing field, further promoting the internal market.

3.4.7.3 Coherence with other support measures

Outside the scope of the EU ETS and within the scope of EU energy and climate policy the most prominent measures are the energy tax exemptions for energy intensive industries and the exemptions from levies to support the growth of renewable energies on the European energy market. Insufficient information is available on the exact level of exemptions from taxes and levies, particularly at the level of individual installations. Consequently, no conclusions can be drawn on whether the exact levels of support were different if all exact costs and relevant exemptions would have been taken into account.

Regarding coherence of allocation rules within the EU ETS, there are the following possibilities:

- Double allocation between Article 10a (free allocation to industry) and Article 10c (exceptional free allocation for the modernisation of the power sector): The only case where a risk of double allocation exists is found in installations

producing electricity and heat (CHP, combined heat and power production). The Benchmarking Decision[320] and the Commission's guidance on allocation under Article 10c[321] ensure that allocation for heat and electricity are clearly separated by using the same formula for attributing emissions to both products.

- A double support between compensation for direct CO_2 costs (by free allocation) and for indirect CO_2 costs (see section 3.5) is excluded by the definition of electricity benchmarks in the state aid guidelines. For carbon leakage exposed sectors with benchmarks taking into account exchangeability of electricity and heat, support for indirect costs can only be granted for the exchangeable fraction not yet covered by free allocation.
- A double subsidy by support from the NER 300 funding (see section 3.8) is unlikely, because only technologies are supported by the NER 300 which are not yet economically viable.

3.4.8 Conclusions

Regarding **relevance**, the evaluation first focussed on whether evidence can be found for actual carbon leakage. The difficulty in any such evaluation, however, lies in the need to establish a causality link between relocation of production and asymmetric climate policies. This difficulty remains unresolved based on current findings. The results of the evaluation suggest that carbon leakage has not occurred in the first two phases of the EU ETS. However, this does not necessarily mean that CL might not happen in the future. There are also studies that argue that the risk of CL needs to be studied over a longer timeframe.

As of Phase III, it remains to be seen how free allocation may have safeguarded against negative impacts on competitiveness and whether the allocation rules have the potential to further prevent or at least reduce the risk of carbon leakage. Carbon leakage will be of lesser concern if extra-EU competitors put in place similar policies. Although there is a growing and encouraging number of jurisdictions implementing or considering carbon markets or taxes, according to the evaluation it is too early to use them as argument that carbon leakage is not relevant any more.

Most importantly, the found absence of evidence of carbon leakage may be caused by the low CO_2 price observed for much of the period covered in the evaluation. Furthermore, stakeholders are still claiming that there is a continued need to prevent carbon leakage. It is therefore advisable to continue to observe if evidence for CL occurs in the future.

The evaluation on **effectiveness** starts with checking if the current CL criteria in the EU ETS Directive are capable of identifying those sectors (and only those)

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[320] Commission Decision 2011/278/EU and related guidance documents, see http://ec.europa.eu/clima/policies/ets/cap/allocation/documentation_en.htm

[321] Commission Decision of 29 March 2011 on guidance on the methodology to transitionally allocate free emission allowances to installations in respect of electricity production pursuant to Article 10c(3) of Directive 2003/87/EC (C(2011) 1983). Download under: http://ec.europa.eu/clima/policies/ets/cap/auctioning/documentation_en.htm (lower part of the page dealing with "Commission Decisions on transitional free allocation for electricity generators")

which are at genuine risk of carbon leakage. Some authors link CL to the ability of industry to pass costs on to their customers. Most sectors are found to be able to pass-through considerable amounts of costs, although quantitative findings differ between different studies. Ability to pass-through CO_2 costs should therefore not be the only criterion for CL, in particular because it is difficult to robustly quantify empirically. However, it shows that a differentiation of sectors based on pass-through ability would be justified in order to avoid windfall profits from free allocation.

The EU ETS currently uses two criteria for identifying sectors at risk of CL: (i) Carbon intensity: This criterion shows good correlation with a “vulnerability score” developed by a group of researchers based on interviews of managers of EU ETS installations. (ii) Trade intensity: Several authors find that this criterion (in particular when used as only criterion) was not useful, and should be discarded.

In a next step, the evaluation focussed on the effectiveness of free allocation to reduce the risk of carbon leakage: With current allocation rules and CL criteria, free allocation is found to be at a level high enough so that several important sectors would not meet the Directive’s CL criteria anymore, because the CO_2 costs are actually significantly reduced by the provision of free allocation. The fact that the CL risk is further reduced can be concluded from the finding that some part of the CO_2 costs can be passed on to customers by industry. Exceptions are sectors where trade intensity is the decisive CL criterion. It must be noted that this conclusion applies at the level of the whole sector, while in case of individual installations there may exist exceptions to that rule.

Efficiency: First, the impact on auction revenues for Member States as the biggest impact of free allocation was evaluated: Some studies indicate that the windfall profits of industry as a result of free allocation rules could have been in the range of one billion Euros in 2013. Consequently the same amount can be considered an annual loss of auction revenues for Member States which could be avoided without negative impact on industry’s CL risk. With increasing carbon prices, these losses will proportionally increase in the future.

Secondly, potential distortions of the CO_2 price signal were considered: Summarising the findings in literature, it can be concluded that free allocation does distort the CO_2 price signal to some extent, despite the theoretical independence between allocation method and abatement behaviour. This means that overall achievement of the GHG emission reductions as defined by the cap could be achieved at lower cost if no allocation were granted for free. However, a quantification of this effect has not been found.

Finally, administrative costs of free allocation were evaluated as indicator for efficiency: The administrative costs for the free allocation under current rules are estimated to be less than 1 % of the value of allowances allocated. It is assumed that the order of magnitude is similar or lower compared to the costs in the first phases, and expected to decline in the future. The costs are considered to be at a reasonable order of magnitude. For completeness reasons it has also been determined that costs are much lower for ex-ante allocation rules than for an ex-post allocation system.

Regarding **EU-added value**, the third trading phase has brought full EU-wide harmonisation of allocation rules. The EU ETS Directive thus ensures an unprecedented level playing field for industry across the EU, such that the alloca-

tion for identical installations is now identical in every Member State. Clearly, this could not have been achieved by national legislation only.

Coherence: Although free allocation is an exception to the ‘polluter pays’ principle enshrined in the Treaty on the functioning of the EU, this is at least partly alleviated by the fact that opportunity costs are still faced by EU ETS operators, and the exception has been justified for avoiding carbon leakage. As shown under “efficiency”, free allocation features some potential for distorting the CO_2 price signal, i.e. for making the EU ETS less cost efficient. However, the overall goals of the EU ETS are not affected by free allocation. Double subsidies due to free allocation and other measures are unlikely. Thus the internal coherence of the EU ETS is found to be a given.

3.5 Support for indirect CO_2 costs

3.5.1 Introduction

Article 10a(6) of the revised EU ETS Directive gives Member States the possibility to compensate energy-intensive sectors exposed to a significant risk of carbon leakage for increases in electricity costs resulting from the EU ETS-induced CO_2 costs for emissions in the electricity sector (hence "indirect CO_2 emissions"). This compensation can be provided through national state aid support schemes. In accordance with the requirements of this Article, the Commission has published guidelines[322] (hereinafter referred to as "the Guidelines") to ensure that such measures are undertaken in conformity with the EU's state aid rules in the field of the environment. As for all national state aid schemes, they have to be approved by the Commission in accordance with Article 108 of the Treaty on the Functioning of the European Union before any aid may be granted. It must be noted here that the state aid for compensating for indirect CO_2 costs is not a measure of the EU ETS Directive itself, and can therefore be granted to installations not themselves covered by the EU ETS.

The evaluation analyses what factors or circumstances in the Member States could explain the decision to implement the option of indirect cost compensation or not. Following the intervention logic, several factors are analysed whether they may have influenced such decisions (section 3.5.4). Thereafter the evaluation questions are addressed.

3.5.2 Uptake by Member States

Six Member States currently make use of the possibility pursuant to Article 10a(6): Belgium (only in the Flanders region), Germany, Greece, Spain, the Netherlands and the United Kingdom. In addition Norway also makes use of this measure.

All those States have defined a fixed annual budget for this compensation, or – as in Greece and in the Netherlands – have defined a price formula based on actual CO_2 prices that will determine the budget. The maximum aid amount payable per installation will be calculated according to the two formulae outlined in point 27 of the Guidelines, taking into account:

- an EU-wide electricity consumption efficiency benchmark;
- a Member State specific CO_2 intensity of the electricity mix; and
- the maximum aid intensities as set out in point 26 of the Guidelines, being 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.

The actual aid paid per installation may be lower if the total request for support is higher than the available budget. The aid intensities are then proportionally lowered. Table 7 provides details on the budgets reserved, the assumptions

[322] Commission Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 OJ C 158, 05.06.2012, and modified by Communication 2012/C 387/06, OJ C 387, 15.12.2012. Download under http://ec.europa.eu/competition/sectors/energy/legislation_en.html

used to calculate the compensation and the eligibility of sectors that may apply for the compensation in each of the six MS that adopted the indirect cost compensation measure.

Table 7: Details on the indirect cost compensation in the six Member States that adopted the measure.

	Belgium (Flanders)	**Germany**	**Greece**	**Spain**	**NL**	**UK**
Budget	Set by auction revenue, estimated to be between 7 and 113 M€, based on a CO_2 price assumption between 1 and 15 €/t CO_2 1)	2013: 350 M€ 2014: 203 M€ 2015: 203 M€	Set by auction revenue, estimated to be between 14 and 20 M€, based on a CO_2 price assumption between 5 and 7.5 €/t CO_2. 2)	Total 2013-2015: 5 M€ Indicative annual budgets: 2013: 1 M€ 2014: 1 M€ 2015: 3 M€	78 M€ for 2014; 50 M€ for 2015 3)	GBP 50M for 2014; same for 2015
Main basis for CO_2 price calculation (€/tCO_2)	Based on the maximum regional emission factor of 0.76 tCO_2/MWh, as provided by the Guidelines	Based on the maximum regional emission factor of 0.76 tCO_2/MWh, as provided by the Guidelines	N/a	N/a (but indicated to be lower than 6 €/t)	8 €/ tCO_2 3)	GBP 33.14 GBP/ tCO_2 4)
Eligibility	All annex II sectors 5) with electricity consumption > 1 M kWh/yr	All annex II sectors	All annex II sectors	All annex II sectors	All annex II sectors with electricity consumption > 1 M kWh/yr	All annex II sectors with sum of EU ETS and the costs of the Carbon Price Floor[323] in 2020 at least 5% of GVA.

1) The budget is set by the revenues coming from the auctioning of the Belgian emission allowances. The revenues allocated to Flanders will fund the measure. The annual budget is estimated to be between 7M€ with a CO_2-price of 1 €/t CO_2 to 113M€ with a CO_2-price of 15 €/t CO_2.

2) The budget will be set by the revenues coming from the auctioning of Greek emission allowances. The annual budget is estimated to be between 14 M€ with a CO_2 price of 5 €/t CO_2 to 20 M€ with a CO_2 price of 7.5 €/t CO_2.

3) The budget is based on the CO_2 price of the year n-2. For the budget year 2014 this was based on the CO_2 price for the year 2020 of 8 €/t CO_2.

4) This is equal to 19.22 GBP/MWh, which is the adjusted price forecasted for 2020 in the context of the Carbon Price Floor (CPF) and based on the regional emission factor of 0.58 t CO_2/MWh for the UK.

5) "Annex II" refers to Annex II of the Guidelines.

[323] The Carbon Price Floor is a charge set by the UK government on carbon emissions on top of the allowance costs.

3.5.3 Intervention logic

- Objectives:
  - Reduce the risk of carbon leakage for electricity-intensive sectors or sub-sectors due to CO_2 costs passed on in electricity prices;
  - Ensure that any related measures apply without distortion of competition, including for sectors outside the EU ETS;
  - Ensure that a compensation scheme does not waive incentives for energy efficiency.
- Actions:
  - Provide the option to compensate the most electricity-intensive (sub-) sectors for increases in electricity costs resulting from the EU ETS;
  - Ensure a level playing field by providing environmental state aid guidelines covering this compensation scheme. Apply a benchmark-based system in those rules for maintaining an environmental improvement incentive.
- Expected and intended results/impacts:
  - The indirect costs for energy-intensive industries as a result of the EU ETS are limited, so that the carbon leakage risk is reduced;
  - Member States applying this option will face costs to provide the funds for the indirect cost compensation.
- Unintended results/impacts:
  - Administrative costs will occur with Member States that apply this measure and with the Commission Services to assess the proposed compensation;
  - Different choices among MS to implement the indirect cost compensation measure may negatively impact the level playing field within a sector.

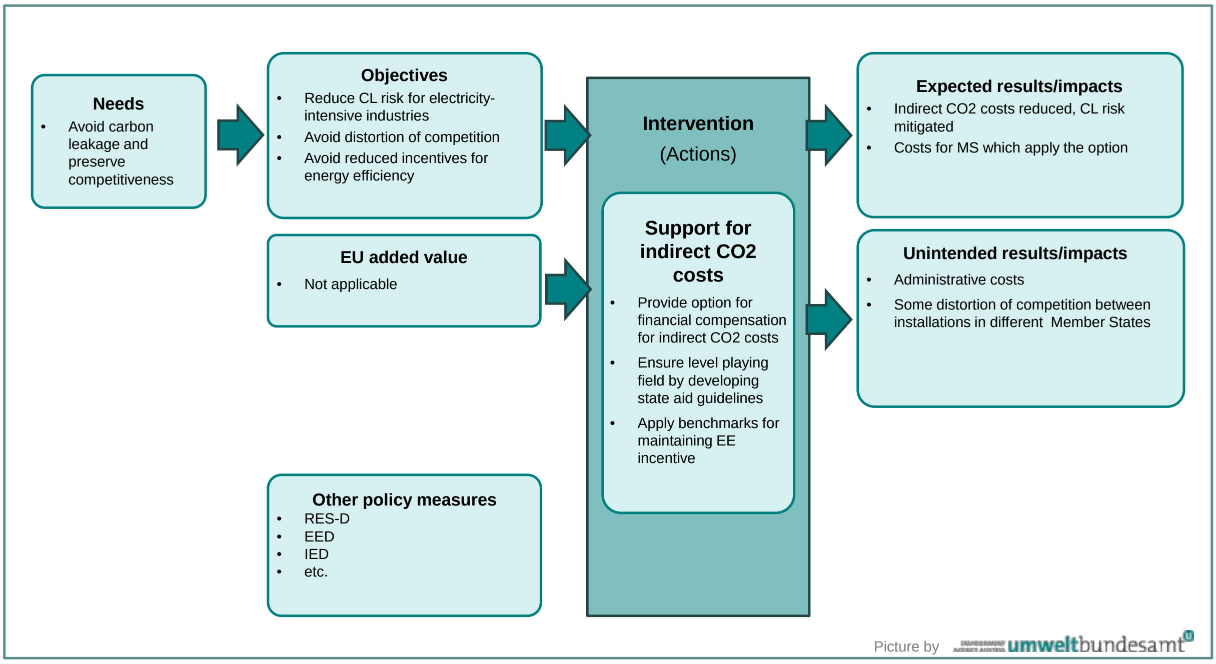

Figure 29: Intervention logic for the evaluation area "indirect CO_2 cost compensation"

3.5.4 Identifying potential factors to explain the choices for applying the option of indirect cost compensation

The possibility of indirect cost compensation was introduced in the EU ETS Directive to give Member States the possibility to compensate the most energy-intensive[324] sectors for increases in electricity costs resulting from the ETS (even if they are not covered by the EU ETS). This should mitigate the potentially negative impact of the EU ETS on the competitive position of these sectors, and thereby reduce their risk of carbon leakage including sectors where free allocation of allowances might not be applicable or not sufficient. Whether cost compensation is provided, and what level of support is provided, is up to the Member State to decide, provided it complies with the criteria defined by the European Commission. Six out of 28 Member States decided to propose measures for indirect cost compensation, all of which were approved by the Commission as compliant with the EU State Aid rules. In this evaluation it is analysed which factors or circumstances in the Member States could explain the choice on whether or not to implement a compensation scheme.

The following factors are analysed:

- **The level of electricity prices** in the six Member States that adopted the measure. Are the electricity prices for energy-intensive industry in these MS particularly high compared to neighbouring countries and the EU average, or is the impact of CO_2 costs on the electricity price in these Member States particularly high?
- **The increase in electricity prices**. Did the level of electricity prices for EII (Electricity-Intensive Industries) in these Member States increase at a stronger rate due to the EU ETS than in the other Member States? How do these price increases compare against purchase power developments?
- **The level of taxes on electricity.** Are energy-related tax levels for energy-intensive industry in these six Member States particularly high?
- **Share of energy-intensive industry.** Is the share of EII in these Member States particularly high compared to the share in other Member States, thus requiring special governmental action to protect their economy?
- **Political considerations**. Are there any political considerations identified which may explain why these six Member States have adopted the measure while other Member States have not made use of indirect cost compensation?

The level of electricity prices

Making a comparison of electricity prices for energy-intensive industry is not straightforward for various reasons. Important limiting factors include:

- Electricity prices for energy-intensive industry are not published. These prices are the result of bilateral contract negotiations with electricity suppliers, depending on the procurement and purchasing structure. The wholesale market prices for medium-sized industry (as available from Eurostat) may serve as an indication of the final prices, but large energy-intensive industry may have

[324] Because the indirect cost compensation is only relevant for electricity as energy input, in this chapter “energy-intensive industries” (EII) should be read as “electricity-intensive industries”.

a buyer-side market power which could result in purchase prices that are lower than the wholesale market prices and certainly result in a large differentiation in electricity prices for EII, as illustrated in Figure 30 below.

- Electricity prices consist of various price components in addition to the wholesale price. This includes retail price components such as sales costs, network costs for transmission and distribution, and taxes and levies. Whereas the wholesale electricity price is relatively similar for all types of consumers, the other price components largely differ between types of consumers. Energy-intensive industry pay significantly lower network costs as they are connected at a higher voltage level.
- Furthermore EII are largely exempt from some of the levies and taxes, with the main reason to protect their competitive position.

To provide a first-level understanding on the differences in electricity prices across Europe a comparison is made of the electricity prices for medium-sized industrial consumers as published by Eurostat. It should be noted that these data are not sector specific and are calculated for a standard medium-size industrial consumer with an annual consumption between 500 and 2 000 MWh. Comparison of the price levels in the six Member States that applied the indirect cost compensation against the EU-28 average does not provide a full explanation on the implementation choices made (see Figure 31). In the UK, Spain and Greece price levels are much higher than the EU-28 average, so this may explain the choice made in these countries. Price levels in the Netherlands and Germany, however, are much lower than the EU average while these two countries have decided to implement the indirect cost compensation measure.

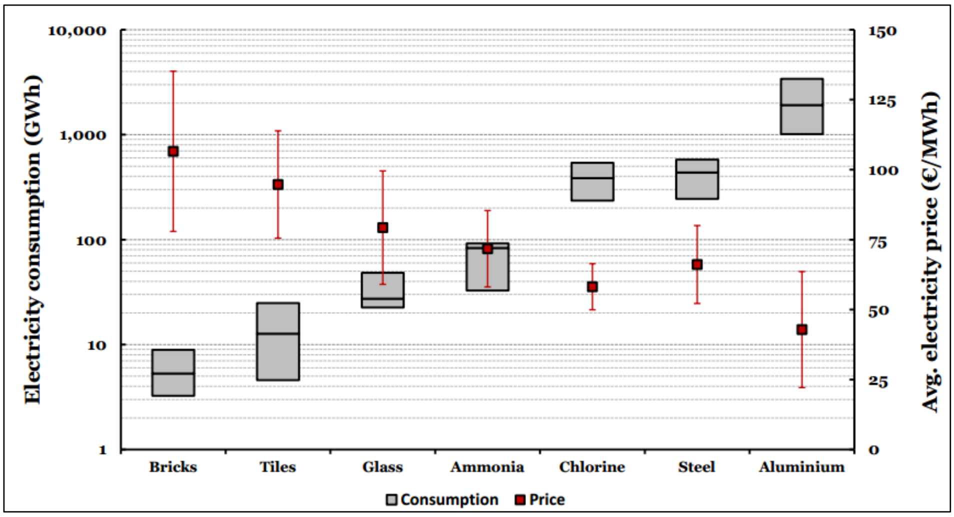

Figure 30: Electricity consumption and price variations grouped by sector (based on interviews with 89 facilities). Source: CEPS (2014)[325]

[325] CEPS (2014) "Composition and drivers of energy prices and costs in energy intensive industries", Brussels, 2014, Download under: http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=7238&lang=en&tpa_id=1020&title=Study-on-composition-and-drivers-of-energy-prices-and-costs-in-energy-intnsive-industries

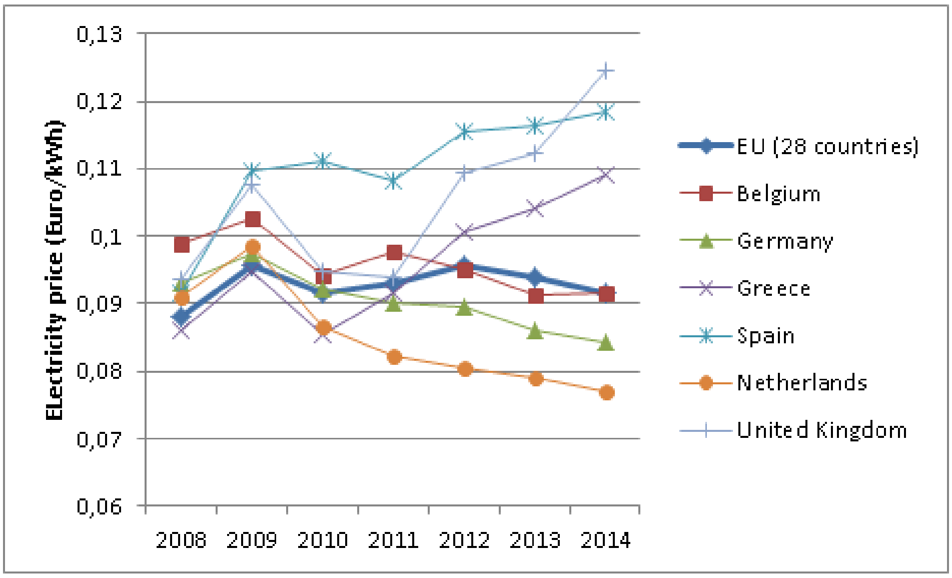

Figure 31: Electricity prices in € per kWh for medium-sized industrial electricity consumers in the first half year of 2013. Source: Eurostat, data code ten00117.

The increase in electricity prices

Figure 31 also illustrates that the price development of electricity for medium-sized industrial consumers largely varies across Europe. On average for the EU-28 price developments were not that large, but significant changes occurred in many countries, as is illustrated in Figure 32. Prices in Spain, Germany and Greece increased, whereas prices in Belgium and the UK were relatively stable and prices in the Netherlands decreased since 2009.

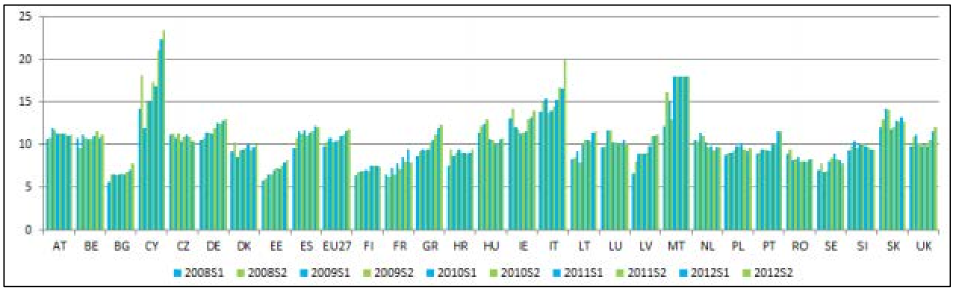

Figure 32: Evolution of retail electricity prices for medium-sized industrial consumers(in € cents / kWh, excluding taxes and levies and excluding tax exemptions). Different bar colours relate to semesters of the years 2008 to 2012. Source: European Commission[326]

[326] "Energy prices and costs report", Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2014) 21 /2, and SWD(2014) 20 final/2. Download under http://ec.europa.eu/energy/sites/ener/files/documents/20140122_communication_energy_prices_1.pdf and https://ec.europa.eu/energy/sites/ener/files/documents/20140122_swd_prices.pdf

When comparing the price developments against producer price changes, also a mixed picture occurs. In the UK and the Netherlands the electricity price changes were smaller than the changes in the producer price index (PPI; measuring inflation), in Spain and Belgium the changes were comparable, whereas in Greece and Germany electricity prices increased at a much faster rate than the PPI. A comparison of the developments in neighbouring countries does not provide a clear explanation as to why these specific six MS chose to implement the indirect cost compensation measure and their neighbouring countries did not.

Table 8: Comparison of producer price index changes and electricity price changes, 2008-2012

	BE	DE	EL	ES	NL	UK	BU	FR	PL	PT
Electricity price change (%)	15	20	33	12	-7	8	20	28	27	22
PPI change (%)	14	5	13	11	+8	16	16	4	7	17

Source: EC (2014)[326]: Energy prices and costs report.

Note: Electricity price changes for medium-size industry (annual consumption between 500 and 2 000 MWh) net of taxes and levies. PPI change is the changes in producer price index, a measure for inflation.

Share of energy-intensive industry

As of 2011 the EU dominates the export market for energy-intensive goods, accounting for more than two-thirds of export value and making it the largest export region for energy-intensive goods in the world[326]. The share of manufacturing in total Gross Value Added (GVA) in the EU-28 has steadily decreased, from 19% in the year 2000 to 15% in 2013. This decreasing share has been an element of worry for many MS governments (see also the following section). A large share or a large reduction in the six MS that have applied the indirect cost compensation measure could be an explaining factor for the choices made regarding the implementation of the measure. This is however not the case, as is illustrated in Figure 33, with Germany being the only one of the six countries that has a higher share than the European average.

Another possible explaining factor would be the share of energy intensity in EII. The share of energy costs in total costs is particularly high for EII. Particularly in times of economic crisis and decreasing share of industry in total GVA this may be a concern. However, the data on this share of energy intensity per MS again do not explain why it was the six MS choosing to implement the measure and not other MS. Figure 34 illustrates that energy intensity in the UK, Germany and Spain were below the EU-28 average, while in the Netherlands, Greece and Belgium it was above the EU-28 average.

As a final possible explaining factor we analyse the share of EII in total domestic electricity consumption (Figure 35). Again data shows that this cannot explain the exact selection of the six MS applying the indirect cost compensation, especially not for the UK which is among the countries with the lowest share of electricity consumption in EII. Spain is close to the average of the EU-28, whereas the other countries that have implemented the measure for indirect cost compensation have a relatively high share of electricity consumption in EII.

Note that for Flanders no conclusion can be drawn on the basis of these data, since the economic structure of Flanders is quite different than shown for Belgium as a whole.

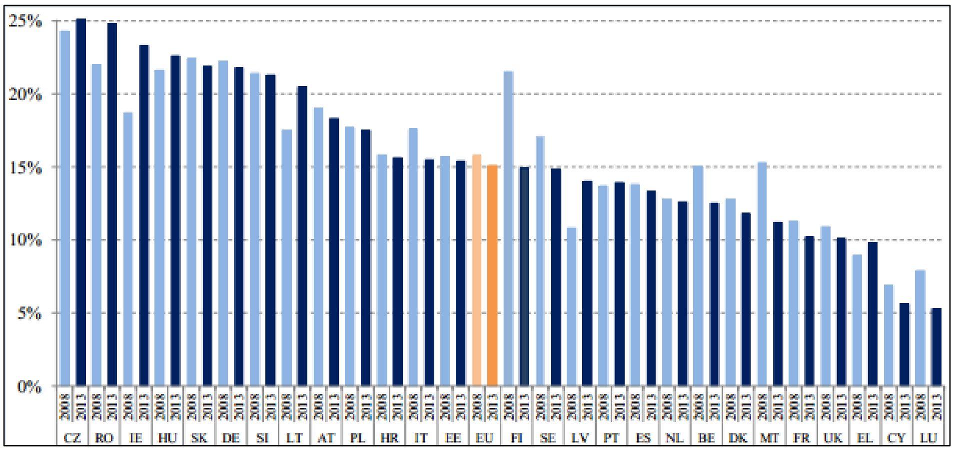

Figure 33: Manufacturing as a percentage of gross value added (2008 and 2013) Source: European Commission[327].

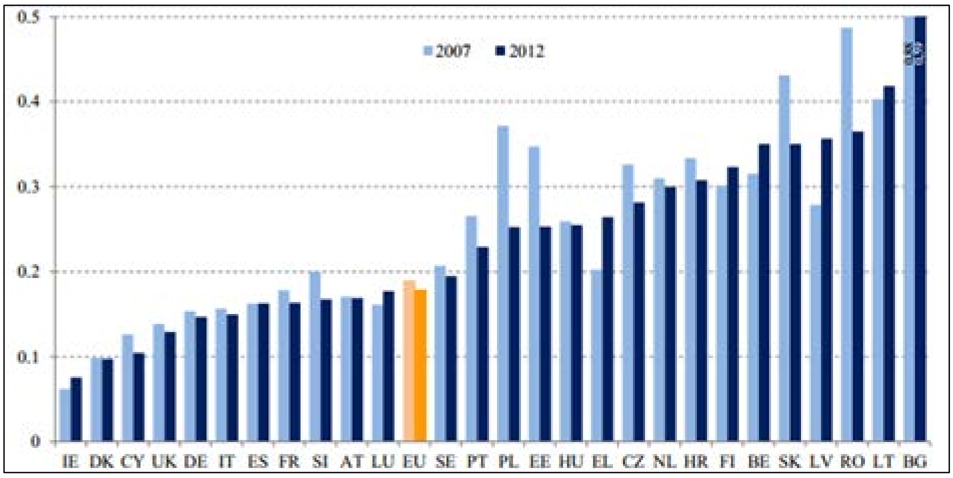

Figure 34: Energy intensity in EII: ratio between energy consumption and total gross value added in the energy sector and industry (in kg of oil equivalent per Euro of gross value added). Source: European Commission[327].

[327] "Reindustrialising Europe. Member States' Competitiveness Report 2014", Commission staff working document, SWD(2014) 278. Download under http://ec.europa.eu/growth/industry/competitiveness/reports/ms-competitiveness-report/index_en.htm

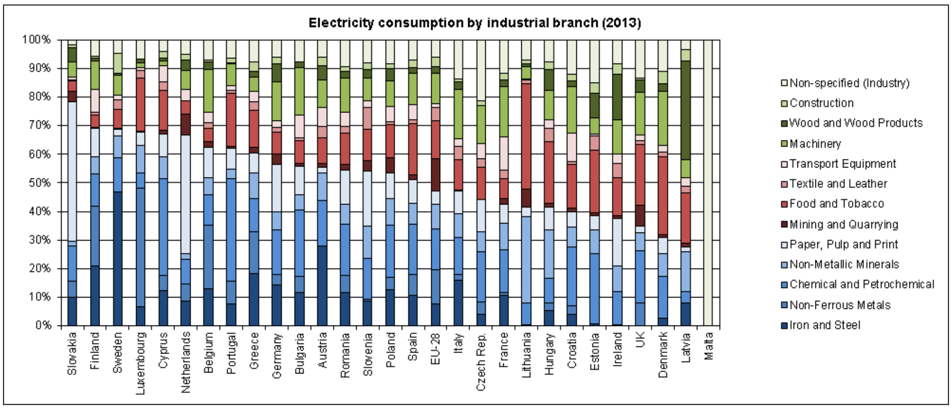

Figure 35: Electricity consumption by industrial branch and Member State. Source: Eurostat (2014), data series [nrg_110a].

Political considerations

In many EU Member States energy intensive industries have a strategic position in the economic value chain. Even though the analysis has so far not provided a conclusive evidence for the implementation of the indirect cost compensation measure across Member States, it may still very well explain why selected governments may have been concerned on matters that may influence the competitive position of their national EII sector, such as the indirect costs of the EU ETS. Below some arguments are provided that may explain the position of the six relevant governments.

The economies of Germany, the Netherlands and Belgium are strongly connected. Statistics on the countries' trade balances show that the Netherlands is Germany's largest trade partner. For Belgium, Germany and the Netherlands are its two most important trade partners, while for the Netherlands this is Germany and Belgium. Industry consequently actively compares its energy costs with those of the two neighbouring countries, also since there is quite some similarity in the economic structure and therewith strong competition among companies from specific sectors. Moreover, the electricity markets between these countries are strongly connected. On average wholesale market prices for electricity in Belgium are usually higher than in the Netherlands, where prices in turn are a bit higher than in Germany. Prices are however converging, especially between Germany and the Netherlands. Consequently it may be concluded as a logical step that when one of these Member States applies for a compensation for electricity costs, the other two Member States would do the same.

Indeed, these three Member States have implemented the indirect cost compensation measure. The Flemish government explicitly mentioned in its impact assessment for the indirect cost compensation measure that energy costs are an important determinant of the competitive position of industry and that the measure for indirect cost compensation is required to be adopted since the UK, the Netherlands and Germany plan to adopt the measure and hence that the national energy-intensive industry needs to be protected[328]. No public docu-

[328] "Reguleringsimpactanalyse voor ontwerp van besluit van de Vlaamse Regering tot toekenning van steun aan ondernemingen ter compensatie van indirecte emissiekosten", Vlaamse regering, 2013, VR 2013 1406 DOC.0596/3.

ments have been found on impact assessments made by the German and Dutch governments for the indirect cost compensation measure. The German BMWi[329] does refer to a background study being available, but via the internet only a summary could be retrieved[330]. This summary focuses on the need to protect jobs and foster competitiveness of the EII. The summary does mention that the measure aims to support growth and to provide incentives for future investments, and refers to the first positive signal that a large company mentioned a new future investment for an aluminium plant in Germany in relation to the availability of this indirect cost compensation being available.

Greece is experiencing difficult economic times, more severe than the average Member State in Europe and has made a priority of improving the competitive position of its EII. This is for example illustrated by the fact that during the Greek Presidency of the European Union (the first semester of 2014) Greece made the "Industrial Renaissance" communication a priority and emphasised the need to address the high costs of energy in Europe. The Greek power market is characterised by a small number of market actors, a high carbon intensity of electricity generation resulting from the high share of domestic lignite power production and a small net share of electricity imports. Implementing the indirect cost compensation measure matches with this situation and the objectives to protect the competitive position of the EII. Kathimerini[331] reports on the study conducted by IOBE[332] on the risks of carbon leakage, which seems to use as a starting point that the EII have to be protected from the risk of bankruptcy and consequently argues that indirect cost compensation is required.

In Spain both the electricity prices and the network charges for industry are higher than those for its direct competitors located in other countries. The Spanish electricity sector was characterised for many years by a high share of subsidised coal-based generation, but since January 2015 the subsidies have been phased out. Electricity prices are consequently expected to increase. Various industrial organisations have actively published their needs for indirect cost compensation and protested when the resulting budget reservations were much smaller than anticipated and also much smaller than similar budgets reserved for example in Germany. Whereas the Spanish proposal for applying the cost compensation was approved under state aid guidelines and the corresponding budget was included in the national state budget, the compensations for the years 2013 and 2014 are reported to have not been paid out yet.

In the UK electricity prices for industry are among the highest in Europe, which negatively influences the competitive position of its EII. In addition the UK intro-

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[329] Federal ministry for economic affairs

[330] “Hintergrundpapier zur sog. Strompreiskompensation (Stand 6.12.2012)”, Download under https://www.bmwi.de/BMWi/Redaktion/PDF/S-T/strompreiskompensation-hintergrundpapier,property%3Dpdf,bereich%3Dbmwi2012,sprache%3Dde,rwb%3Dtrue.pdf

[331] “IOBE: business exposed to carbon leakage”, Kathimerini, 2013, Download under http://www.kathimerini.gr/57369/article/oikonomia/epixeirhseis/iove-ekte8eimenes-ston-kindyno-diarrohs-an8raka-oi-epixeirhseis-deixnei-ereyna

[332] IOBE is the Greek Foundation for Economic and Industrial Research. In the study IOBE analyses the risk of carbon leakage as a result of indirect emission costs for three carbon price scenarios (5, 15 and 25 € / tCO_2). Particular emphasis is given to the risk of job losses and reduced tax revenue as a result of EII businesses going bankrupt when carbon costs would further increase the costs of energy. The study points out that approximately 20% of turnover in EII is generated by industries that are currently in risk of bankruptcy. It concludes that the avoided losses outweigh the costs for the indirect cost compensation and therewith that the compensation is justified.

duced the "Carbon Price Floor", i.e. a charge on emissions on top of the allowance costs, which is significantly higher than the current price of EU allowances. This brought about another competitive disadvantage to the UK's industry. In this light the indirect cost compensation measure may be seen as a means of limiting this potential disadvantage. In preparation of deciding on the implementation of the indirect cost compensation measure the UK government had issued a study to compare electricity costs for EII in various countries, and to identify cost compensations from energy and climate policies. The study was however not published and a copy could not be obtained.

3.5.5 Relevance

The relevance of the measure for indirect cost compensation is evaluated on the basis of the following questions:

- Is there evidence that electricity prices for industry have increased due to electricity companies passing through the (opportunity) costs of the EU ETS?
- To what extent do the objectives of Article 10a(6) correspond to the needs of the energy and climate policy framework?
- More specifically, to what extent do indirect CO_2 costs contribute to the risk of carbon leakage determined in accordance with Article 10a(13)-(18)?

In the first years of the EU ETS the power prices on the wholesale electricity market showed a sharp increase. The electricity price developments seemed to coincide with price developments on the market for carbon allowances. This led to a large number of empirical studies that provided evidence to support the economic theory that power companies were including the opportunity costs of EUAs in their prices and therewith passed on to the customers[333]. The exact pass-through rate is not easy to determine. Sijm et al.[334], for example, concluded that the pass-through rates in the UK and the Netherlands were between 60 and 100 percent. Fabra and Reguant[335] demonstrate a factor of 80 percent for the Spanish market. Huisman and Kilic[336] show that the cost pass-through rates are not constant and vary over time, using data from the UK and German markets. Zachmann[337] found evidence of pass-through in Germany and also con-

[333] On cost pass-through and windfall profits on respectively the Finnish, the UK and the Dutch market see for example:
J. Honkatukia, V. Malkonen, A. Perrels, "Impacts of the European emission trade system on Finnish wholesale electricity prices", VATT Discussion Paper 405, Government Institute for Economic Research, Helsinki, 2006. **https://www.vatt.fi/file/vatt_publication_pdf/k405.pdf**
M. McGuinness, A.D. Ellerman, "CO_2 Abatement in the UK Power Sector: Evidence from the EU ETS Trial Period", Working paper, Massachusetts Institute of Technology, Center for Energy and Environmental Policy Research, 2008. **http://dspace.mit.edu/handle/1721.1/45654**
Frontier Economics, "CO_2 trading and its influence on electricity markets. Final report to DTe", Frontier Economics Ltd, London, 2006. **https://www.acm.nl/nl/download/bijlage/?id=8246**

[334] J. P. M. Sijm, K. Neuhoff, Y. Chen, "CO_2 cost pass through and windfall profits in the power sector", Climate Policy 6 (Special Issue: Emissions Allocation and Competitiveness in the EU ETS), p49–72, 2006. **http://www.eprg.group.cam.ac.uk/wp-content/uploads/2008/11/eprg0617.pdf**

[335] N. Fabra, M. Reguant "Pass-Through of Emissions Costs in Electricity Markets", 2013. Available at **https://www.aeaweb.org/articles.php?doi=10.1257/aer.104.9.2872**.

[336] R. Huisman, M. Kilic, "Time Variation in European Carbon Pass-Through Rates in Electricity Futures Prices", Erasmus School of Economics, 2014. Download at: **http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2500135**

[337] G. Zachmann, C. von Hirschhausen, "First Evidence of Asymmetric Cost Pass-through of EU Emissions Allowances: Examining Wholesale Electricity Prices in Germany", DIW discussion pa-

cluded that pass-through is asymmetric: increasing EUA prices have a stronger impact on wholesale electricity prices than decreasing EUA prices. Various papers confirm impacts for the EII, including Alexeeva-Talebi[338] for the European Petroleum Markets and Walker[339] for the cement sector. Most of the empirical evidence concerns the first phase of the EU ETS, but Solier and Jouvier[340] demonstrate that pass-through at least also occurred in some countries over the years 2008 and 2010 (but not in 2009).

The intention of Article 10a(6) is to mitigate the risk of carbon leakage for the EII. This has no direct relation to the objectives of the energy and climate policy within the EU, except an indirect relation to the objective of decarbonisation of the economy in terms of Article 10a(6) potentially avoiding EII to shift some activities to other regions which would then lower the amount of emissions in Europe, but increase emissions in the other regions. Thus Article 10a(6) does have a direct relation with objectives of the EU ETS such as to reduce emissions in EII while limiting the costs to achieve the targeted reductions. To understand whether, and if so, to what extent the indirect costs impact the risk of carbon leakage we compare the direct and indirect costs of carbon emissions per type of industry.

Figure 36, taken from The Carbon Trust[341], shows the direct and indirect costs of CO_2 per type of industry in the UK. The light blue bars show the direct cost of emissions based on an allowance price of 20 €/t CO_2. The dark blue bars show the indirect cost of carbon paid through higher electricity prices based on a price of 10 €/MWh at an allowance price of 20 €/t CO_2. From the graph it may be concluded that for some industries, such as aluminium, the indirect costs are significant in comparison to the direct costs and therewith compensation of such indirect costs are relevant in terms of preventing carbon leakage for that sector. For other EU ETS sectors such as lime, cement and basic iron and steel this is however not the case. The figure is drawn only for the UK[342], and for a single year. However, it is assumed that conclusions would not be very different for other Member States and for other years, since the level and improvement of energy intensity of EII in Europe are reasonably comparable across Europe, and at least do not differ that strongly that it would significantly impact the ratio between direct and indirect costs.

per 708, 2007. Download under: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.449.2800&rep=rep1&type=pdf

338 V. Alexeeva-Talebi, “Cost Pass-Through of the EU Emissions Allowances: Examining the European Petroleum Markets”, Discussion Paper No. 10-086, 2010. Download under: ftp://ftp.zew.de/pub/zew-docs/dp/dp10086.pdf

339 N. Walker, “Concrete Evidence? An Empirical Approach to Quantify the Impact of EU Emissions Trading on Cement Industry Competitiveness”, University College Dublin, PEP 06/10, 2006. http://www.ucd.ie/gpep/publications/archivedworkingpapers/2006/06-10.pdf

340 B. Solier, P-A. Jouvet, “An overview of CO_2 cost pass-through to electricity prices on the European market”, Paris-Dauphine University, CDC Climat, working paper series 2011-08, 2011. http://www.chaireeconomieduclimat.org/wp-content/uploads/2015/07/11-07-12-WP-2011-8-Jouvet-Solier.pdf

341 “EU ETS impacts on profitability and trade A sector by sector analysis”, Carbon Trust, 2008, download under: https://www.carbontrust.com/media/84892/ctc728-euets-impacts-profitability-and-trade.pdf

342 A similar picture, although with some different assumptions, for the EU-28 is given in Figure 21 (p. 124).

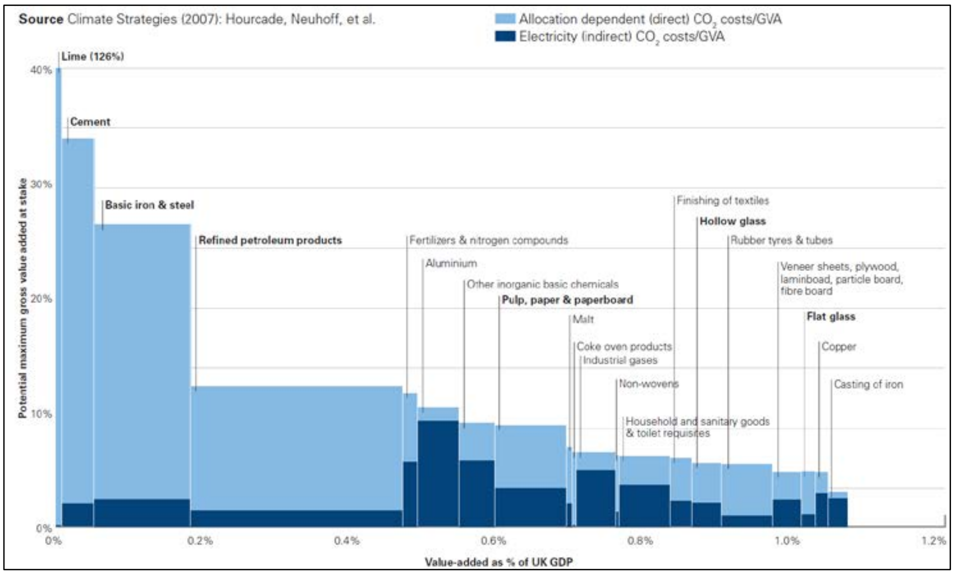

Figure 36: Comparison of direct and indirect costs of carbon emissions based on UK data. Source: Sato et al.[343]

3.5.6 Effectiveness

The effectiveness of the measure for indirect cost compensation is evaluated on the basis of the following questions:

- To what extent did the Directive incentivise the establishment of indirect cost support schemes? To what extent would that have happened without the Directive?
- To what extent have the Member States' choices on implementing the indirect cost compensation measure helped prevent carbon leakage for the sectors concerned? Would this conclusion have been different if carbon prices had been significantly higher?

No information has been found on the actions that Member States would have taken in the absence of the option to implement the indirect cost compensation measure. On the one hand it may be concluded that many Member States would not have implemented other measures for the simple reason that 22 out of 28 have not implemented the measure provided for by the EU ETS Directive. On the other hand, the indication that actions could have been based on political reasons and for reasons of protecting the national electricity-intensive industry could well lead to the conclusion that the Member States that did choose to implement the indirect cost compensation would have implemented alternative measures, too. This is illustrated by the fact that many Member States have implemented energy tax exemptions for their larger industries, with the main aim

[343] Sato, M., Neuhoff, K., Graichen, V., Schumacher, K., Matthes, F. (2014). "Sectors under scrutiny: Evaluation of indicators to assess the risk of carbon leakage in the UK and Germany". Environmental and Resource Economics, 60(1), 99–124. Available from: http://rd.springer.com/article/10.1007/s10640-014-9759-y;
also found in: J.C. Hourcade, K. Neuhoff, D. Demailly, M. Sato, "Differentiation and dynamics of EU ETS industrial competitiveness impacts", Climate Strategies report, 2007, download under: http://climatestrategies.org/wp-content/uploads/2007/12/1-climatestrategies-competitiveness-final-report-140108.pdf

to protect their competitive position. Table 9 (page 171 and following) illustrates the extent of these tax exemptions, which is available by comparing the tax rates of non-business and business electricity consumers. Figure 37 pictures the differences in energy taxes for business consumers across Member States, which again does not constitute a clear correlation with the choices that Member States made on the implementation of the indirect cost compensation. Note that the four tax levels shown for the Netherlands correspond to different levels of electricity consumption. The lowest rate of 0.5 €/MWh applies to business consumers with an annual consumption of over 10 000 kWh. Most of the EU ETS participants from EII would be part of this group of consumers and therewith pay the minimum required level of excise duty taxes as required by EU regulation.

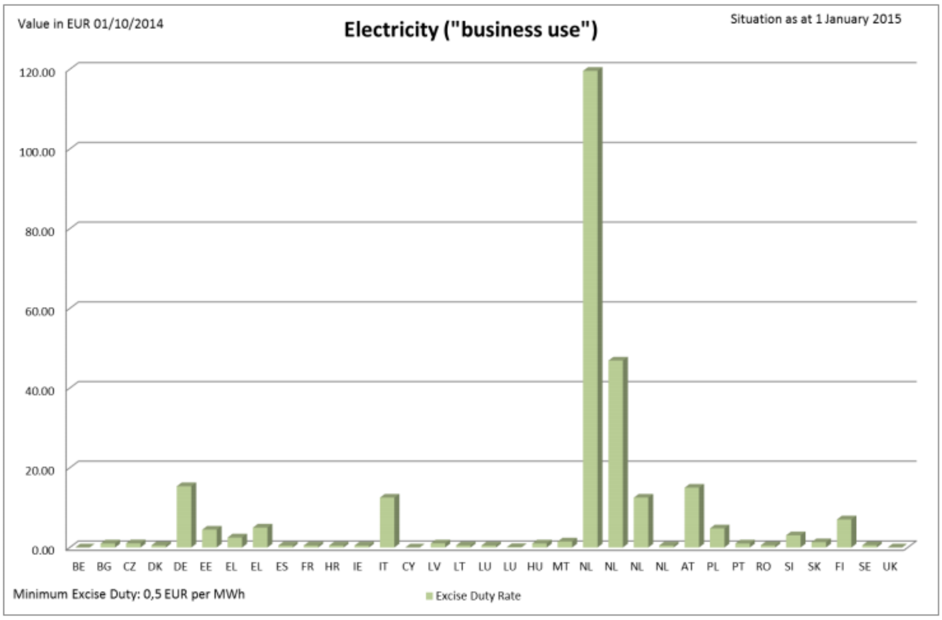

Figure 37: Energy excise duty levels for business activities in EU-28. Source: European Commission[344]

Analysis on carbon leakage in general (with focus on direct CO_2 costs) is included in section 3.4. No evidence has been found in publicly available literature whether the implementation of the measure for indirect cost compensation has helped to prevent carbon leakage. This is probably explained by the fact that the measure has only been implemented recently, and consequently little evidence exists on its impacts. Sartor[345] analysed carbon leakage in the primary aluminium sector – the most prominent electricity-intensive sector – as a result of the EU ETS between 2005 and the 2nd quarter of 2011. He concluded that there was no hard evidence that the level of the carbon price has led to carbon

[344] "Excise Duty tables. Part II: energy products and electricity", European Commission, REF 1042, January 2015; The latest status can be downloaded from DG Taxud website under: http://ec.europa.eu/taxation_customs/taxation/excise_duties/energy_products/rates/index_en.htm

[345] O. Sartor, "Carbon Leakage in the Primary Aluminium Sector: What evidence after 6 ½ years of the EU ETS?", CDC working paper 2012-12.

leakage in the primary aluminium sector[346]. He furthermore concludes that other factors, including rising primary energy prices and changes in EU competition law regarding long term contracts for electricity purchase, appear to be more important factors explaining the rise in net imports of primary aluminium and the gradual closure of a number of European primary smelters during the period of research. The author points out that the results need to be interpreted with caution, indicating that the signs of carbon leakage may not yet be visible in the aluminium sector[347]. The author points out that energy costs are one of the main explaining factors of the sector's developments – this could be seen as an implicit indication that the pass-through of carbon costs in the electricity prices actually takes place. In that respect it could be concluded that indeed some influence of indirect carbon costs on carbon leakage may exist.

Table 9: Electricity taxes for business-use and non-business use in EU-28, illustrating the level of tax exemptions for industry. Source: European Commission[344]

		Electricity							
		Business use				Non-business use			
		CN 2716				CN 2716			
Minimum excise duty adopted by the Council on 27-10-2003 (Dir. 2003/96/EEC)		0,5 EUR per MWh (Annex I of Directive 2003/96/EC)				1,0 EUR per MWh (Annex I of Directive 2003/96/EC)			
MS	National Currency	Excise duty	NatCurr	EUR	VAT %	Excise duty	NatCurr	EUR	VAT %
BE	EUR	(1)		*0	21,00			*1,9140	21,00
BG	BGN		2,00	1,00	20,00		*2,00	1,00	20,00
CZ	CZK		28,30	1,03	21,00		28,30	1,03	21,00
DK	DKK		4,00	0,54	25,00		878,00	117,95	25,00
DE	EUR			15,37	19,00		-	20,50	19,00
EE	EUR			4,47	20,00			4,47	20,00
EL	EUR	Consumers of high voltage		*2,50	13,00	Households		2,20	13,00
					13,00				
		Rest business use		5,00		Rest non-business use		5,00	13,00
ES	EUR			0,50	21,00			1,00	21,00
FR	EUR			*0,50	20,00			1,50	20,00
HR	HRK		3,75	0,49	25,00		7,50	*0,98	25,00
IE	EUR			0,50	13,50			1,00	13,50
IT	EUR			12,5*	22,00			22,70	22,00
CY	EUR			0	19,00			*0	19,00
LV*	EUR			1,01	21,00			1,01	21,00
LT	EUR			0,52	21,00			1,01	21,00
LU	EUR	> 25000 Mwh		0,50	8,00	<25000	Mwh	1,00	8,00
	**	> 25000 Mwh		0,10	8,00				

BE: Electricity business use: a federal contribution of EUR 2,5310 per MWh is collected.
BE: *See Articles 4.2 and 5 of Council Directive 2003/96/EC.
BE: (1) delivered to a final consumer connected to a transport or distributor network with a nominal tension of more than 1 kV: 0 EUR
Delivered to a final consumer connected to a transport or distributor network with a nominal tension of 1 kV or less than 1 kV: 1,9140 EUR
BG *Zero rate for electricity, used by households - article 15 (1) (h) of Council Directive 2003/96/EC.
*There is a special discount scheme for households with a consumption of more than 4.000 kWh a year. They pay 406 DKK in electricity tax instead.
EL: *The excise duty on electricity is applied from 2 May 2010. Electricity of solar, wind, wave, tidal or geothermal origin is exempted.
ES: Electricity tax has a general ad-valorem tax rate of 5,113% on a base that excludes VAT, except for cases in which this leads to a lower tax, in which minima apply. These minima are of 0,5 or 1,00, depending on its use (business/non business). Art. 10 of Council Dir. 2003/96/EC).
ES: VAT rate valid as of 1st September 2012
FR: *For the electric power subscribed superior to 250 KVA.
HR: Electricity used by households is exempted, see Article 15(1)(h) of Council Directive 2003/96/EC.
IT: for monthly consumptions until 200.000 kWh

[346] Note that this study only concerns the indirect costs of the EU ETS as a result of increase in electricity prices, since in the period under study the aluminium sector was not directly included in the EU ETS.

[347] Quoting the author: "(…) *these results need to be interpreted with caution, given that our sample period examined is relatively short and given technical constraints on short-run production shifting in this sector. It is thus possible that the signs of carbon leakage in the sector are not yet visible.*"

Table 9 (continued): Electricity taxes for business-use and non-business use in EU-28, illustrating the level of tax exemptions for industry. European Commission[344]

		Electricity					
		Business use			Non-business use		
		CN 2716			CN 2716		
Minimum excise duty adopted by the Council on 27-10-2003 (Dir. 2003/96/EEC)		0,5 EUR per MWh (Annex I of Directive 2003/96/EC)			1,0 EUR per MWh (Annex I of Directive 2003/96/EC)		
MS	National Currency	Excise duty NatCurr	EUR	VAT %	Excise duty NatCurr	EUR	VAT %
HU	HUF	310,50	1,00	27,00	*310,50	1,00	27,00
MT	EUR	MWh	*1,50	18,00	MWh	*1,50	18,00
NL	EUR	0-10.000 kWh	*119,60	21,00	0-10.000 kWh	*119,60	21,00
		10.000 - 50.000 kWh	*46,90	21,00	10.000-50.000 kWh	*46,90	21,00
		50.000 - 10.000.000 kWh	*12,50	21,00	50.000-10.000.000 kWh	*12,50	21,00
		>10.000.000 kWh	* 0,50	21,00	>10.000.000 kWh	*1,00	21,00
AT	EUR		*15 ,00	20,00		*15,00	20,00
PL	PLN	20,00	4,78	23,00	20,00	4,78	23,00
PT	EUR		1,00	23,00		1,00	23,00
RO	RON	2.37	*0,54	24,00	4.74	*1,08	24,00
SI	EUR		3,05	22,00		3,05	22,00
SK	EUR	per MWh	1,32	20,00		*-	20,00
FI	EUR		*7,03	24,00		22,53	24,00
SE	SEK	*5,00	0,55	25,00	**294,00	32,33	25,00
UK	GBP	0	0	20,00	0	0	5,00

HU: Electricity used by households is exempted, see Article 15(1)(h) of Council Directive 2003/96/EC.

for monthly consumptions upper 200.000 kWh and until 1.200.000 kWh if monthly consumptions don't exceed 1.200.000 kWh: euro 7,5 per MWh
for monthly consumptions upper 200.000 kWh if monthly consumptions exceed 1.200.000 kWh: euro 4.820

CY: *See Council Directive 2003/96/EC, Art. 4(2).
Electricity irrespective of whether is used for business or not is charged with EUR 5,00 per MWh. The income from this levy is used for providing incentives for the use of renewable sources of energy.

LV: * Exemption is applied for electricity used by households. Exemption is applied for electricity generated using renewable energy sources.

LT: Exemption is applied for electricity used by households and charitable organizations. See article 15(1)(h) of Directive 2003/96/EC.

LT: Exemption is applied for electricity generated using renewable energy sources . See article 15(1)(b) of Directive 2003/96/EC.

LU: **metallurgical processes, electrolyse and chemical reduction or mineralogical process.

NL: National rates per kWh. Rates in table per MWh; * Besides the energy tax rate as mentioned in the table there is a surcharge on this energy tax in order to finance the subsidy scheme on renewable energy since 1/1/2013. The rate of this surcharge will increase. This surcharge is not included in the mentioned rates, but is mentioned in the sheet of national taxes as a parafiscal tax. As of 1/1/2015 there is a tax reduction of 7,5 cent per kWh for locally produced sustainable electricity in the first tax bracket (0-10.000 kWh)

AT: The national tax rate is 0,015 EUR per kWh.

RO: The electricity produced from energetic renewable sources is exempted from the payment of excise duties. The regime is applying from 1st of January 2007. (Directive 2003/96/EC – Art. 15(1)(b))

SK: * Use for households is exempted.

FI: *Industry, data centers and greenhouse cultivation. Electricity used by other consumers in the business sector amount to the same rates as apply to non-business use.

FI: The rates including the strategic stockpile fee

SE: * For taxation of electricity in the manufacturing process in industry as well as agriculture, horticulture, pisciculture and forestry. Electricity used by other consumers in the business sector is taxed at the same rates as apply to non-business use.

SE: ** In northern Sweden the tax rate is reduced to SEK 194,00 (EUR 21,33) per MWh.

3.5.7 Efficiency

The efficiency of the measure for indirect cost compensation is evaluated on the basis of the following questions:

- Can the maximum support levels allowed under the state aid guidelines be considered justified (in view of the effectiveness given and the actual emission intensity of electricity production)?
- Where known at MS level, is the level of support granted justified, given the differences in electricity prices across the EU-28 and with international competitors and the risks of carbon leakage for these (sub-) sectors? Or would lower support levels be sufficient for avoiding carbon leakage in the relevant sectors?

No information could be obtained on the exact amount of support granted to specific sectors or individual installations and consequently no conclusions can be drawn on whether the levels of support are justified. However, it can be argued that the boundary conditions to the support as defined in Articles 26 and 27 of the Guidelines ensure that no excess support is given.

When comparing the electricity prices for European industry to its international peers, it can be concluded that the prices in Europe are relatively high. The IEA for example reports[348] that electricity prices for industrial consumers in Japan and Europe are on average more than twice as high as for their counterparts in the United States and that Chinese industrial consumers pay almost double the US level (see Figure 38). Such differences illustrate that significant indirect costs would further worsen the competitive position of the average European industry. A compensation for the indirect costs in that perspective is well explainable and lower levels of indirect cost compensation would not immediately be expected. Note, however, that studies from the same sources have also shown that the EU installations on average have a higher efficiency than in most other regions in the world. This reduces the relative impact of higher electricity prices on competitiveness.

3.5.8 EU-added value

The EU-added value of the measure for indirect cost compensation is evaluated on the basis of the following questions:

- What is the additional value resulting from the fact that the measure to provide indirect cost compensation is regulated at EU level, compared to what could have resulted when this would be regulated at the level of individual Member States?
- What could have been achieved (regarding avoiding carbon leakage) by Member States at national and/or regional levels without Art. 10a(6) of the Directive?

[348] "World Energy Outlook 2013 factsheet. How will persistent disparities in energy prices alter global economic geography?", International Energy Agency (IEA), 2013, download under: http://www.worldenergyoutlook.org/media/weowebsite/factsheets/WEO2013_Factsheets.pdf

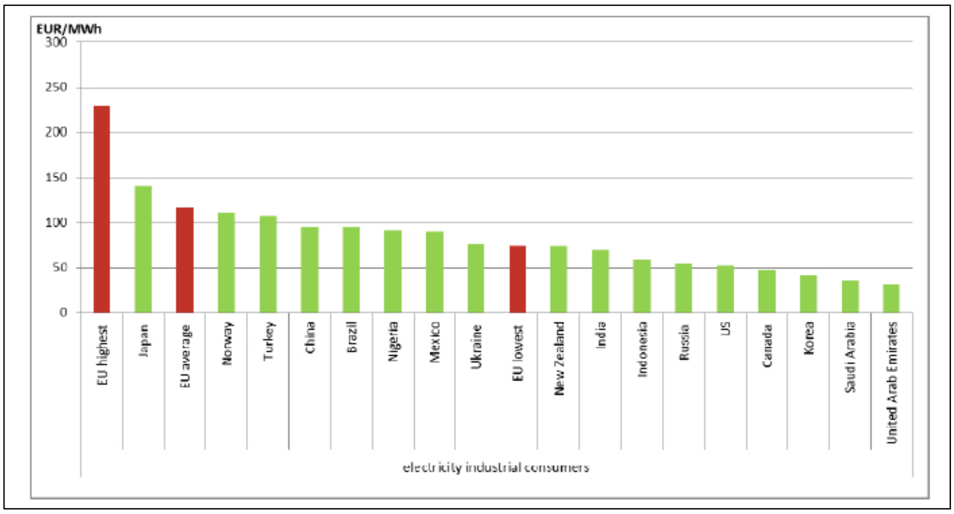

Figure 38: Electricity retail prices for industrial consumers in 2012. Source: European Commission[326].

The measure to compensate indirect CO_2 costs is not a measure of the EU ETS Directive itself and can be granted to EU ETS as well as non-EU ETS industries. Compensations for indirect CO_2 costs have been requested by industries in various Member States since the start of the EU ETS and could have been implemented at the level of individual Member States without the formulation of Article 10a(6). It did however receive more attention since it was taken up in the context of the cost impacts of the EU ETS. Whether implemented at EU level or at country level, the compensation has to be approved by the Commission under the State Aid Guidelines. The fact that it has been implemented at EU level as such not necessarily leads to different levels of efficiency or effectiveness. However, since the range of measures would likely have been wider than in the current context, the evaluation of such measures would have been more complicated, leading to higher administration costs. Moreover, a range of different measures would have been more complicated to understand for market parties and comparison of support levels between countries would have been more complicated.

Articles 26 and 27 of the Guidelines specify boundary conditions to the indirect cost compensation granted. Article 26 limits the aid intensity to a maximum share of the eligible costs occurred in specific years, with the intensity level decreasing from 85% to 75%. Article 27 specifies formulas for the calculation of the maximum level of aid per installation, where possible using electricity consumption efficiency benchmarks. As such the risk of overcompensation is avoided, and efficient electricity use is promoted. However, the cost compensation measure is voluntary for Member States. As concluded in earlier sections of this report, only 6 out of 28 Member States decided to take up the measure, with different budgets and some differences in the rules to determine eligibility to the measure. Moreover, no conclusive explanation could be found on the needs to protect the industries in these specific Member States more than in the other 22 Member States. In the said 6 countries the indirect cost compensation measure does provide an opportunity to reduce the risk for carbon leakage for EII in selected countries. However, it cannot be concluded that the indirect cost

compensation measure has improved the level playing field. It may even have negatively impacted the level playing field in Europe.

3.5.9 Coherence

The coherence of the measure for indirect cost compensation is evaluated on the basis of the following questions:

- To what extent is the indirect CO_2 cost support coherent with other interventions which have similar objectives?
- To what extent is the indirect cost compensation coherent with the other objectives of the revised Directive, such as a transition to low-carbon economy and harmonisation?
- Would answers regarding effectiveness, efficiency and coherence be different, if a full picture were provided on electricity cost compensations, including levels of energy taxes and RES support schemes?

Since the indirect cost compensation does not incentivise actions on the side of the energy user, the indirect cost compensation measure is not coherent with the transition to a low-carbon economy. However, there is some coherence with the objective of harmonisation of energy and climate policy within the EU by means of the harmonisation of the specific eligibility criteria and boundary conditions to the compensation granted. As the Guidelines allow for differentiation in implementation across Member States, they do not support full harmonisation of the impact of the EU ETS across Member States.

The measure for indirect cost compensation is coherent with the rules for free allocation. Both aim at lowering the costs of complying with the EU ETS and both are available for all industrial operators within the EU ETS[349]. Further coherence is found in the fact that under both measures the amounts granted are determined by the relative performance of operators as defined by the use of benchmarks. By using the benchmark element both measures also include an incentive for more energy efficiency, which can be considered as in line with the EU's overall targets.

Besides the measure for compensation of indirect costs of CO_2 several other measures are used to protect the competitiveness of European industries. Within the EU ETS the most prominent are the free allocations granted as carbon leakage provisions, which are discussed in section 3.4. Outside the scope of the EU ETS and within the scope of EU energy and climate policy the most prominent measures are the energy tax exemptions for the EII and the exemptions from levies to support the growth of renewable energies on the European energy market. As argued in section 3.5.4, insufficient information is available on the exact level of electricity costs and the levels of exemptions for taxes and levies. Furthermore, no public information has been obtained to determine the level of indirect cost compensation at the level of individual installations. Consequently no conclusions can be drawn on whether the exact levels of support were different if all exact costs and relevant exemptions would have been taken into account.

[349] Note again that the measure for indirect cost compensation is also available for industries that are not participating in the EU ETS but that are affected by the indirect costs of the EU ETS.

3.5.10 Conclusions

Relevance of compensation for indirect CO_2 costs is given only to the extent that industries are exposed to a significant risk of carbon leakage, and where their competitiveness can't be protected by free allocation. This is the case where they are affected more by cost increases caused by (indirect) CO_2 emissions covered by the EU ETS in the power sector than by own (direct) GHG emissions. This concerns a relatively limited number of industry sectors. As potential reasons for Member States for adopting the measure, the following factors were analysed: Electricity prices and increases thereof, tax levels on electricity, share of electricity-intensive industries, political reasons. However, no clear reasons (except potentially political ones) could be identified why it was only those six Member States which adopted this measure.

The **effectiveness** of indirect cost compensation could not be determined sufficiently. This is mainly because evidence for carbon leakage is not conclusively found yet (see sections 1.3.4 and 3.4 on carbon leakage for details). Furthermore no evidence is found that this special support measure would be more effective than exemptions from or low rates of energy excise duties.

Efficiency: Currently evidence is insufficient for drawing conclusions.

EU-added value: The indirect cost compensation can be attributed to the EU ETS Directive only indirectly. However, it has led to development of dedicated state aid guidelines and has thus helped to limit the potential competitive distortions created by the measure. By developing a uniform approach it has also created some transparency and efficiency in the Commission's approval process. Subject to further evaluation whether such financial compensation is justified in the light of potential carbon leakage and is administratively feasible, more EU-wide harmonised action might be advisable. However, energy prices and energy markets differ strongly throughout the EU, and further harmonisation of EU ETS-related measures would therefore not in itself be sufficient for establishing a level playing field in this regard.

This measure is **coherent** with the target of a low-carbon economy only to the extent that the Guidelines establish the maximum compensation based on several factors, including benchmarks for electricity consumption, and thereby do not waive the incentive for energy efficiency. Support schemes for electricity-intensive industries in the Member States (including different excise duties and exemptions thereof, different RES support schemes etc.) are highly fragmented and diverse. Therefore, and due to a lack of available information, no conclusions can be drawn in this regard within this evaluation.

3.6 The compliance system (monitoring, reporting, verification, accreditation)

3.6.1 Introduction

The EU ETS Directive contains a solid basis for a sound monitoring, reporting and verification system. This is achieved by Articles 14 and 15 in connection with Annexes IV and V of the EU ETS Directive. Based on these the MRR[350] (Monitoring & Reporting Regulation) and AVR[351] (Verification and Accreditation Regulation) were adopted. These two Regulations are applicable to monitoring, reporting and verification of emissions and tonne-kilometre data starting from 1 January 2013, and for accreditation of verifiers. The fact that the EU ETS Directive requires Regulations on M&R and V&A are among the key reforms during the EU ETS review in 2008. Before the review, Article 14 allowed the Commission to adopt *guidelines* (MRG[352]). As EU Regulations are directly applicable in Member States, these Regulations constitute considerable progress compared to the situation in the first two trading periods, as the MRG needed to be implemented in the national law of Members States and did not lead to a sufficient harmonisation in the MS. Furthermore the guidelines left a regulatory gap regarding accreditation of verifiers and some lack of clarity on particular technical details.

The evaluation of the EU ETS Directive's "MRVA" system (System for Monitoring, Reporting, Verification and Accreditation of verifiers) has to put the focus on the elements contained in the Directive itself. However, as the most important technical details (such as minimum quality requirements for metering and data flow processes) are contained only in the two Regulations, the content of the Regulations is implicitly taken into account in the evaluation here. The most important elements of the "EU ETS architecture" as provided by the Directive are the key target of the evaluation. These elements are:

- Every installation needs a permit and a monitoring plan, and every aircraft operator[353] requires a monitoring plan approved by the Competent Authority (CA), thereby ensuring that minimum requirements are met (Articles 4 to 7, Article 3g). Before the 2008 review, monitoring plans were only an implicit requirement and not sufficiently regulated regarding minimum content.

[350] Commission Regulation (EU) No. 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Consolidated Version can be downloaded under http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02012R0601-20140730&qid=1417167975116&from=EN

[351] Commission Regulation (EU) No. 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0001:0029:EN:PDF

[352] "Monitoring and Reporting Guidelines 2007" applicable in the second trading phase: Commission Decision 2007/589/EC of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council – the original guidelines and several amendments can be downloaded under http://ec.europa.eu/clima/policies/ets/pre2013/documentation_en.htm
For the first phase, the "MRG 2004" were used: Commission Decision 2004/156/EC establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council (Download under same link)

[353] Except for the lack permits and some technical differences in monitoring, monitoring and reporting requirements regarding emissions are quite similar for installations and aircraft operators. Therefore aircraft operators are not specifically addressed in the rest of the evaluation.

- The CA shall, at least every five years, review the greenhouse gas emissions permit and make any amendments as are appropriate (Article 6). Operators have to inform the competent authority on any planned changes mentioned in Article 7. Where appropriate the competent authority shall update the permit. More specific requirements on the updating of the monitoring plan and the notification of changes are laid down in the MRR.
- Operators are obliged to monitor their emissions throughout the year (Article 14) and to report them annually.
- From Article 15 it follows that the reports have to be verified (which is to be ensured by the operator), and that 31 March is the deadline for handing in the reports to the competent authority.
- Requirements for the accreditation and supervision of verifiers are laid down in the AVR (Article 15).
- Penalties are an important instrument for ensuring compliance. The Directive (Article 16(3)) ensures environmental integrity (i.e. effectiveness of the cap) by requiring 100 € (+inflation) penalty to be paid for each t CO_2(e) emissions for which no allowance has been surrendered (without waiving the requirement to surrender the allowances). Furthermore, the Directive provides for transparency (Article 16(2), also termed “naming and shaming”) regarding the publication of installations and aircraft operators which have failed to surrender sufficient allowances for covering their verified emissions.
- Other penalties in general (i.e. including for MRVA issues) are left to the Member States to be put in place[354]. They must be “effective, proportionate and dissuasive” (Article 16(1)). However, as this is within the discretion of the Member States, penalties are not within the scope of this evaluation[355].

The annual recurring activities (monitoring – reporting – verification – potential updates of monitoring plans – reporting on improvements of the monitoring methodology – surrendering of allowances, as well as the annual activities of competent authorities like approving annual emission reports etc.) are jointly termed the “*compliance cycle*”.

3.6.2 Findings

Little is found in literature on the functioning of the EU ETS’ compliance system. While monitoring, reporting and verification has attracted huge interest within the EU and worldwide[356], most international efforts currently focus on capacity building and setting up MRV as a preparation step to develop climate mitigation policies. Within the EU, MRV was mostly of interest for practitioners (operators, verifiers and competent authorities), and guidance notes[357] and templates put forward by the Commission are widely referenced. Some literature can be found regarding legal implementation[358]. However, virtually no information can be

[354] An exception are operating bans for aircraft operators which are regulated by the Directive.

[355] The reports of Member States pursuant to Article 21 of the Directive contain some information about limits of penalties in the Member States, and about actually applied penalties.

[356] See e.g. https://www.thepmr.org/content/mrv-data-management-and-registries

[357] http://ec.europa.eu/clima/policies/ets/monitoring/documentation_en.htm

[358] E.g. Verschuuren, Fleurke, Report on the legal implementation of the EU ETS at Member State level, http://entracte-project.eu/research/report-legal-studies/

found about how well the MRVA system actually works in practice, except from the following two sources:

- Reports by the Member States pursuant to Article 21 of the EU ETS Directive: The individual reports are publicly available[359], and the European Environment Agency has compiled a technical report summarising the result of the 2014 reports[360], covering the EU ETS implementation in 2013, i.e. the first year of the third phase and applying the new rules of the MRR and AVR.
- The Commission has commissioned several "Compliance Cycle Evaluation" projects. As a result of the latest such study, the "CCEV 4" report has been published[361]. For this study, competent authorities in all Member States and national accreditation bodies were interviewed based on a questionnaire for evaluating the implementation of the EU ETS compliance cycle in the year 2013.

These two main sources are used below to evaluate how well the MRVA system is functioning, and to what extent the ETS review goal of 2008, the improved harmonisation, has been achieved. Finally, some considerations on the administrative efforts required for MRVA are assessed.

Functioning and harmonisation of the MRVA System

Regarding monitoring, the fact that the MRR contains minimum requirements for the monitoring plan, and the Commission's publication of electronic templates, have led to a strong improvement of monitoring plan quality and better permit applications for installations. Operators now have to clearly list all the metering instruments and monitoring approaches (including procedures for sampling of fuels and materials and their analyses), they have to outline the data flows and the implemented control procedures in place, etc. This raised awareness among operators, and provided a better basis for competent authorities to approve monitoring plans. Furthermore clear and detailed monitoring plans facilitate the work of verifiers, and in the longer term help reducing verification costs for operators. Problems – or rather areas where still further improvements can be expected in the future – relate mostly to technical issues, such as the correct determination of uncertainty attached to monitoring data, more frequent use of continuous emission measurement systems (CEMS), or more harmonised application of sustainability criteria for biofuels and bioliquids. However, the Commission has already published a plethora of guidance on these issues, and understanding of those issues has considerably improved over the past years. Due to the obligation for operators to regularly review (and improve) their monitoring system, it can be expected that the situation will further improve over the coming years, without any necessary change of current legislation. Even if the legislation requires changes, these changes will occur in the MRR and would have no impact on the Directive itself.

[359] http://rod.eionet.europa.eu/obligations/556/deliveries

[360] EEA, "Application of the EU Emissions Trading Directive – Analysis of national responses under Article 21 of the EU ETS Directive in 2014", Technical report No 3/2015, , Download under: http://www.eea.europa.eu/publications/application-of-the-eu-emissions

[361] Ecofys and AEA Technology, "Fourth ETS MRAV Compliance Review", 2015, Download under: http://ec.europa.eu/clima/policies/ets/monitoring/docs/report_4th_ets_mrav_compliance_en.pdf and http://ec.europa.eu/clima/policies/ets/monitoring/docs/report_4th_ets_mrav_compliance_annex_2_en.pdf (Annex)

Regarding permitting, CCEV findings and Article 21 analysis show that there are differences between Member States on permit updates and how the coordination between the EU ETS permit and Industrial Emissions Directive (IED) permit required by Article 8 of the EU ETS Directive is organised[362]. Where IED regulators are involved in checking EU ETS monitoring plans or permits, improvement in the quality of compliance processes can be achieved by the training of these regulators on EU ETS specific elements or by involving EU ETS personnel in these checks. These improvements do not require changes in legislation.

Reporting:

The main difference with respect to reporting requirements concerns whether an IT system for reporting is in place or not. The required content of reports is harmonised in the MRR. Templates laying down minimum requirements have been developed by the Commission. CCEV results show that there is a wide take-up of these Commission's templates and guidance. For some MS this is an increase of level of detail reported, offering the CAs more possibilities to check annual emission reports. Both the CCEV and Article 21 analysis show that there are differences in how the CAs check the emission reports. However, this can best be addressed by developing additional guidance, developing uniform checklists, organisation of peer reviews and use of IT systems. It does not have an effect on the provisions of the Directive. Another improvement compared to the first two trading periods are the stricter requirements on addressing improvements, how to respond to outstanding issues identified by the verifier in the verification report and on the conservative estimation of emissions in the case verified emission reports are not submitted or a negative verification opinion statement is issued. According to the CCEV report, the improvement reports to be submitted by operators since 2013 under certain conditions are found as improving the overall MRV quality. However, their potential is not yet fully exploited.

Verification and accreditation:

Since requirements on verification and accreditation were included in the AVR a strong increase in harmonisation has been observed. In the first and second trading period verification requirements could only be found on a high level in the monitoring and reporting guidelines and a guidance developed by the European Co-operation for Accreditation[363]. According to the CCEV report, only 7 countries indicated that their system has not changed as a consequence of the AVR introduction. The most important new element is the requirement for accreditation[364], which puts some burden on verifiers for meeting formal requirements, but which ensures a level playing field. Furthermore the accreditation system (which includes a peer evaluation process among accreditation bodies) ensures a high and uniform quality of competence checks for the verifiers. This in turn paved the way for EU-wide recognition of accreditations, so that verifiers

[362] Findings include different levels of integration: harmonised permit application process, full integration of EU ETS and IED permits, information exchange between IED and EU ETS CA, the same CA overseeing IED and EU ETS permits etc.

[363] EA 6/03: this guidance was not applied by all Member States and left room for different interpretations on certain issues (e.g. no requirement for independent review). The version relevant for the first trading phases cannot be retrieved from the EA's website anymore.

[364] According to the CCEV report, the allowed alternative certification of natural persons as verifiers was taken up in only one MS and only one person made use of it.

can offer their services more widely, thereby improving competition. The CCEV report and Article 21 analysis show that in most Member States foreign verifiers are carrying out the verification, but the uptake of this option is still rather limited. According to the EEA report, the number of accredited verifiers seems sufficient. Only in five Member States complaints against verifiers were filed. This suggests that by and large the system is working well.

Another improvement comes from the Commission's verification report template, which improves the level playing field in the EU. In some Member States it significantly improved the usefulness of verification reports for the CA's assessment. Furthermore the requirements for independent review during verification and the Commission's guidance on time allocation in verification ensures that no "race for the bottom" regarding cheap verification takes place.

A potential area for improvement is the information exchange between competent authorities and national accreditation bodies across borders, where verifiers offer services in Member States other than the one where they are accredited.

<u>The competent authority's role</u>:

According to the EEA report, only 18 emission reports in 2014 were rejected by the competent authority because of non-compliance with the MRR. This suggests that verifiers seem to have done a good job in reducing the potential higher number of such reports, and that overall the level of compliance is very high. However, EEA admits that this could also mean that competent authorities should perform even more rigorous checks.

The CCEV report mentions as a particular concern that still some Member States seem to face a significant shortage of staffing. Several Member States are reported to have to prioritise some areas of work, or have to rely on external consultancies. Furthermore several Member States involve more than one competent authority in administering the EU ETS. Four Member States have even more than 50 CAs. While this in itself does not generate a problem, there is the possibility of an additional administrative effort required for coordination, and considerable risk of different approaches within one Member State where such coordination is missing. CCEV and Article 21 analysis showed that this was the case in some MS.

Another point for potential improvement is that on-site inspections are not yet carried out by all Member States. This work is sometimes considered to be the job of verifiers. However, as the EU ETS Directive does not contain explicit requirements in that regard, inspections are not further considered in this evaluation.

<u>Infringements, penalties, fraudulent behaviour</u>:

According to the Article 21 report by EEA, in at least ten Member States cases occurred where the CA had to provide conservative estimates for an installation's emissions due to the lack of verified emission reports. However, less than 2 % of installations were affected in any of these ten Member States.

All Member States report that they have various types and ranges of penalties in place, both as financial fines and prison terms. However, for the 2013 reporting period, only seven Member States actually imposed financial fines, and none reported prison sentences. Fraudulent behaviour was investigated in six countries, namely theft of units, suspect free allocation fraud, VAT fraud, and

boiler-room scam. Notably no case of fraud regarding the reporting of emissions is mentioned in that report.

Level of harmonisation

The CCEV report states: "*Variation between implementation practises in different MS has reduced as a result of the MRR and AVR. […] Broadly speaking, new regulatory elements changed the practice of about half of the countries, whereas the other half often had a broadly suitable approach in place before. Examples of this split impact included the degree to which the quality and extent of information in the permit application or MP submission improved, impact of the AVR on verifiers' understanding of the general obligations of the verifier, and enforcement practices. However, all MS agreed that the guidance provided by the Commission is very helpful.*"

This quotation confirms in short what has already been said above: The level of harmonisation is much higher than during the first two phases of the EU ETS. The majority of options for harmonisation have already been used. Further harmonisation is still achievable, e.g. by providing an EU-wide uniform IT system for communicating monitoring plans, annual emission reports, verification reports etc. between CAs, operators and verifiers. However, this would affect the overall MRVA system only marginally.

Overall conclusions

The MRVA system is found to be working well in general, though verifiers still report on non-conformities which should have been resolved earlier. It can be concluded that the new approach (with clear responsibility of verifiers to report these issues, and responsibility of the operator to report on improvement, etc.) will lead to a gradual improvement over the next couple of years. The most positive conclusion of both analysed sources is that the overall low number of problems points to a well working MRVA system. Compliance of operators is high, and the credibility of reported figures is generally not questioned[365]. It seems that the system as established following the 2008 EU ETS review has found the right balance between detailed EU-wide rules, further harmonisation by extensive guidance and electronic templates provided by the Commission, private sector verification and public oversight by competent authorities.

[365] This might explain the virtual lack of other literature sources. "No news is good news".

3.6.3 Intervention logic

- Needs:
  - A robust and credible but cost-effective compliance and enforcement system is needed for setting up an ETS.
- Objectives:
  - Emissions must be monitored and reported in a complete, consistent, comparable, accurate and transparent way;
  - Emissions must be verified by an independent and competent third party (verifiers) and reported annually:
  - Competent authorities must be enabled to supervise the MRV process, and to apply penalties where relevant.
- Actions
  - Define common rules for Monitoring, Reporting, Verification, Accreditation of verifiers;
  - Define compliance requirements (surrender of allowances);
  - Put a robust accreditation and supervision scheme in place to ensure verifiers' competence and independence[366];
  - Ensure that effective, proportionate and dissuasive penalties are in place.
- Expected results
  - Emissions are monitored with the most accurate but cost-effective approaches;
  - Emissions data are verified by accredited, competent and independent verifiers, reported and published;
  - Operators comply with the rules; for each tonne CO_2(eq) emitted an allowance is surrendered (i.e. the environmental outcome of the EU ETS is ensured);
  - Enforcement action is carried out if operators do not comply with the rules;
  - Overall EU ETS is credible due to robust rules and transparent results;
  - Fraudulent behaviour is a rare exception.
- Expected impacts
  - Administrative efforts are required, adding to the overall costs of the system.

[366] Note that the AVR also allows certification of individual verifiers (i.e. natural persons) as exception to the rule that verifiers have to be accredited (which is possible only for legal persons). However, for the required level of detail in this evaluation, this distinction will not be considered in detail.

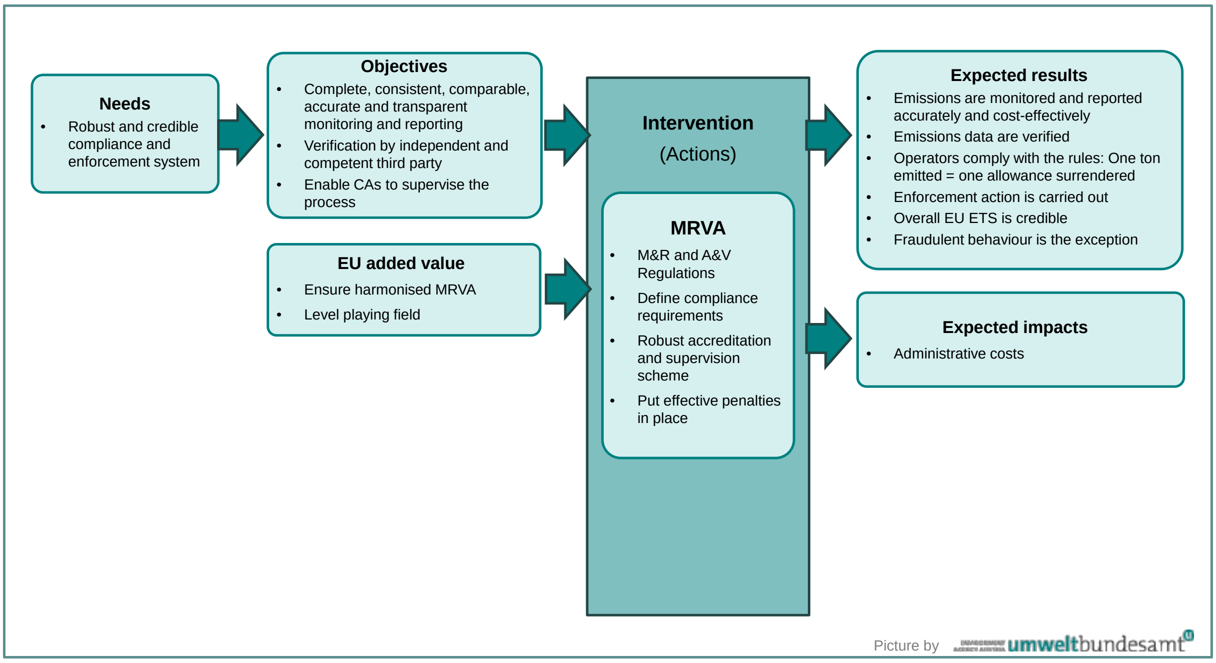

Figure 39: Detailed intervention logic for the evaluation area "MRVA".

3.6.4 Relevance

The following questions have been used as guidance for evaluation of the MRVA system's relevance:

- To what extent does the current EU ETS architecture (regarding monitoring, reporting and verification, and for accreditation of verifiers) correspond to the needs of the EU ETS (including its environmental integrity), and the EU's energy and climate policy framework in general?
- More specifically, have the requirements on monitoring, reporting and verification, and for accreditation of verifiers been set up in such a way that a robust and credible compliance and enforcement system is realised? Are there improvements in the 3rd trading phase compared to the situation before?
- Have the requirements on enforcement action and penalties been set-up in such a way that a robust and credible enforcement system is realised?

In response to the first question it can easily be stated that a robust compliance system, based on strict rules for monitoring, reporting and verification of emissions plays a key role for the credibility of any emission trading system. Without MRV, compliance would be impossible to track and enforcement toothless. The assurance of a complete, consistent, precise and transparent monitoring, reporting and verification system creates trust in emission trading. For ensuring the competence and independence of verifiers, accreditation is the most common and appropriate tool. In this sense the MRVA system is not only relevant for the EU ETS, but it forms an absolutely *essential* backbone of the EU ETS. As such, it is also relevant for the overall EU climate policy, as it directly feeds into the EU's internal and international reporting obligations on climate change.

On the basis of the findings listed in section 3.6.2 it can be stated that the MRVA system is a very mature system by now, with a strong improvement having taken place after the EU ETS review in 2008. Feedback from competent authorities in the CCEV and Article 21 reports show how much effort CAs put into the supervision of the EU ETS, starting from monitoring plan approval to checking annual emission reports and verification reports. The low number of emission reports rejected by competent authorities and the few penalties is an indication, but not stringent evidence that verification is a credible means of ensuring the reliability of emissions data in the EU ETS. Finally, the lack of critical literature regarding the functioning of the MRV system indicates to some extent that the current implementation gives little reason for concern regarding the robustness of the compliance system.

3.6.5 Effectiveness

The following questions have been used as guidance for evaluation of the MRVA system's effectiveness:

- To what extent did the monitoring and reporting requirements (in particular approval of monitoring plans and the new requirement of improvement reports) lead to complete, consistent, comparable, accurate and transparent monitoring and reporting?
- To what extent have the verification and accreditation requirements increased public's confidence in the accuracy and faithfulness of emission data?

The first question can only be answered in a theoretical way: The named principles are enshrined as the very basis of the M&R and A&V Regulations. Therefore, they are achieved almost *per definitionem*.

- <u>Completeness</u> of emissions data is firstly ensured by the competent authority approving the monitoring plans of operators, secondly by the operator when adhering to the MP during monitoring throughout the year, and finally by the verifier, who uses the monitoring plan as the very basis for checking the completeness of emissions, but who will also check during the site visit whether additional (new) emission sources or source streams are found.
- <u>Consistency</u>: For the same reasons as for completeness, the monitoring plan ensures consistency of data series over the years.
- <u>Comparability</u>: Because the same rules apply to installations throughout the EU, data are comparable also between installations. E.g. if an installation emits more than another one while producing the same amount of the same product, the latter is clearly the more GHG-efficient one.
- <u>Accuracy</u>: The MRR is based (implicitly) on the principle that all monitoring must be based on scientifically robust methods. The method leading to the lowest uncertainty[367] is always to be preferred over methods with higher uncertainty. Furthermore each operator has to have an understanding of the sources of uncertainty in his monitoring methodology, and to strive for reducing uncertainties even further.

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[367] The MRR uses "uncertainty" as the more appropriate metric, as it is the widely used scientific principle in metrology. It takes into account the spread of both, accuracy and precision. It can also be stated that it accounts for both, systematic and random errors.

- Transparency: The MRR and AVR implement a staged approach: The full transparency of all data generated during the operator's monitoring is available to the verifier. The monitoring plan and annual emission report provide sufficient information for the CA to understand the submitted data. Finally, the Directive provides for the annual emissions data and the installation's compliance status to be published, which most Member States implement through publication in the EU Registry. In accordance with the environmental information Directive[368], further information such as annual emission reports can be accessed from the CA, unless the CA determines that the data are confidential because of reasons of commercial sensitivity.

The question if public confidence has been increased by the new A&V requirements is difficult to answer. As has been stated above, there is little evidence that the quality of verification had been questioned in earlier ETS phases. It can only be concluded that the current situation is widely considered satisfactory.

3.6.6 Efficiency

The following question has been used as guidance for evaluation of the MRVA system's efficiency:

- To what extent are the costs of MRVA and the compliance system proportionate to the objectives and benefits of the MRVA requirements in the Directive?
- Is the MRVA system in the EU ETS efficient in terms of time delay for data becoming available?

Timing:

The MRVA system in the EU ETS is set up such in principle every operator of an installation should be able to have actual emission data available on a day-by-day basis. However, this depends strongly on the individual installation's monitoring plan approved by the competent authority. Where for cost effectiveness reasons the emissions are determined using the "calculation methodology"[369], fuel or material consumption may be determined using invoices or delivery notes, and chemical analyses may be carried out for larger batches of materials. In these cases the typical delay for obtaining verifiable data may be one month, after which the operator has the emission figure at hand. Annual emission reports are compiled from the detailed data available to the operator, and must be verified by accredited[366] verifiers and submitted to the competent authority by 31 March of the year following the year to which the report relates, i.e. within only three months after the emissions occurred. In this regard the EU ETS is considered highly efficient, since this is much faster than e.g. the process for national GHG inventories, which become available only 15 months after the reporting year.

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[368] Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003L0004

[369] This methodology is used by the overwhelming majority of installations in the EU ETS. For details see e.g. the Commission's Guidance Document No.1 "The Monitoring and Reporting Regulation – General guidance for installations", download under http://ec.europa.eu/clima/policies/ets/monitoring/docs/gd1_guidance_installations_en.pdf

Costs:

As discussed in section 3.1.5.3, costs for compliance are part of the overall transaction costs incurred by an ETS. Compliance costs encompass the following activities:

- Monitoring of GHG emissions,
- Reporting of GHG emissions,
- Verification of GHG emission reports,
- Accreditation of verifiers.

Despite these costs being borne by parties such as by competent authorities, verifiers and accreditation bodies, the focus of attention is usually on the compliance costs incurred by the operators. This is because industry stakeholders are raising concerns, like in stakeholder consultations, about the associated administrative costs and its potential direct negative impact on competitiveness. Furthermore, MRV costs and transaction costs in general, potentially distort the carbon price signal which might have negative impacts on the system's overall efficiency. Therefore, studies on compliance costs only cover costs incurred by operators.

Studies to date are however only covering costs for phase II. These may not be representative for the period 2013-2020 in light of the changes introduced since then. Studies based on surveys may also be affected by differences in the way in which costs are reported, for example whether this relates to all costs, the capital costs included, or the current costs of a system that is in operation. Studies on costs for the current trading period are not yet available. Those studies based on previous periods found that compliance costs vary by installation's sector and size (in terms of annual emissions). A study[370] of German installations showed that overall annual transaction costs ranged from about 0.03 €/t CO_2 (installation emitting 1 Mt CO_2) to 0.76 €/t CO_2 (installation emitting 10 kt CO_2). MRV activities account for roughly 69 % of these overall costs. For installations located in the UK[371], a study found that average transaction costs of about 0.1 €/t CO_2 are incurred by operators, with about three quarters of those costs arising from MRV activities. An Irish study[372] concluded that the average installation faced transaction costs of 0.08 €/t CO_2 in Phase I.

However, all of these studies also show that considerable scale effects can be observed. For small installations transaction costs were in the range of 1-2 €/t CO_2. A recent survey[373] with Swedish operators showed significantly higher transaction costs for small installations, with average costs for MRV in the range of up to 54 €/t CO_2, considerably exceeding current carbon prices.

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[370] P. Heindl, "Transaction Costs and Tradable Permits: Empirical Evidence from the EU Emissions Trading Scheme", ZEW, 2012, Download under http://ftp.zew.de/pub/zew-docs/dp/dp12021.pdf

[371] Aether UK, "Assessing the cost to UK operators of compliance with the EU Emissions Trading System", 2010, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47953/895-cost-euets-uk-operators-compliance.PDF

[372] J. Jaraite, F. Convery, C. Di Maria, "Assessing the Transaction Costs of Firms in the EU ETS: Lessons from Ireland", University of Birmingham, 2009, Download under http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1435808

[373] J. Coria, J. Jaraite, "Carbon Pricing: Transaction Costs of Emissions Trading vs. Carbon Taxes", University of Gothenburg, 2015, Download under https://gupea.ub.gu.se/bitstream/2077/38073/1/gupea_2077_38073_1.pdf

This strong difference compared to other studies may be explained by the structure of small installations in Sweden which often use fuels with a high share of biomass. With a low fossil share of CO_2 emissions they appear as small installations, while at the same time they are not small in terms of capacity. Therefore their absolute MRV costs per installation are comparable with bigger installations, and only the relative costs per tonne *fossil* CO_2 appear unusually high.

An overview of available studies on transaction costs is shown in Table 10. Table 11 shows the results from these studies on the distribution of MRV only costs to the three activities: monitoring, reporting and verification. It can be seen that the share of each activity in total MRV costs does not vary very strongly. In summary, it seems reasonable to say that all three activities each contribute to about one third of the total costs. Another source of transaction costs are registry fees (see section 3.7.5). However, these may vary between Member States and they are usually not considered part of MRV costs. Therefore they are not further discussed here.

Table 10: Overview of studies estimating transaction costs in the EU ETS

Study	Methodology	Temporal coverage	Geographical coverage	Transaction costs (average installations)	Transaction costs (small installation)
Coria and Jaraite[373], 2015	Surveys[374,375]	2012	Sweden	0.53 €/t CO_2	54 €/t CO_2
Aether UK[371], 2010	Surveys, Standard cost model[376]	2009	UK	0.10 €/t CO_2	1.5 €/t CO_2
Heindl[451], 2012	Surveys, Regression analysis	2009, 2010	Germany	~0.15 €/t CO_2	<1.0 €/t CO_2
Jaraite et al.[372], 2009	Surveys[374]	2005–2007	Ireland	0.04 €/t CO_2	1.5 €/t CO_2

Table 11: Overview of the distribution of MRV costs

Study	Temporal coverage	Monitoring	Reporting	Verification
Coria and Jaraite[373], 2015	2012	40 %	30 %	31 %
Aether UK[371], 2010	2009	24 %	40 %	36 %
Jaraite et al.[372], 2009	2005–2007	29 %	29 %	42 %

[374] Figures represent average costs for medium-sized installations

[375] Figures only cover transaction costs for MRV

[376] Converted from British pound sterling to euros using the calculator at http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm

The study by Aether UK[371] showed an even more detailed split of all transaction costs by installation's annual emissions and by sector (Figure 40). It can be seen clearly that the share of verification costs and subsistence fees strongly increased with decreasing installation size. By sector, it emerges that the share of MRV costs in total administrative costs was particularly high for refineries and low for the electricity producing sector. This is not surprising since refineries are amongst the most complex installations where more effort is needed to ensure robust MRV. On the other hand, electricity generators often consume only one type of fuel where corresponding emissions can be determined in a robust way relatively easily.

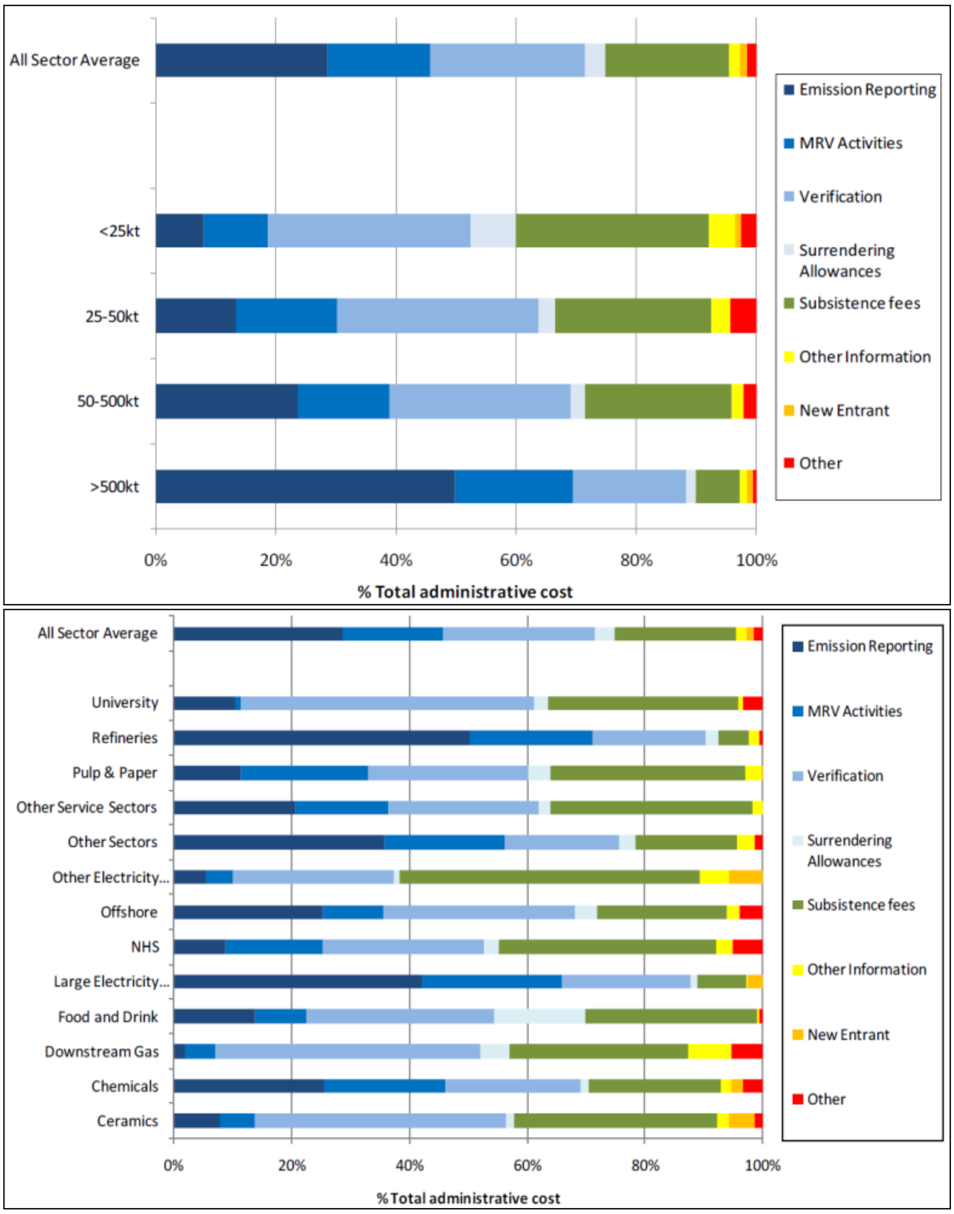

Figure 40: Costs by size and sector contributing to average total administrative costs, data for UK in 2009, Source: Aether UK[371], 2010.

3.6.7 Coherence

The following question has been used as guidance for evaluation of the MRVA system's coherence:

- To what extent are the reporting requirements of the EU ETS coherent with reporting requirements under other environmental legislation (e.g. the Industrial Emissions Directive)?

The MRR requires operators to report the identifiers used in other reporting schemes for each Annex I activity (the CRF codes[377] used under UNFCCC, the installation's identification numbers from EPRTR[378], the codes of the IPPC activities[379] pursuant to Annex I to Regulation EC No.166/2006 and the NACE[380] code). CCEV results show that these reporting codes are not always included correctly in the reporting templates. This is again an issue that is best addressed in guidance or update of templates and is not necessarily an issue that requires a change in legislation.

Furthermore the EEA report shows that integration of reporting requirements is widespread among Member States. There are however differences in how the integration takes place. In most countries EU ETS data is either used to support GHG reporting or EPRTR reporting or there is shared data submission and administration of EU ETS and EPRTR data. Member States that have integrated and coordinated these reporting requirements expressed that the administrative costs was reduced and the data quality in the reporting mechanisms increased. Further improvements on integration and coordination can be achieved by providing guidance on quality checks to be carried out on data and comparing available data sets. These improvements do not require a change in legislation.

3.6.8 EU-added value

The following questions have been used as guidance for evaluation of the MRVA system's EU-added value:

- What is the added value of the EU-wide MRVA requirements compared to what could be achieved by Member States at national and/or regional levels or by other alternatives?
- Is the current MRVA architecture suitable for avoiding distortion of competition between participants in different Member States?

The answer to those questions is clearly positive: MRVA based on EU-wide Regulations are considered more cost-effective and improving the level playing field. Due to better comparability of administration processes and of the data generated, this approach was rated as increasing the public confidence as well – however, as stated before, little evidence can be found for the improvement in current literature, as the robustness of the data seems to be unquestioned.

[377] Sector codes according to the Common Reporting Format

[378] European Pollutant Release and Transfer Register

[379] Activities listed in Annex I of the Industrial Emissions Directive, formerly "IPPC Directive" (IPPC = Integrated Pollution Prevention and Control)

[380] Statistical Classification of Economic Activities in the European Community (French: "Nomenclature statistique des activités économiques dans la Communauté européenne")

3.6.9 Conclusions

Relevance: The MRVA system is not only relevant for the EU ETS, but it forms an absolutely *essential* backbone of the EU ETS. It is also relevant for the overall EU climate policy, as it feeds into the EU's internal and international reporting obligations on climate change. The current MRVA system is reasonably mature, and robust, as demonstrated by the low number of non-compliance cases found.

Effectiveness: The principles completeness, consistency, comparability, accuracy and transparency are at the core of the EU ETS MRVA system. They are firmly implemented by the Regulations following Articles 14 and 15 of the Directive. Confidence in the EU ETS compliance system is high, and therefore effectiveness is rated high, too.

Efficiency: Based on studies on administrative costs for operators, the costs for MRV found in the range between 0.04 and 0.53 € per t CO_2(e) for average installations. For installations with low emissions, cost per t CO_2(e) are higher. This is considered reasonably efficient for a complex system like the EU ETS. The MRV system in the EU ETS is set up such that final emissions data become available at the latest three months after the end of the year monitored. This is much faster than e.g. the process for national GHG inventories, which become available only 15 months after the reporting year.

Coherence: There are some linkages to other reporting requirements, such as EPRTR and UNFCCC Inventories. They are utilised to different extents by Member States. However, there is no direct requirement in the EU ETS Directive, and issues – if any – can be best addressed by guidance documents rather than legislation.

EU-added value: The improvement brought about by the EU Regulations for MRVA has not been questioned since their introduction. They have increased the robustness of the system and improved the level playing field for participating industries. As the situation in previous EU ETS phases shows, a similar level of harmonisation cannot be brought about without EU legislation.

3.7 Registry system

3.7.1 Introduction

The registry system[381] has been set up to provide the necessary infrastructure for transactions of allowances and Kyoto units that are needed to implement the EU ETS compliance cycle. The registry system has been in place since the start of the EU ETS in 2005. From 2005 to 2012 Member States operated their own national registries, with their own server infrastructure and several different software solutions[382]. The 2008 EU ETS review (Directive 29/2009/EC) required the switch to a common EU registry for the EU ETS in order to make the registry system more robust, secure and cost efficient. In June 2012, all countries participating in the EU ETS switched to the common EU registry (the Union Registry). In addition, Member States also transferred their Kyoto registries to a Consolidated System of EU Registries (CSEUR), which is a common IT platform provided by the European Commission.

The EU ETS Directive defines the registry system in Article 19 in the following way:

- The registry system is a system of electronic databases with the purpose of holding allowances, the execution of the tasks of allocation, surrender and cancellation of allowances, the tracking of transfers of allowances and the administration of holding accounts.
- Any person may hold allowances, and the registry system shall be available to the public.
- The technical details are to be laid down in a Regulation by the Commission.

The technical details are contained in the Registry Regulation[383] and are in general not subject to this evaluation, with one exception: Article 111 of the Registry Regulation allows national administrators to charge account holders reasonable fees for accounts administered by them. National administrators have to inform the European Commission about these fees. The Commission has to publish this information on its public website[384]. The fees charged for accounts in the Union Registry differ significantly between Member States. There have been lengthy discussions on possibilities for harmonising these fees for accounts in the Union Registry.

The evaluation is valid for both stationary installations and aviation because differences between the two types of operators are negligible concerning the functioning of the registry system and fees.

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[381] In this report “registry system” refers to the Consolidated System of EU registries (CSEUR) including the Union Registry, the EUTL and Parties’ Kyoto registries. Where reference is made to the situation before the switch to the CSEUR in 2012, “registry system” refers to the CITL and Parties’ national registries.

[382] Four brands with several customised versions for individual Member States.

[383] “Registry Regulation” in this report refers to the Regulation pursuant to Article 19(3) of the EU ETS Directive, which has been amended or replaced by new versions several times since the start of the EU ETS. The currently applicable Regulation is Commission Regulation (EU) No 389/2013 of 2 May 2013 establishing a Union Registry pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Decisions No 280/2004/EC and No 406/2009/EC of the European Parliament and of the Council and repealing Commission Regulations (EU) No 920/2010 and No 1193/2011. The Registry Regulation (including the legislative history) and related information can be found under http://ec.europa.eu/clima/policies/ets/registry/documentation_en.htm.

[384] http://ec.europa.eu/clima/policies/ets/registry/documentation_en.htm

3.7.2 Intervention logic

For evaluating the area of the registry system, we propose to apply the following intervention logic:

- Objective:
  - To provide a robust and secure registry infrastructure for registry transactions and processes in a cost-effective way.
- Actions:
  - Commission to put in place the Regulation, the technical specification and the implementation of the registry system providing all necessary functions;
  - Commission to ensure high system availability of the registry system;
  - Commission and Member States to enforce appropriate security measures for the registry system.
- Expected results:
  - Registry system has a high availability and provides all necessary functions;
  - Registry system meets security requirements.
- Expected impacts:
  - Preservation of the integrity of the registry system;
  - Enhancement of the reliability and the credibility of the EU ETS.
- Unintended results:
  - Administrative costs.
- External factors:
  - Fraudsters (hacking, phishing, money laundering, VAT fraud, etc.);
  - Developments on the ITL side (UNFCCC Secretariat).

The intervention logic is summarized in Figure 41.

3.7.3 Relevance

The relevance of the registry system is evaluated on the basis of the following questions:

- How relevant is the registry system for the EU ETS?
- Given the fact that only one registry system is in place, is there still a need for the Registry Regulation, or could those requirements also be put in place by other kinds of governance documents or bodies?

For efficiency reasons allowances only exist in electronic form. The existence of a registry system in which the allowances can be held and accounted for is therefore not only relevant, but an absolutely essential element of the EU ETS.

The advantages of an EU Regulation are that it is directly applicable and enforceable in all Member States. Other governance documents, such as technical guidance papers or agreements, do not have a legal status and are thus not enforceable.

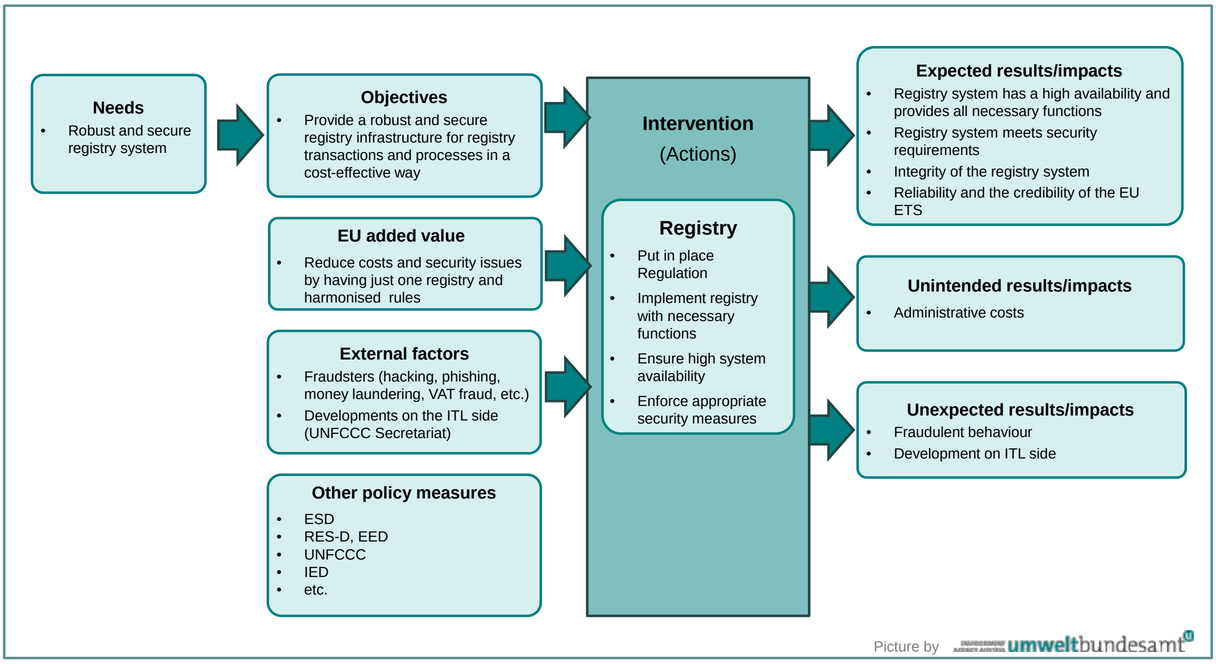

Figure 41: Detailed intervention logic for the evaluation area "Registry system".

In the first two ETS periods, Member States were allowed to run their own registries. In order to ensure their compatibility and equivalence of functions, it was necessary to have strong legislation in place. However, even now – with only one EU Registry in place – the Registry Regulation contains a number of elements for which a harmonised approach across all EU Member States is important, e.g. related to the security of the Union Registry (suspension of accounts, KYC[385]-checks, etc.) and to uniform accounting rules. If those aspects were not regulated in a Regulation but in some other type of non-enforceable document the Commission would run the risk of substantially different practices in Member States. This could entail a security risk and lead to a type of "account tourism", which means that person holding and trading accounts would be opened in the registries with more favourable conditions.

It is therefore concluded that a legally binding instrument such as the Registry Regulation is still needed to determine important aspects related to the registry that all Member States have to comply with. However, more technical details of the registry system (of which some used to be included in earlier versions of the Registry Regulation) are now included in the more flexible Data Exchange and Technical Specifications (DETS), which are rather a technical standard and not a legislative text.

[385] Know Your Customer checks

3.7.4 Effectiveness

The effectiveness of the registry system is evaluated on the basis of the following questions:

- To which extent is the registry system available?
- Is the registry system secure?

Availability

The availability of the registry system has been assessed based on the monthly reports by the European Commission. As period for the assessment February 2014 to January 2015 was selected (the most recent data available at the time of writing the report, see Figure 42).

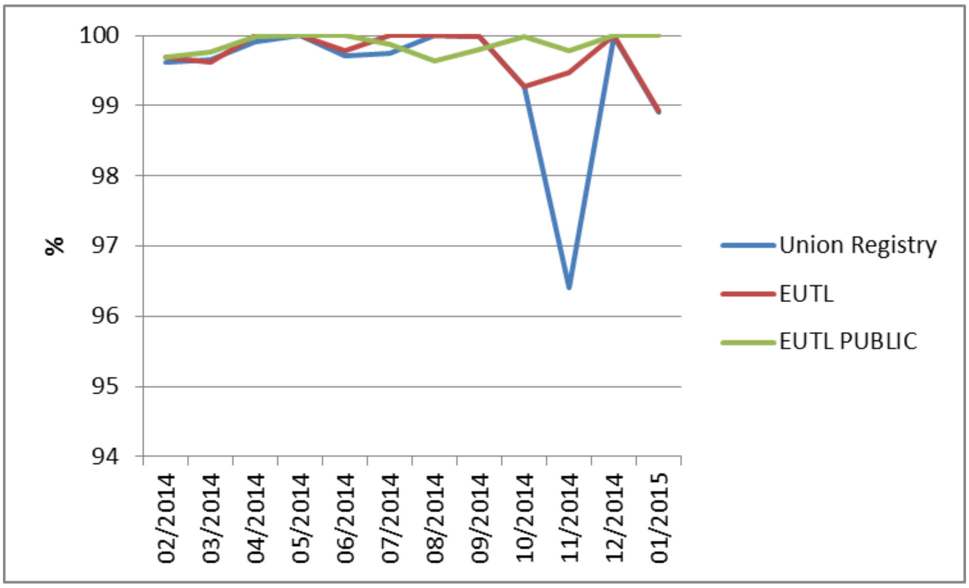

Figure 42: Availability of the registry system for the most recent 12 months of available data at the time of writing this report.

The remarkably lower availability of the Union Registry in November 2014 was due to planned downtime for the deployment of a new software release. Such downtimes are always announced in advance and are therefore deemed to be no problem for users. There is no standardised reference value to judge the availability against. For highly critical applications, an availability of at least 99.9% is common. However, for the registry system short periods of unavailability are acceptable and the performance of the registry system with an average availability above 99.5 % can thus be rated as good. In addition, the availability over the 12-month period showed little fluctuations across the timeline, except for the month of November, which is another success criterion and indicator for a stable registry system.

Is the registry system secure?

After a series of security incidents (e.g. hacking and phishing) in Member States' national registries, in particular in the years 2009-2011, the decision to

switch to an EU registry system with uniform security standards was taken. The security requirements for the Union Registry are laid down in the Registry Regulation and have been further specified in the DETS.

Article 68(3) of the Registry Regulation stipulates that communications between authorised representatives and the secure area of the Union Registry shall be encrypted. Article 69(4) of the Registry regulation stipulates that the Union Registry has to provide a two-factor-authentication. The European Commission Authentication Service (ECAS) is used to authenticate the users of the Union registry. It provides 2-factor authentication[386] and out-of-band confirmation[387].

Article 81(3) of the Registry Regulation requires that the Union Registry shall store records. The Union Registry and the EUTL confirm to the logging requirements of the UNFCCC Data Exchange Standards[388]. The purpose of an auditing and logging system is that all actions performed in the Union Registry and the EUTL are traceable and transparent.

Since the switch-over to the Union Registry there have been no major security incidents like hacking or phishing attacks anymore. Therefore, it can be concluded that the Union Registry is secure and constitutes an improvement to the security level of many of the previous national registries.

However, the security of the registry system has to be reviewed regularly and improvements of the current security levels are discussed with the Member States representatives. Another aspect to be considered when evaluating the security of the registry system are the know-your-customer (KYC) checks[389] that are carried out at Member State level. The purpose of KYC checks is to avoid that persons or entities with fraudulent intentions get access to the Union Registry. Following the change in legislation in 2011, the national administrators started applying the new enhanced security requirements for the opening of the new accounts. In addition, Article 25(4) of the Registry Regulation stipulates that national administrators have to review at least once every three years whether the information submitted for the opening of an account remains complete, up-to-date, accurate and true.

Since 2013, registry administrators have to annually report to the European Commission on the implementation of the KYC checks in their country. The European Commission assesses and summarises the information reported by Member States in order to encourage harmonised application of KYC checks rules by the national administrators and to ensure level playing field among Member States.

It can be concluded that the security level provided by the centralised registry system has improved compared to the previous decentralized system. The security level should, however, be constantly checked against the state-of-the-art. The implementation of the know-your-customer checks in Member States is good.

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[386] "Two factors" means the user must 1) possess something for the authentication (e.g. a key for a physical lock, or in this case a mobile phone with a registered phone number), and 2) know something (a password).

[387] Such transfer of information by a separate information channel (other than internet) is important so that hackers cannot "eavesdrop" the complete security-relevant information by internet.

[388] http://unfccc.int/kyoto_mechanisms/registry_systems/items/3683.php

[389] These are improved checks of the identity of customers, aimed at preventing identity theft, financial fraud, money laundering etc.

3.7.5 Efficiency

The efficiency of the registry system is evaluated on the basis of the following question:

- Are there significant differences in registry fees charged by Member States and if yes what is causing them?

Article 111(2) of the Registry Regulation stipulates that national administrators may charge reasonable fees to account holders administered by them. This gives national administrators considerable leeway in determining the fees. Table 12 provides an overview of the fees for operator holding accounts[390]. It shows that the fees are not only different in terms of their amount, but that also the charging mechanisms vary considerably across countries.

An operator holding account costs 0 € in Cyprus, Germany, Estonia, the Netherlands, Italy, Luxembourg and Sweden, and a maximum of 11 773 € in Austria and 12 000 € per year in Spain (those maximum values apply only to the biggest installations). However, this comparison only includes countries where a fixed maximum total fee has been indicated in the used data source. Other Member States charge a fee per tonne of emitted CO_2 or per free allowance with no maximum fee indicated. Norway charges 0.07 € per allocated allowance. In Denmark operators have to pay 0.02 € per tonne of verified emissions compared to 0.007 € per t CO_2 in the Czech Republic. Latvia uses another approach and charges annual maintenance fees between 95.7 € and 957 € depending on the quantity of allocated allowances, plus further one-off fees for different services, such as performing transfers on behalf of operators. Other registries also charge additional one-off fees, e.g. France charges for its know-your-customer checks.

In most countries, the charging system for aircraft operator holding accounts is the same as for operator holding account. Table 13 shows the registry fees in countries in which different fees apply for aircraft operators.

Fees for person holding accounts also vary considerable between countries. Table 14 shows that the lowest fee for a person holding account is 25 €/year in Poland and the highest fee is 3 000 €/year in France. The fees for trading accounts are largely the same as for person holding accounts.

Information whether countries charge for verifiers is harder to find. Some countries seem to charge a fee (e.g. 50 €/year in Bulgaria or 100 €/year in Greece) whereas in other countries verifier accounts are free of charge (e.g. in Austria). Latvia charges a fee for the account opening of 638 € in case of a non-Latvian verifier.

The differences in registry fees are thus significant for all account types. These can be explained by various reasons. Firstly, the costs in different Member States for staff, office space, etc. vary considerably, in particular between old and new Member States. However, more importantly the sources for funding the registry also vary. Some Member States have additional sources of funding

[390] The data has been compiled based on research on national Registry websites. For efficiency reasons, reports by Member States under Article 21 of the EU ETS Directive were also used. While these sources sometimes contain differing information, the registry website is considered more reliable and has been used in case of discrepancies.

(e.g. from auctioning revenues or tax money) to fund their registry activities whereas other Member States fund all registry activities by registry fees.

In Germany, for example, operator holding accounts are for free because the German registry administration receives funds from the auctioning of allowances. On the other hand, the Austrian registry is fully funded by registry fees only. Thus, fees have to be charged for operator holding accounts. Consequently, the comparison of registry fees in the tables below has very limited value without knowing which additional sources of funding are available in Member States to finance registry activities. However, this information is currently not available for the different countries and it is outside the scope of this project to carry out a detailed survey on the sources of funding of registry activities in all Member States.

Another reason for different fees appears to stem from varying operation efficiencies and/or level of efforts put into registry management in different Member States. In 2013, France performed a survey on the structure of registry fees in different Member States in which nine Member States participated. Due to the confidentiality of the replies the results were anonymised before being made available to registry administrators.

Table 15 shows that the number of end users, i.e. account representatives, per full-time staff member in the registry team varies considerably between the nine countries included in the survey. One possible explanation is that bigger Member States with more accounts have economies of scale and thus fewer staff per account will be needed. However, the difference most likely also reflects different efforts put into registry management in different Member States.

Table 12: Overview of fees for operator holding accounts. HRK, CZK, DKR were converted[391] to EUR, all other fees were provided in EUR in the respective information source.

Country	Opening fee / one-off fee (in EUR)	Minimum annual fee (in EUR)	Maximum annual fee (in EUR)	Comments	Source, year
Austria		250 *	11 733 *	* fixed fee 250 € plus variable fee depending on emissions, maximum fee applies to installations with emissions of more than 2.5 million t CO_2	National registry website, for 2014 and 2015
Belgium		542.83			National registry website, for 2014
Bulgaria		102.25			National registry website, as of 25 March 2015
Croatia	97	97		converted from 750 HRK / 750 HRK / 750 HRK; no annual fee in the first calendar year	National registry website, as of 25 March 2015
Cyprus	0	0		no fees are charged for OHA, AOHA	Article 21 report by CY for 2013
Czech Republic	43	86 € + 0.007 €/t CO_2		"t CO_2" refers to verified emissions; annual fee = monthly fee × 12; values converted from 1,200 CZK, 12 × 200 CZK and 0.19 CZK / t CO_2	National registry website, as of 25 March 2015
Denmark		515 € + 0.02 € per allowance		refers to free allowance allocated; values converted from 3,830 DKR and 0.14 DKR / EUA	National registry website, as of 26 March 2015
Estonia	0	0		no fee for OHA, AOHA	Ministry of the Environment website, 2014 and ongoing
Finland		250 *	3 500 *	* depending on emissions	National registry website, as of 26 March 2015
France	600 *	360 € + 0.0104 €/t CO_2 **		* additional KYC check fees ** refers to verified emissions	National registry website, for 2014
Germany	0	0			National registry website
Greece		100	300		National registry website, as of 30 March 2015
Hungary	0	90	2 733	fee depends on amount of free allocation	Article 21 report by HU for 2013
Ireland	350				National registry website, as of 30 March 2015
Italy				no fee	Article 21 report by IT for 2013

[391] Conversion was performed using the currency converter of the European Commission, http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm (exchange rates as of February 2015).

Country	Opening fee / one-off fee (in EUR)	Minimum annual fee (in EUR)	Maximum annual fee (in EUR)	Comments	Source, year
Latvia	0 / 638 *	127.6 **	988.9 **	* depends on the account holder ** annual fee is based on allocated allowances amount plus 31.90 € per diverse services (entering of verified emissions, transactions etc.; figures include fee for one activity).	National registry website, as of 26 March 2015
Lithuania	87	145			Article 21 report by LT for 2013
Luxembourg	0	0		no fees	Article 21 report by LU for 2013
Malta	1 164.59 – 3 494.06 *	232.94 € per 100 000 allowances **		* based on estimated average reportable annual emissions in t CO_2 equivalents. ** refers to allocated allowances	National subsidiary legislation, national justice services website, as of 26 March 2015
Netherlands		0			National registry website, as of 30 March 2015
Poland	100	25			National registry website, as of 30 March 2015
Portugal		866.6			Article 21 report by PT for 2013;National registry website, as of 30 March 2015
Romania	200	100 € + 0.000596 € per allowance *		* refers to allocated allowances	Article 21 report by RO for 2013
Slovakia		350 € + 0.015 € per verified emission			National registry website, from 2015; Article 21 report by SK for 2013
Slovenia	100.15	100.15			Article 21 report by SI for 2013; National registry website, as of 30 March 2015
Spain	500	150	12 000		Official State Gazette, as of 30 March 2015
Sweden	0	0		no fees	Article 21 report by SE for 2013; National registry website, as of 30 March 2015
United Kingdom				fee is included in the application charge for a new permit or emissions plan	National registry website, as of 26 March 2015; Article 21 report by UK for 2013
Iceland	415	370		converted from 62 900 ISK and 56 000 ISK	National registry website, as of 30 March 2015

Country	Opening fee / one-off fee (in EUR)	Minimum annual fee (in EUR)	Maximum annual fee (in EUR)	Comments	Source, year
Liechtenstein	*			* unclear if opening fee of 1 500 CHF (1 446 €) applies only to person holding accounts or also to OHA	Government information website on terms and conditions as of 26 March 2015; Article 21 report by LI for 2013
Norway	0	0.07 € per free allowance		costs per free allowance allocated	Article 21 report by NO for 2013; National registry website

Table 13: Overview of fees for aircraft operator holding accounts. This table only includes countries in which the fees for aircraft operator holding accounts differ from operator holding accounts. Sources for each Member State are the same as for Table 12.

Country	Opening fee/one-off fee (in EUR)	Minimum annual fee (in EUR)	Maximum annual fee (in EUR)	Comments
Bulgaria				no information on aircraft operator fees found
Finland		1 500		National registry website, as of 26 March 2015
France	600 *	360 € + 0.056 €/t **		* additional KYC check fees ** refers to verified CO_2 emissions
Greece		300		
Hungary	0	333		fixed fee

Table 14: Overview of fees for person holding accounts. Sources for each Member State are the same as for Table 12.

Country	Opening fee/one-off fee (in EUR)	Annual fee (in EUR)	Comments
Austria	1 500 *	870	* for person and trading-accounts for non-EEA countries
Belgium		542.83	
Bulgaria		178.95	
Croatia	97	97	converted from 750 HRK
Cyprus			no information about fees for person holding accounts found
Czech Republic	54	432	annual fee = monthly fee × 12; values converted from 1 500 CZK and 12 × 1 000 CZK
Denmark		304	value converted from 2 260 DKR
Estonia	250	320	

Country	Opening fee/one-off fee (in EUR)	Annual fee (in EUR)	Comments
Finland	450	450	
France	1 800	3 000	
Germany	400		one-off fee for period 2013-2020
Greece		100	
Hungary			no information in Article 21 report by HU for 2013; National registry website only available in Hungarian
Ireland			no information about fees for person holding accounts found
Italy			no information about fees for person holding accounts found
Latvia	977.9 – 1 914 * **	1 595** - 1 914**	* AAR approval fee, ** depends on citizenship, type of company
Lithuania			no information in Article 21 report by LT for 2013; National registry website only available in Lithuanian
Luxembourg			no information available
Malta	232.94	116.47	
Netherlands		200	
Poland	100	25	
Portugal	135.1		
Romania	200	200	
Slovakia		500	
Slovenia	50.07	50.07	
Spain	700	250	
Sweden	107		converted from 1 000 SEK
United Kingdom	254	508	converted from 190 GBP and 380 GBP
Iceland			no information available
Liechtenstein	1 446		converted from 1 500 CHF
Norway	136	136	converted from 1 200 NOK

Table 15: Number of end users per equivalent full time employee.
Source: Andal Conseil: Registry fees structure survey – Aggregated results for respondents. Based on information provided by registry administrators in nine Member States.

	Min	Max	Average
Number of end users per equivalent full time employee	122	665	258

The assumption that the efforts for different registry tasks vary between Member States is substantiated by data included in the study on how much time national administrators spend on different registry activities such as KYC checks and support of end-users. For example, one national administration indicated that KYC checks take 48% total of the time needed for registry administration compared to only 10% in another country. This indicates that although the registry software is the same, the efforts that national administrators put into different activities may vary considerably and explain differences in the level of fees.

Registry fees are therefore no suitable measure for the evaluation of efficiency. Furthermore a significant fraction of costs for running the registry system lies with the Commission, and the related costs are unknown.

3.7.6 Coherence

The coherence of the registry system is evaluated on the basis of the following question:

- To what extent is the registry system coherent with other reporting systems used in the EU ETS (e.g. for the submission of annual emissions reports and verification reports)?

Based on the rules in the Registry Regulation, the Union Registry could theoretically be connected to an external trading platform, e.g. a stock exchange that trades allowances or Kyoto units, or to a national administrative platform, which Article 3(25) of the Registry Regulation defines as an "*external system operated by a national administrator or a competent authority that is securely connected to the Union Registry for the purposes of automating functions related to the administering of accounts and of compliance obligations in the Union Registry*". Currently no such links have been established. However, it could be assessed whether a link between the Union Registry and other databases such as the IT systems used for submission of annual emissions and verification reports under the EU ETS could be established via such an administrative platform in the future. This would increase coherence between the submission of annual emissions and verification reports and the registry. However, the submission of annual emissions reports and verification reports is currently still performed at Member State level and has not been centralised so far, which is a barrier for harmonisation with the central Union Registry.

Regarding other reporting obligations the installation data in the Union Registry currently includes a field for the E-PRTR ID because most ETS installations are also covered by E-PRTR. However, this field is not mandatory (E-PRTR ID might not exist for all ETS installations) and thus not all installations that have

an E-PRTR ID have to indicate it (unless this is checked by the respective national administrators).

Work performed by the European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM)[392] has shown that the CO_2 reported under the EU ETS is mostly comparable to CO_2 reported under E-PRTR although the two reporting obligations are not coherent because the boundaries of the unit of reporting differs (installations versus facilities) and E-PRTR requires the reporting of CO_2 including biomass. However, this refers to the coherence of the reported emissions and not to the coherence of the reporting tools.

Currently, the Union Registry is a stand-alone system not linked to other reporting tools. The only link to other reporting obligations is currently the possibility to enter the E-PRTR ID in the Union Registry for ETS installations (i.e. it is possible to identify EU ETS installations also in the E-PRTR database).

3.7.7 EU-added value

The EU-added value of the registry system has been evaluated based on the following question:

- What is the additional value added from the centralised EU registry system compared to the previous decentralised registry system at Member State level?

The evaluation of the security of the EU registry system (section 3.7.4) above has shown that with the switch to the EU registry system in 2012 the overall security of the registry system in Europe has significantly improved because the Union Registry enforces common security standards across EU ETS countries. At the same time those security standards have been significantly increased, which would have required more effort by individual Member States in previous phases. This is one important added value of the centralised registry system.

Another assumed added value is lower cost for the centralised registry system because not every software developer has to implement required changes separately. However, since the cost of the EU registry system and of previous national registries is not known, this cannot be verified in numbers.

The question whether the Union Registry offers EU-added value compared to the previous decentralised system in terms of its user-friendliness and efficiency is more difficult to judge because it will depend on the subjective opinion of the respective users. Some registry administrators have argued that there are also disadvantages to the centralised registry system. Some registry administrators raised the following points:

- The Union Registry is less user-friendly than national registries were before.
- Member States do not have direct access to the database of the Union Registry to make their own queries.
- Member States cannot decide alone which changes in the registry software they want to implement but the decision is taken by a Change Management Board, in which Member States are represented.

[392] “E-PRTR Informal Review Report 2011 covering the 2009 E-PRTR dataset”, ETC/ACM Technical Paper 2011/06, Download under http://acm.eionet.europa.eu/docs/ETCACM_TP_2011_6_RevRep_2009_E-PRTRdata.pdf

To assess the added value of the Union registry in terms of efficiency and user-friendliness the results of a research project currently conducted by Germany will be valuable. That project examines potential future development of the administration of the Emissions Trading Scheme (EU ETS)[393] including questions on the effectiveness and efficiency of the Union Registry. However, at the time of writing this evaluation report, no results of this project are available yet.

To conclude, there is added value in terms of security and cost efficiency whereas the added value in terms of efficiency and user-friendliness of the centralised registry system is uncertain.

3.7.8 Conclusions

The availability of the EU registry system is high. The switch to the centralised EU registry system has delivered a considerable improvement of the overall security standard of the registry system by introducing two-factor authentication and transaction signing. Since the switch-over to the common EU registry no security problems have been reported, such as phishing and hacking attacks. However, the security level of the registry system has to be constantly revised and checked against evolving security standards. The know-your-customer checks have in general been implemented by EU Member States and have made access to the registry system more difficult for fraudsters.

It can be assumed that the efficiency of the registry system has improved significantly since the switch-over to the common EU registry because software development is now performed centrally, although data on cost is not available.

The fees that national administrators charge to account holders vary significantly between Member States. The reasons are that different levels of costs are found in Member States, differences of operational efficiencies, and of effort put into different registry activities. Most importantly, the sources of funding of registry activities are very heterogeneous across Member States, meaning that some Member States receive additional funds from other sources to cover their registry activities whereas others are solely reliant on registry fees.

Coherence with other reporting systems (including for MRV under the EU ETS) is theoretically satisfactory in terms of consistency between data from different sources. However, in practice few such links exist. According to the Registry Regulation, a stronger link to IT systems such as trading platforms or MRV systems could be established.

Regarding EU-added value, there have been considerable gains in efficiency since the introduction of the Union Registry. Furthermore, introduction of new security standards was easier possible than with individual Member States' registries. However, according to users, the user-friendliness of the current system should be further improved.

[393] The questionnaire is currently available at
http://docuserv.uni-speyer.de/ETS/index.php?sid=13723&newtest=Y&lang=en

3.8 The NER 300 funding

3.8.1 Introduction

Article 10a(8) of the revised EU ETS Directive provides the option to make up to 300 million allowances available from the New Entrants' Reserve (NER) until 31 December 2015 to help stimulate demonstration projects for Carbon Capture and Storage (CCS) and innovative renewable energy technologies. This is called the "NER 300 programme".

The EU ETS Directive itself provides the following framework for the NER 300 programme:

- The size (300 million allowances) and the timing (up to 31 December 2015) for grants under the programme;
- The overall scope: demonstration projects performing environmentally safe capture and geological storage of CO_2 or using innovative renewable energy technologies; projects have to be on commercial scale, but using technologies which are not yet commercially viable;
- Projects should be geographically well balanced in the EU territory;
- Awards shall be dependent upon the verified avoidance of CO_2 emissions; Detailed transparent criteria (including on knowledge sharing) are to be adopted by the Commission using the Comitology procedure with scrutiny;
- Funding is to be complementary to substantial co-financing by the operator of the installation. Projects could also be co-financed by the Member State concerned, as well as by other instruments. Funds per project are capped at the equivalent of 45 million allowances (i.e. 15% of the total NER 300).

However, this framework cannot be evaluated without taking into account the relevant daughter instrument, the "NER 300 Decision"[394], which contains the abovementioned criteria in more detail, in particular as regards the projects eligible for funding. It also defines the role of the EIB (European Investment Bank) and outlines the due diligence assessments to be performed before funding can be granted.

Two calls for proposals were published by the Commission during which projects could compete to obtain financial support from the NER 300 programme. The selected projects were awarded in December 2012 and in July 2014. The amount awarded to selected projects is dependent on the assumed avoided CO_2 emissions of that project. The actual support, therefore, depends on the CO_2 stored (for the CCS project) or renewable energy produced (for RES projects).

The evaluation in this report focuses on the actual outcome of the two calls, particularly on the technological and geographical spread of awards, the cost-effectiveness of the fund and the ability to leverage private capital for low-

[394] Commission Decision 2010/670/EU of 3 November 2010 laying down criteria and measures for the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of CO_2 as well as demonstration projects of innovative renewable energy technologies under the scheme for greenhouse gas emission allowance trading within the Community established by Directive 2003/87/EC of the European Parliament and of the Council, Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:290:0039:0048:en:PDF

carbon innovations. The main source of information is the Commission website which includes many details on the results of the two NER 300 calls[395].

3.8.2 Intervention logic

Rationale for intervention:

As recital 20 of Directive 2009/29/EC states, "*the main long-term incentive for the capture and storage of CO_2 and new renewable energy technologies is that allowances will not need to be surrendered for CO_2 emissions which are permanently stored or avoided. In addition, to accelerate the demonstration of the first commercial facilities and of innovative renewable energy technologies, allowances should be set aside from the new entrants reserve to provide a guaranteed reward for the first such facilities…*" In other words, the legislators have acknowledged that the CO_2 price signal provided for by the EU ETS may not be strong enough yet for accelerating technological progress in some areas.

- Needs:
  - Support development of innovative low-carbon energy demonstration projects on a commercial scale within the European Union.
- Objectives:
  - Support a broad technological range of CCS and RES demonstration projects;
  - Achieve the highest possible cost-effectiveness for the use of NER 300 funds;
  - Leverage private funding;
  - Seek a wide geographical spread among EU Member States.
- Inputs:
  - Revenues from auctioning of 300 million allowances from the new entrant reserve;
  - Financial resources for Commission services and fees for experts/consultancies to support project selection and monitor the NER 300 programme.
- Activities:
  - Put in place detailed and legally binding rules for the management of the NER 300 programme (this has been done in the "NER 300 Decision");
  - Manage the programme in accordance with the NER 300 Decision:
    - Enter in an agreement with the EIB for the monetisation of the 300M allowances and the management of the revenues;
    - Issue (two) calls for to submit projects;
    - Attract project proposals from the private sector (by information workshops etc.);

[395] See the webpages on the NER 300 programme (http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm) and its documentation (http://ec.europa.eu/clima/policies/lowcarbon/ner300/documentation_en.htm), as well as the first (http://ec.europa.eu/clima/funding/ner300-1/index_en.htm) and second call for proposals (http://ec.europa.eu/clima/funding/ner300/index_en.htm).

        - Require Member States to confirm the eligibility of the project proposals and the national co-funding, where applicable;
        - Conduct an eligibility check, as well as a financial and technical due diligence assessment, on proposed projects;
        - Make a final ranking of the eligible projects, based on the CPUP (Cost-Per-Unit-Performance) indicator;
        - Ask Member States to confirm their support to the projects that passed the selection assessment;
        - Award the funding and require beneficiaries to comply with knowledge sharing requirements.
        - Ask Member States to confirm their support to the projects that passed the selection assessment.
- Results / Short term outcomes:
    - Support for a broad range of CCS and innovative renewable energy projects (the NER 300 Decision lists four CCS technology categories and eight renewable energy categories with 34 RES sub-categories);
    - Private funding secured[396], optionally Member State funding as well;
- Medium term outcomes:
    - Large-scale, innovative demonstration low-carbon projects are built and operating showing that technologies are viable;
    - Supply chain enhanced in EU across key technologies (knowledge obtained and shared on the commercial development and operation of innovative, low-carbon projects);
    - Track record in operational conditions established to reduce financial and technical risks for upscaling and subsequent projects.
- Impacts:
    - Replication potential of innovative low-carbon technologies;
    - New private sector investment secured into additional demonstrators due to NER 300 ‘demonstration effects’ (i.e. reduced risk profile)
    - Creation of temporary and permanent jobs for the development and operation of the projects awarded funding;
    - Some of the eligible low-carbon technologies reach market readiness quicker than without the funding.
- Unexpected results:
    - Failures to achieve financial close of projects;
    - Public funds crowding out private investments in similar project activities.
- External factors:
    - Consequences of the economic crisis:
        - Lower than initially expected funds available due to lower carbon price;
        - Restricted availability of private capital;
        - Higher risk perception of investments for innovations;
        - Changes in the support schemes in the Member States;

[396] Private investments are leveraged and would otherwise not have been made available for such innovative low-carbon projects.

  - ○ GHG mitigation projects (in particular CCS) less viable than under "normal" circumstances.
- Different levels of Member State interest and ability to provide financial support.
- Different levels of technology development potentials between Member States due to geology, weather conditions, geography, existing energy infrastructure, energy mix, etc.
- Faster / slower development of certain technologies than expected.

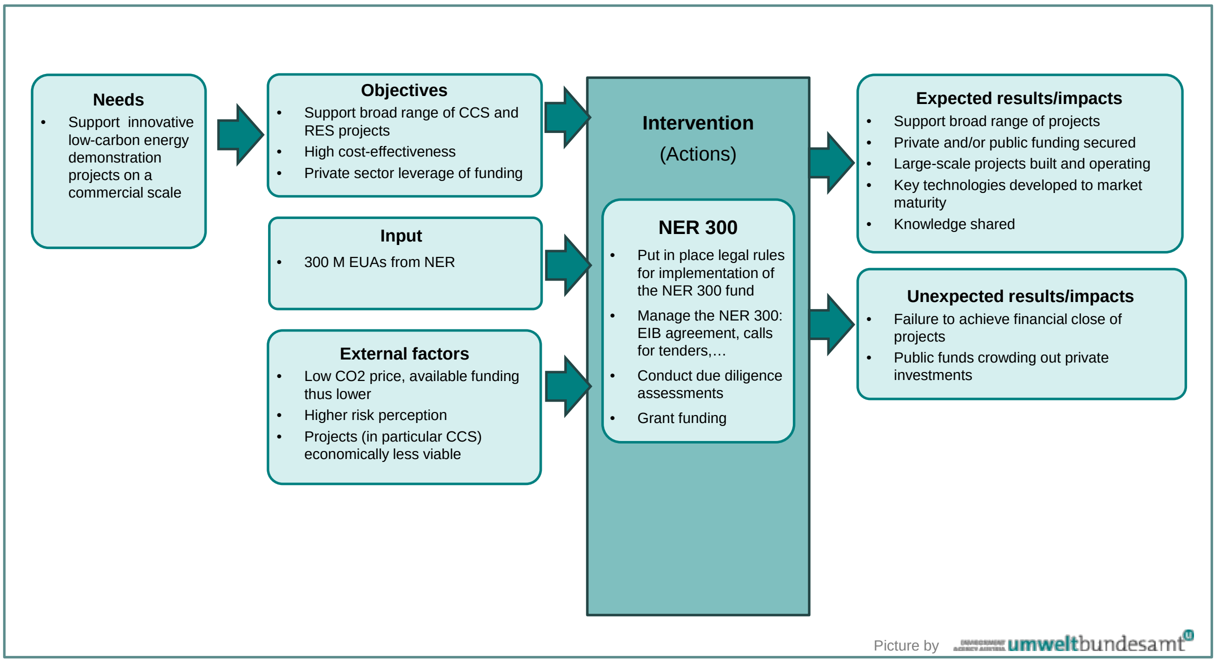

Figure 43: Detailed intervention logic for the evaluation area "NER 300".

3.8.3 Relevance

The relevance of the NER 300 programme is evaluated on the basis of the following questions:

- To what extent do the objectives of the NER 300 programme correspond to the needs of the energy and climate policy framework?
- To what extent did the targeted innovations correspond to the needs and interest of market parties and Member States?

The EU ETS creates costs for emitting greenhouse gases, which in turn create an incentive for avoiding such emissions. While in the short term relatively large amounts of GHG emissions can be avoided by the use of existing technologies and operation modes (e.g. fuel switch), the long-term EU climate targets (in particular the 2°C goal) will require the application of a significant number of innovative technologies. Bringing new technologies to market readiness requires project sponsors accepting that first-of-a-kind projects are usually much more expensive than proven technologies, and that significant financial and technical risks are involved. Public funding is justified because it can speed up market

readiness and, therefore, help bringing benefits of these new technologies early to the market and reduce overall costs to the society in the long run.

In the case of the EU ETS there are some GHG mitigation technologies known to be ready for large-scale testing. However, their initial costs are estimated to be still too high compared to the CO_2 cost savings they offer compared to other technologies. It can be assumed that at least some of them will become economically viable if the first demonstration projects per technology are built, and if the knowledge gathered from them is shared. Under such circumstances EU funding which leverages additional private (and public) funds is justifiable and fully in line with the EU climate targets.

The EU ETS Directive fully follows this logic by providing the legal basis for the NER 300 programme. It aims to support innovations in low-carbon technologies, with a specific focus on first-of-a-kind commercial-scale demonstration projects.

The interest from project sponsors and Member States is considered sufficiently high to demonstrate relevance of the NER 300 programme: In the first round 79 applications were received from 21 Member States[397] (13 CCS and 66 RES projects)[398]. In the second round 32 applications were received from 12 Member states[399] (1 CCS and 31 RES projects). The high response of RES players in combination with a high quality of applications (see section 3.8.4 on effectiveness) resulted in a high number of awarded projects (see details below), but for CCS the amount of awarded projects was below expectation[400].

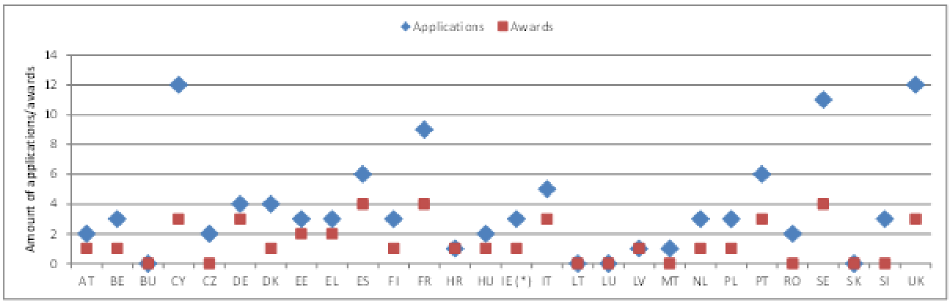

Figure 44 : Total amount of project applications and awards by Member State in the NER 300 programme

Figure 44 shows the project applications received from each Member State as well as the total awards[401]. It should be noted that Croatia was not eligible for the first round of applications as it was not a member of the EU. France received an award for its cross-border geothermal project with Germany, which,

[397] SWD(2012) 224 final - COMMISSION STAFF WORKING DOCUMENT – NER 300 - Moving towards a low carbon economy and boosting innovation, growth and employment across the EU.

[398] One more application for a renewable energy project was received from Ireland, but in a later stage this project was withdrawn from the first round of applications, and was re-submitted in the second round.

[399] http://ec.europa.eu/clima/funding/ner300/docs/project_proposals_en.pdf

[400] The Directive limits the number of CCS projects to twelve, while the NER 300 Decision identifies the desired CCS portfolio as eight projects.

[401] Note that two projects that were awarded in the first round – the Spanish Alvarado project (concentrated solar power) and the Swedish Pyrogrot project (bioenergy) – were withdrawn after being awarded.

because of its transboundary nature, does not count towards the maximum of 3 projects that could be awarded per Member State. The highest amount of applications was sent in by Cyprus (12), the UK (12, of which a larger amount of requests for CCS projects in the first round), Sweden (10) and France (9). Only 4 out of the 28 Member States did not submit an application: Bulgaria, Lithuania, Luxembourg and Slovakia. This illustrates a high interest among Member States.

The amount of applications and the technology choices per Member State are obviously strongly influenced by the prevailing national competitive and comparative advantages. For example, the Concentrated Solar Power (CSP) projects come from Cyprus and Greece while ocean energy projects come from the UK, France, Ireland and Portugal (see ICF 2014[402]).

3.8.4 Effectiveness

The effectiveness of the NER 300 programme is evaluated on the basis of the following questions:

- To what extent has the NER 300 programme led to an innovative project pipeline for low-carbon energy demonstration projects? To what extent is this influenced by the particular design of the financial instrument?
- To what extent would similar projects have happened without the NER 300 funding?
- Has the NER 300 programme sufficiently achieved the targeted geographical coverage?

The *potential effectiveness* of the NER 300 is concluded to be relatively high. The programme resulted in a number of applications that was sufficiently high to deliver the amount of projects targeted. The potential quality of submissions was considered excellent: 87% of applications in the first round and 84% of applications in the second round achieved a positive due diligence assessment. The amount and spread of RES projects is concluded to be good (see details below) and consequently the NER 300 has succeeded in bringing about a good project pipeline for innovative, large-scale RES demonstration projects across the European Union. Given that only a limited number of projects are currently operational, no conclusion can be drawn on the *actual effectiveness* of the NER 300 yet. An assessment is possible only once awarded projects have entered into operation. In this respect, it should be noted that the actual effectiveness of the NER 300 may be negatively impacted by eventual withdrawal of awarded projects.

However, when measuring the programme's *potential effectiveness*, a qualitative analysis of the selected proposals proved that almost 80% of the NER 300 awards went to highly innovative or potentially game changing projects. This is the result of a qualitative analysis on the proposals carried out after the eligibility check, taking into account the availability of the technology on the market, the

[402] ICF (2014), Study on the competitiveness of the EU Renewable Energy Industry (both products and services); Policy Analysis and Sector Summaries, ICF and CE Delft, 31 July 2014, download under http://bookshop.europa.eu/en/study-on-the-competitiveness-of-the-eu-renewable-energy-industry-pbNB0414731/ .

difference from available solutions, tests on the technologies, and their potential for scale-up and replicability.

The NER 300 is funded by the sales of 300 million EU allowances. Whereas the CO_2 price expectations were based on the price of EU allowances at the time of announcement of the first call (November 2010; approximately 15 €/t CO_2) the average price of the 300 million EUAs sold by the EIB to fund the programme was 7.19 €/t CO_2, in line with the average market price[403].

Project sponsors and Member States have provided informal feedback[404] on the design of the NER 300 programme in relation to the ability to prepare successful project applications. One negative element identified as impacting the success rate was the condition that in principle, NER 300 disbursements take place once the projects have entered into operation. For highly innovative projects with high risks this is seen as a drawback. This is confirmed by literature and various experts. For example the Worldbank[405] states "*… clean projects are still often more expensive and riskier than polluting projects. As a result, they have special financing needs, particularly to manage upfront costs and the high risks associated with these technologies.*" Also IEA states: "*Specific support or guarantees for innovative concepts and 'first-of-kind' demonstration projects is needed to alleviate the risks for investors. Without this support, these projects have the potential to be severely delayed or may not be deployed.*"[406] This is in line with the relatively small amount of projects that is currently in operation[407] and/or that is expected to meet its initially targeted date of entry in operation[408]. It should however be noted that project delays were likely also influenced by other changes in project circumstances such as the CO_2 prices lower than originally expected, changes in the regulatory environment and the continued economic downturn.

Cumulative annual disbursements up to now amount to only € 137 455 – considerably less than expected due to lower than planned performance of operational projects. At the same time, a majority of projects have requested a later date of entry into operation following the amendment of the NER 300 Decision adopted on 5 February 2015[409].

Because of the financial barriers they face, several project sponsors applying for NER 300 funding requested the possibility for upfront funding, as a means to lower risks and improve options to leverage the funding. The NER 300 Decision (Article 11(5)) indeed allows early disbursements if these are guaranteed by the

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[403] See EIB webpage: **http://www.eib.org/products/advising/ner-300/monetisation/index.htm**

[404] DG Climate Action, personal communication, February 2015.

[405] "A Public-Private Partnership Approach to Climate Finance", Worldbank, 2013, Download under **http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/03/06/000442464_20130306124932/Rendered/PDF/758250WP0P12450h0to0Climate0Finance.pdf**

[406] "Energy Technology Perspectives 2014. Harnessing Electricity's Potential", OECD/IEA, 2014. Available via http://www.iea.org/bookshop/472-Energy_Technology_Perspectives_2014

[407] To date three projects have started operation. The Italian BEST project (bioenergy), the German verbiostraw project (bioenergy) and the Swedish Blaiken wind park.

[408] Three projects have withdrawn from the NER 300 after project award. In addition the majority of remaining projects is expected to apply for a later start date (see text below).

[409] Commission Decision (EU) 2015/191 amending Decision 2010/670/EU as regards the extension of certain time limits laid down in Article 9 and Article 11(1) of that Decision (notified under document C(2015) 466); Download under **http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015D0191**

relevant Member State. It is expected that several projects will receive upfront funding.

Seeking a wide geographical spread among EU Member States is an explicit objective formulated in the Directive. Figure 45 illustrates that this wide geographical spread was well achieved in the project awards. In the first round projects were awarded to 15 Member States. Spain, however, withdrew its awarded Alvarado project (concentrated solar power) to replace it with another project in the second round. In the first round an additional six Member States had submitted projects but did not receive a project award. Two of these six Member States received a project award in the second round[410]. In this second round four other Member States (Croatia, Estonia, Latvia and Spain) were also added to the list of Member States with project awards, resulting in a total of 20 Member States with project awards. The conclusion on the geographical spread among Member States is that out of 28 Member States applications were received from 24 Member States (86%), and from those 24 Member States a total of 20 have project awards (83%).

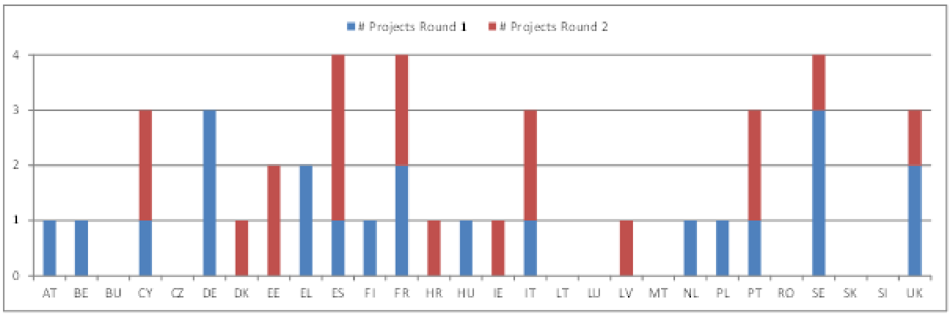

Figure 45: Geographical spread of project awards

A wide technology coverage and a clear definition of innovation were also aimed for when developing the NER 300 programme. The NER 300 Decision lists eight main RES categories, 34 RES sub-categories and four CCS project categories as eligible. Projects were sought in each of these sub-categories. Specific objectives were formulated for the spread among four CCS subcategories. For the CCS projects this goal was not achieved. The initial response was strong: 13 project applications were received in the first round, and one in the second round. The project applications covered all four technology categories with at least two projects per category, and also covered both desired storage options. All these applications received a positive selection assessment, and consequently the target could have been achieved. However, problems were encountered at the confirmation stage: in the end none of the projects that passed the evaluation were confirmed by Member States. Reasons put forward by national authorities include: funding gaps in public and private contribution, delays in permitting procedures, insufficient maturity, and bad

[410] As earlier mentioned, Sweden also had withdrawn a project after being awarded in the first round. This however does not change the statistics on the number of countries with project awards since Sweden had two other projects that were awarded under the first round.

timing with respect to national competition. In the second one CCS project application was submitted, confirmed by the Member State and awarded.

For the RES projects a sufficient spread among categories was achieved. In the first round applications were received in 7 out of 8 categories (24 out of 34 subcategories). Project awards were granted for 6 of these categories, leaving only photovoltaics (PV) with no projects awarded and hydropower with no project applications. The second round included three applications for PV projects, of which one project was awarded. Consequently all categories except hydropower were included in the final list of awarded projects. Details on the amount of projects submitted and awarded per category and per round are included in Table 16 below.

Table 16: Mix of projects submitted and awarded under both rounds of the NER 300 programme

Type of project	First call submitted/ awarded	Second call submitted/ awarded	Total number of projects awarded
CCS categories	13/0	1/1	1
CCS pre-combustion	3/0	0/0	0
CCS post-combustion	6/0	0/0	0
CCS oxyfuel	2/0	1/1	1
CCS in industry sector	2/0	0/0	0
RES categories	66/20	31/18	38
Advanced bioenergy	24/7	10/6	13
Concentrated solar power	9/3	3/2	5
Photovoltaics	4/0	3/1	1
Geothermal	3/1	4/2	3
Wind	15/6	3/2	8
Ocean	8/2	5/3	5
Hydropower	0/0	0/0	0
Smart grids	3/1	3/2	3

It should be that the technology specification in the NER 300 is very detailed and specific. This may provide an explanation for the fact that there were no submissions in some of the categories. Since technologies usually develop over time this specific and detailed categorisation may be a potential conflict with the adequate take-up of technological progress under the NER 300 programme, especially if the programme would span over a longer timeframe. This potential conflict would need to be evaluated in a later stage, and if necessary the technology specification may need to be adapted over time. Given the short timeframe between the first and second call under the NER 300, hence with likely a limited technological progress, this aspect was not evaluated in the scope of the current evaluation.

3.8.5 Efficiency

In the NER 300 Decision and the application form the Commission's defined criteria for the ranking of the projects, based on the Cost-Per-Unit-Performance (CPUP) indicator. This formed the basis of selecting the most efficient GHG abatement projects per unit of funding in each of the technology sub-categories defined. The efficiency of the NER 300 programme itself is evaluated on the basis of the following questions:

- Has the NER 300 programme leveraged significant private investments for innovative low-carbon projects?
- Were the amounts of funding available from the NER 300 programme and the administrative efforts involved justified, given the expected effects?
- Can factors be identified which influenced the achievements observed?

The NER 300 programme provided a total funding of 2.1 billion € and is expected to leverage 2.7 billion € of private investments. This is a ratio of 1:1.3. The amount of funding awarded to each Member State is shown in Figure 46[411].

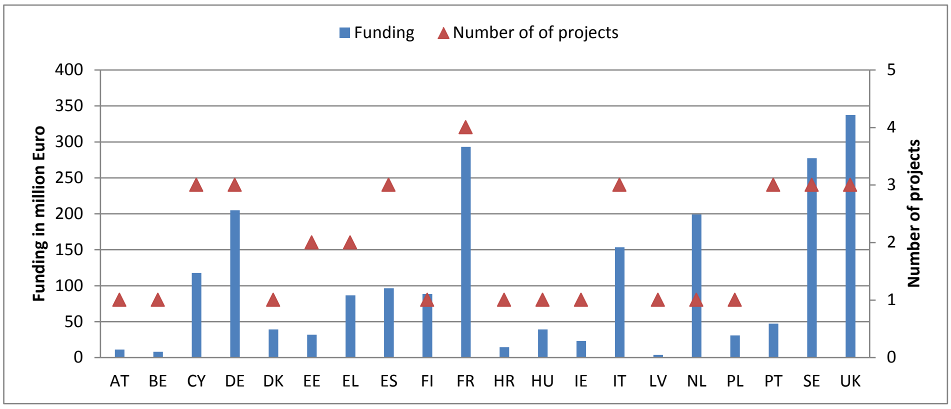

Figure 46: Amount of funding and number of project awards per Member State

To evaluate the leverage ratio achieved by the NER 300 programme it is compared against leverage ratios of selected other clean technology funding programmes:

- A stock-take by the European Commission on the implementation of the 2007-2013 EU-level financial instruments concluded that the achieved leverage ratio is equal to 5 for Equity Instruments, ranges from 4.8 to 31 for Guarantee Instruments, from 10 to 259 for Risk-sharing Instruments, and from 1.54 to 158 for Dedicated Investment Vehicles[412]. It should be noted that for many financial instruments money is lent to financial intermediaries who lend this on to other stakeholders. Consequently the achieved leverage is often an intermediate figure, while the total achieved leverage will be significantly higher[412];

[411] Note that projects that were withdrawn after being awarded are not included in this graph.

[412] "Report from the Commission to the European Parliament and the Council on financial instruments supported by the general budget", COM(2014) 686 final; Download under http://ec.europa.eu/transparency/regdoc/rep/1/2014/EN/1-2014-686-EN-F1-1.Pdf

- IFC[413] reports an average weighted total leverage ratio of 5.45 for its renewable energy project activities and an overall average weighted total leverage ratio over all its activities of 3.63;
- The UK Innovation Investment Fund (UKIIF[414]) had £150m of public funding and leveraged £175m private co-investment, which is a leverage ratio of 1.2;
- The Global Environment Facility (GEF) concludes a high co-finance ratio of 1:14 for climate change projects, but notes that much of this co-finance comes from implementing partners[415]. Additional information from the World Resources Institute (WRI)[416] on GEF shows that 737 million USD of GEF funding leveraged 1,536 million USD of direct private co-finance, which is a leverage ratio of approximately 2.

Based on the comparison with other programmes, the leverage ratio of the NER 300 programme may seem on the lower side. It is, however, not really possible to draw firm conclusions since the nature of funding to a large extent determines its leverage capabilities. Most of the funds mentioned in the comparison are equity funding, which have a much larger leverage than grant funding. Grant funding typically has a leverage ratio of 1, compared to which the leverage ratio of 1.3 of the NER 300 programme is somewhat on the higher side.

In addition there are a number of other key influencing factors that should be taken into account when drawing conclusions on the leverage ratio:

- Leverage ratios are considerably lower when technologies are not yet well-established or where the activities financed have not yet entered the mainstream. The NER 300 programme targets highly-innovative projects, whereas most other funds mentioned target technologies that are considered mainstream already. The risk of the NER 300 projects therewith are considered to be considerably higher, which explains a lower risk position especially from private investors and therewith a lower leverage ratio.
- The leverage ratio of other programmes usually includes funds leveraged from other public bodies, such as international donors and national governments. The NER 300 has leveraged additional public funding for part of the projects awarded, but the amount of these funds are not published. The NER 300 Decision states that NER 300 financing shall be 50 % of the relevant projects costs. This financing is reduced if the selected project had received European Energy Programme for Recovery (EEPR) funding (see details below in section 3.8.7).
- The NER 300 funding only provides capital at the moment of first production (i.e. production of renewable energy or geological storage of CO_2). Conse-

[413] "Leverage in IFC's Climate-Related Investments. A review of 9 Years of Investment Activity (Fiscal Years 2005-2013)", IFC, 2013, Download under http://www.ifc.org/wps/wcm/connect/f69ea30041ca4479935997000caa2aa08/Leverage+in+IFC%27s+Climate-Related+Investments.pdf?MOD=AJPERES

[414] "Early assessment of the UK innovation Investment fund", CEEDR Report to Department for Business Innovation and Skills, 2012, Download under https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32236/12-815-early-assessment-uk-innovation-investment-fund.pdf

[415] S. Nakhooda, "The effectiveness of climate finance: a review of the Global Environment Facility", ODI, 2013, Download under http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8632.pdf

[416] S. Venugopal, A. Srivastava, C. Polycarp, E. Taylor "Public Financing Instruments to Leverage Private Capital for Climate-Relevant Investment" WRI, 2012, Download under http://www.wri.org/sites/default/files/pdf/public_financing_instruments_leverage_private_capital_climate_relevant_investment_focus_multilateral_agencies.pdf

quently, private investors have to provide all funding – and therewith bear all risks – in the earlier project stages, which, for highly-innovative projects, are considered to have a high risk rate. This may significantly lower the amount of private capital provided.

- As many investments, climate-related investments also follow underlying market trends. With the economic crisis in Europe, the availability of private investment capital was considerably lower than in non-crisis times.

To support the European Commission's development of the next multiannual financial framework, IEEP (2013)[417] analysed the optimal use of the EU grant and financial instruments to address the climate objectives. For mitigation projects in the energy sector – the main focus of the NER 300 programme – they concluded that for early commercial-scale deployment of new energy supply and CO_2 storage technologies the most appropriate instruments would be grants, equity or quasi-equity, risk guarantees or partial grants reducing the volume of investment needed. The types of instruments were particularly selected to address the high risks of these types of projects. The NER 300 programme fits in this group of appropriate instruments.

Identifying the best instruments and approaches to support innovative, first-of-a-kind, commercial-scale, low-carbon projects is essential. The EIB identified several financial risks when it carried out the due diligence of NER 300 project proposals such as changing national support schemes (e.g. feed-in tariffs) or lack of equity, long-term debt financing or revenues. Indeed, lack of national funding was the main reason why Member States did not confirm the CCS projects submitted under the first NER 300 call.

Financial risks for NER 300 projects are, therefore, very significant. Easier access to and larger amounts of upfront funding disbursed already during the construction phase, and its combination with other EU and national funding sources or financial instruments could have helped projects in mitigating those risks.

Given the wide range of sub-categories within each technology category, it could be expected that the funding rate would show large variations within each technology category. Figure 47 illustrates that such large variations indeed occurred, especially for those categories that may be considered the least market mature (ocean energy and Distributed Renewable Management (DRM)). However, as projects were ranked based on the Cost-Per-Unit-Performance (CPUP) indicator before awarding, it can be assumed that the best projects in each category have been granted funding.

[417] K. Medarova-Bergstrom, A. Volkery, R. Sauter, I. Skinner, L Núñez Ferrer, "Optimal use of the EU grant and financial instruments in the next multiannual financial framework to address the climate objective". Final report for DG Climate Action, European Commission. Institute for European Environmental Policy, IEEP, London/Brussels, 2013, Download under http://ec.europa.eu/clima/events/docs/0072/report_ieep_en.pdf

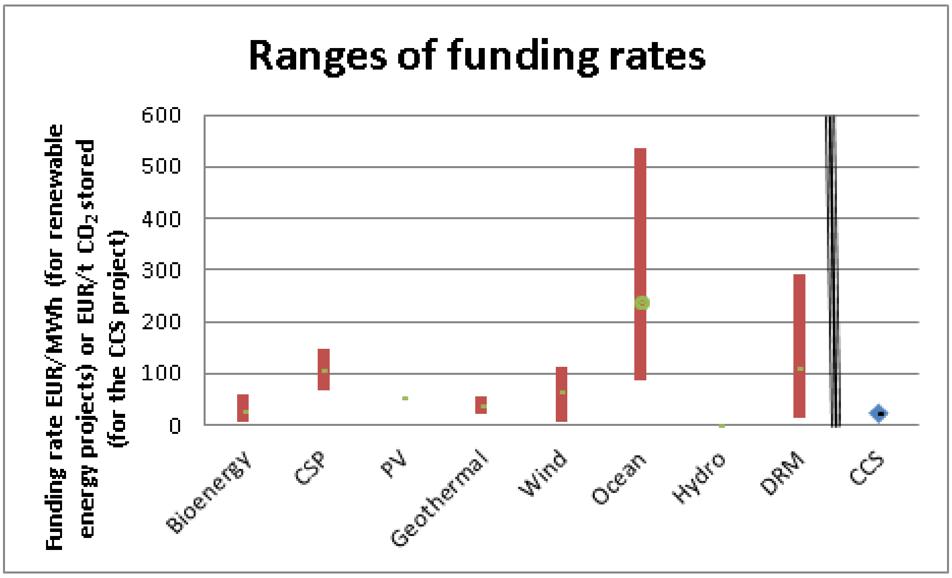

Figure 47: Range of funding rate per technology under the NER 300 programme. With CSP: concentrated Solar Power, PV: Photovoltaic energy, DRM: distributed renewable management, CCS: Carbon Capture and Storage

However, the CPUP also has limitations. Since it measures efficiency, it encourages projects to seek economies of scale and reduce their cost per MWh produced (for RES projects) or CO_2 tonne stored (for CCS projects). This led into the selection of very few but very large projects especially in the bioenergy and wind categories. Consequently, a different ranking methodology might be sought when designing a NER 300 follow-up instrument, to reduce funding for individual projects and increase their number.

A larger number of supported projects could have enhanced the programme's ability to foster innovation in low-carbon technologies.

To determine *administrative efficiency* information would be needed on the time spent by all stakeholders (project sponsors, Member State representatives, the Commission, the EIB and their supporting consultants) and their associated costs. A complete analysis would require these costs of the entire lifetime of the project, or at least until the time of entering into operation complemented by an assessment of the costs of operation for the years thereafter. At this stage of implementation of the NER 300 projects insufficient data is available and thus it is too early to draw conclusions on administrative efficiency.

3.8.6 EU-added value

The EU-added value of the NER 300 programme is evaluated on the basis of the following questions:

- Has the NER 300 programme stimulated development of innovative low-carbon projects at a faster pace than what could be achieved by Member States at national and/or regional levels?

- Has the NER 300 programme stimulated development of innovative low-carbon projects at a larger size what could be achieved by Member States at national and/or regional levels?
- Has the NER 300 programme stimulated international knowledge sharing for low-carbon innovations?
- Has the international coordination resulted in lower administrative costs compared to support at Member State level?
- Are there other additional values resulting from the fact that NER 300 is an EU-wide instrument, compared to what could be achieved by Member States at national and/or regional levels?

The NER 300 programme includes requirements on the date of entry into operation for the projects that are awarded funding. The deadline was originally established at four years from the award decisions. However, in view of delays in permitting procedures or financial planning, it has been extended to six years, i.e. December 2018 for projects awarded under the first call and June 2020 for those selected under the second. Since at the time of conducting the evaluation these final dates have not been reached, most of the evaluation questions in this category could not be addressed.

The NER 300 programme targets highly innovative projects that could not have been realised without public funding. Insofar as similar types of projects are currently being developed on the European market, the size of these projects is considerably smaller than the projects awarded under the NER 300 programme. The amount of projects awarded also seems to be considerably higher than in other ongoing private activities for the same technologies and therewith the *potential* added value is high. In this, a crowding out effect could occur, where the NER 300 funding would replace funding that would otherwise have been provided by private investors and/or national governments. However, no evidence could be found on this matter.

As mentioned above, no conclusions can be drawn on the *actual* delivery of the NER 300 programme compared to a reference situation without this programme, since only three projects have started operation to date.

Knowledge sharing is an explicit requirement of the NER 300 programme. To this end knowledge sharing templates have been developed for each technology, which have to be completed by each operational project every year. The relevant knowledge is collected and will be shared with interested parties at two levels: Level 1 knowledge is shared within the technology category; Level 2 knowledge is publicly shared. Knowledge dissemination activities will be organised for active sharing of results obtained, including the participation in technology-specific sectoral events, targeted policy events and workshops discussing specific aspects/impacts of the NER 300 programme and its projects. This range of knowledge sharing activities is potentially much more extensive than in other support programmes but similar to the one established for CCS projects under the EEPR. However, the impact and outcome of knowledge sharing should be assessed when more projects have become operational.

3.8.7 Coherence

The coherence of the NER 300 programme is evaluated on the basis of the following questions:

- To what extent is the NER 300 coherent with other European interventions which have similar objectives, such as European R&D funds, regional development funds and funds provided in the Horizon2020 programme, existing EIB instruments, EEPR (European Energy Programme for Recovery)?
- To what extent is the NER 300 funding coherent with the other parts of the EU ETS Directive?
- To what extent is the NER 300 coherent with energy and climate policy in the EU Member States and with other donors' interventions?

The NER 300 programme is financed from sales of EU allowances and as such not part of the general budget of the European Union. Consequently it can be combined with funding from other instruments as well as with loan financing facilities provided by the EU. When formulating the NER 300 programme the European Commission did pay particular attention to the fact that the programme should be coherent with ongoing activities and should be complementary to funding from other public sources.

In the formulation of the NER 300 programme the European Commission emphasised that the funding provided in this programme should support implementation of the European Strategic Energy Technology Plan (SET-Plan) in respect of the needed demonstration projects and should implement the European Council conclusions of June 2008 to incentivise the construction and operation of twelve CCS demonstration plants by 2015.

A larger number of funds is available in Europe to stimulate R&D activities and/or support to achieve the European energy and climate policy goals. However, within the energy sector none of these funding opportunities particularly addressed larger-scale first-of-a-kind demonstration projects for RES and CCS, apart from the EEPR programme which is discussed below. The funds provided both at European and national level mostly focus either on the R&D phase and pilot testing of smaller projects or on the larger-scale implementation of proven technologies. In that respect there is no obvious overlap between the NER 300 programme and other existing funding. One important exception to this is the EEPR which was established in 2009 to aid economic recovery[418]. This programme provided opportunities for granting of financial assistance to the energy sector, among others for RES and CCS projects. Projects eligible for NER 300 could therefore have received financing under the EEPR. However, in order to avoid overlap, double funding and undue favouring of projects, the NER 300 rules specified that any NER 300 funding requested had to be reduced by the amount of EEPR funding received.

Finally, it is concluded that the NER 300 programme is coherent with the overall architecture of the EU ETS Directive. It supports the transition to a low-carbon economy by accelerating innovation where the mere CO_2 price signal is not yet a sufficient driver for development. It speeds up developments in particular in

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[418] Regulation (EC) No 663/2009 of the European Parliament and of the Council of 13 July 2009 establishing a programme to aid economic recovery by granting Community financial assistance to projects in the field of energy, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009R0663

the (renewable) energy sector and aims for a wide implementation of innovative low-carbon projects across Europe. It furthermore supports active knowledge sharing on the targeted innovations across Europe and provides a stimulant to economic development and employment. However, not all low-carbon technology areas listed by Annex I of the ETS Directive are covered by the NER 300 programme.

Renewable energies as well as CCS are seen as key technologies for fighting climate change. Thus, European support for their development is fully in line with Europe's policy in international climate negotiations and should be seen as a contribution to achieving the 2°C target.

3.8.8 Conclusions

In 2008, it was recognised that new technologies were required for the transition to a low-carbon economy and that currently the CO_2 price signal provided by the EU ETS will alone not be sufficient to tackle the high costs and risks of first-of-a-kind installations in the short term. It was in this context that the NER 300 system was adopted and deemed very **relevant**. The high number of applications received (111 in total across the programme's two calls for proposals) confirms this that a large number of stakeholders considered the programme as a potentially crucial element in allowing large scale demonstration plants to be put into operation. However, the NER 300 programme did not meet expectations as regards funding for CCS projects. Only one CCS project, instead of the anticipated eight, could be funded. It must be noted, however, that this is not a flaw of the EU ETS Directive, but is related to the CO_2 price since the beginning of the economic crisis (and consequently lower than expected NER 300 funding), and/or to financial and technical challenges of the CCS projects, due to which many CCS projects were not confirmed by the Member States. However, no detailed information in this regard is available, so firm conclusions cannot be drawn.

In terms of **effectiveness**, project quality was very good, and the spread of approved projects across technologies and Member States met expectations (with the exception of the number of CCS projects). Almost 80% of the NER 300 awards went to highly innovative or potentially game changing projects as indicated in a qualitative analysis on the proposals' initial eligibility check. Thus, *potential* effectiveness is good. However, it is too early to make conclusions on the *actual* effectiveness since the majority of projects have not entered into operation yet.

A disadvantage of the set-up of the programme is that funds become usually available only once the project has started to store CO_2 (for CCS the project) or generate energy (for RES projects). Member States and project sponsors have generally not made use of the possibility of upfront funding. While giving funding only to operational projects against proof of reaching annual targets can be justified, easier access to upfront funding might be able to speed up project implementation and lower costs for capital.

The programme covers only RES and CCS technologies, while low-carbon industrial technologies and processes covered by Annex I of the ETS Directive are not in its scope. The technology specification as included in the NER 300 is quite specific and detailed. No analysis was made whether this specification is

in line with expected technological progress, but such analysis could be useful in case the NER 300 program were continued over a longer timeframe.

Several aspects were evaluated regarding **efficiency:** The assessment of project applications using a Cost-Per-Unit-Performance (CPUP) indicator led to the *most GHG efficient projects* being selected. The *funding leverage* (i.e. ratio between private investment and NER 300 funding) is 1.3. This ratio is considered reasonable given the nature of the funding programme (relatively high risk due to its focus on innovative technologies). The leverage ratio is 1.6 if additional public funding is taken into consideration (NER 300 mobilised €700m of national funds). Overall, the CPUP is favourable to larger projects which benefit from economies of scale. *Administrative efficiency* of the NER 300 programme was not analysed, as there was (at the time of writing) insufficient information available for its quantification.

Size and number of the funded projects suggest that a similar impact could not have been achieved at national level. In this regard NER 300 programme proves a high **EU-added value**. No evidence has been found that the programme would have led to a crowding-out effect from other (in particular national) funding mechanisms. At the same time, it is noted that additional EU-added value in terms of combining the NER 300 funding with complementary financial products offered by the EIB was not achieved. To date project sponsors have not applied for such complementary instruments.

The programme in theory has a stronger knowledge sharing element than other similar programmes. However, no knowledge sharing has taken place so far due to the low number of projects which entered into operation but also due to the overall low number of projects in each technology category which could share knowledge.

The NER 300 programme was found **coherent** with the overall EU ETS targets, since it promotes the necessary innovations and investments in innovative low-carbon technologies. No overlap or double funding between NER 300 and other European or national funding systems were identified. Potential overlaps with the EEPR (European Energy Programme for Recovery) were prevented through the programme's rules. While Horizon 2020 focussed on the R&D and pilot stages of the cycle, NER 300 bridged the gap between R&D and commercialisation by funding first-of-a-kind projects. Hence the programme was well designed to cover the technology development cycle complementary to Horizon 2020.

3.9 Transitional free allocation for the modernisation of the power sector

3.9.1 Background

3.9.1.1 Article 10c of the EU ETS Directive

Article 10c of the revised EU ETS Directive states that Member States may give transitional free allocation to installations that generate electricity (and were in operation, or "for which the investment process was physically initiated", by the end of 2008) to encourage infrastructure modernisation and investments in clean technology, even though the power sector in general does not receive allowances for free as of Phase III of the EU ETS. Article 10c is thus an *exception* to the rule. Therefore only Member States that meet certain criteria are eligible to apply for derogation under Article 10c. Among those Member States eligible, Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania applied successfully for transitional free allocation. The free allowances are deducted from the quantity of allowances that the respective Member State would otherwise auction. Free allocation is limited by the Directive, and to be phased out by 2020[419].

Eligible Member States had to submit an application to the European Commission with a national plan "that provides for investments in retrofitting and upgrading of the infrastructure and clean technologies" (Article 10c(1)). Accordingly, these plans must "provide for the diversification of their energy mix and sources of supply for an amount equivalent, *to the extent possible*, to the market value of the free allocation with respect to the intended investments, *while taking into account the need to limit as far as possible directly linked price increases*" (emphasis added). Electricity generators and network operators that benefit from the transitional free allocation of allowances shall report every 12 months on those investments' implementation. Member States shall report to the Commission and shall publish such reports.

The Commission shall evaluate the implementation of the national plan two years before the respective Member State's free allocation period ends. If the Commission finds "a need for a possible extension of that period, it may submit to the European Parliament and to the Council appropriate proposals, including the conditions that would have to be met in the case of an extension of that period." The provisions of the Directive are specified further in two guidance documents by the Commission (see section 3.9.1.3).

3.9.1.2 Magnitude of the Article 10c derogation

The quantity of allowances involved in the Article 10c derogation, in relation to the overall allocation of allowances and the combined value of the investments, reveals its relative magnitude on a volume basis. Table 17 below shows the free allocation percentage of the auctioning amount per Member State.

[419] Article 10c(2): "In 2013, the total transitional free allocation shall not exceed 70 % of the annual average verified emissions in 2005-2007 from such electricity generators for the amount corresponding to the gross final national consumption of the Member State concerned and shall gradually decrease, resulting in no free allocation in 2020."

Table 17: Article 10c derogation total volumes per Member State in relation to emissions in 2013

Member State	Maximum number of free allowances pursuant to Article 10c	Verified emissions	Art. 10c allowances relative to verified emissions
Bulgaria	13 542 000	33 020 916	41.0 %
Cyprus	2 519 077	4 024 874	62.6 %
Czech Republic	26 916 667	69 150 390	38.9 %
Estonia	5 288 827	15 926 130	33.2 %
Hungary	7 047 255	19 351 701	36.4 %
Lithuania	582 373	7 513 325	7.8 %
Poland	77 816 756	206 177 309	37.7 %
Romania	17 852 479	42 470 851	42.0 %
Art.10c total	**151 565 434**	**397 635 496**	**38.1 %**
EU total	as above	1 924 811 548	7.9 %

Sources: Verified emissions of ETS sectors per country from EUTL[420], Article 10c allowances from European Commission[422], further calculation: Meyer-Ohlendorf and Duwe[421]

Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania applied successfully for transitional free allocation. The European Commission approved a maximum total of almost 680 million EUAs to be given for free over the period 2013-2019 by these Member States. For 2013, the total maximum volume is 7.9 % of the total verified emissions in the EU. For the eight countries using Article 10c, the maximum amount of free allowances equals 38.1 % of their total emissions. For most of them it ranges between 33 % and 42 %. Only Lithuania (8 %) and Cyprus (60 %) are not in this range.

For 2013 and 2014, the Commission has published status tables with the maximum allowable volume and the amount actually allocated. For 2013, the allocated amount is 88 % of the maximal allowed number, i.e. 12 % were not allocated. Five of the eight countries concerned have allocated lower amounts than originally foreseen[422]. For 2014, data is not yet complete, and is therefore not further analysed.

[420] Compliance data for 2013, download under: http://ec.europa.eu/clima/policies/ets/registry/documentation_en.htm

[421] N. Meyer-Ohlendorf, M. Duwe, "Assessment of Article 10c of the EU ETS Directive in light of the 2030 negotiations", 2014.

[422] "Status table on transitional free allocation to power generators for 2013. Updated on 28 October 2014", Download under: http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/process_overview_10c_en.pdf, A similar table for 2014 is also available, but not yet complete: http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/process_overview_10c_2014_en.pdf.

Table 18: Overview of maximum and actual Article 10c allocation per Member State in year 2013

	Maximum number of free allowances pursuant to Article 10c	Number of free allowances pursuant to Article 10c allocated by MS	Percentage of allocated free allowances to Art 10c
Bulgaria	13 542 000	11 009 416	81.30%
Cyprus	2 519 077	2 519 077	100.00%
Czech Republic	26 916 667	25 285 353	93.94%
Estonia	5 288 827	5 135 166	97.09%
Hungary	7 047 255	7 047 255	100.00%
Lithuania	582 373	322 449	55.37%
Poland	77 816 756	65 992 703	84.81%
Romania	17 852 479	15 748 011	88.21%
Art 10c total	**151 565 434**	**133 319 354**	**87.79%**

Source: European Commission[422], Meyer-Ohlendorf & Duwe (2014)[421] and own calculation.

3.9.1.3 Guidance on National plans for investment

The Commission issued guidance documents (in form of a Decision and a Communication)[423] on the application of Article 10c. While the Decision deals primarily with the allocation formulae and benchmarks, the Communication stresses Member States' discretion in the implementation of national plans and recommends that they be based on common principles, such as:

- Identifying investments that directly or indirectly contribute to decreasing greenhouse gas emissions in a cost effective manner (Principle 1);
- Eliminating the power sector configuration that made the respective Member State eligible for Article 10c allowance in the first place, i.e. overwhelming dependency on one fossil fuel for power generation and no or weak connection to the former UCTE network (Principle 2);
- Compatibility of investments with each other and with other relevant Union legislation, including the need to avoid distortion of competition and trade in the internal market (Principle 3);
- Additionality of investments from Article 10c allowances, i.e. funds must go to projects that would not have occurred otherwise – either because they are required by EU law or because they are needed to meet increasing demand (Principle 4);
- Contribution to diversification and reduction in carbon intensity of the electricity mix (Principle 5);

[423] Commission Decision of 29 March 2011 on guidance on the methodology to transitionally allocate free emission allowances to installations in respect of electricity production pursuant to Article 10c(3) of Directive 2003/87/EC (C(2011) 1983 final); download under: http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/c_2011_1983_en.pdf, and Communication from the Commission: Guidance document on the optional application of Article 10c of Directive 2003/87/EC (2011/C 99/03); download under: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011XC0331(01)

- Economic viability even without the free allocation of emission allowances, if the allocation of free allowances under Article 10c will be phased out. Exceptions are defined for emerging technologies which are still at the demonstration stage and especially indicated in the Directive (Principle 6).

Against this backdrop, the following sections assess the extent to which these investment plans steer funds towards decarbonising electricity production in the countries concerned, and whether the plans and their monitoring results are available to the public.

Within the limited scope of this analysis, the study focuses on three Member States: Poland, Czech Republic and Romania.

3.9.2 Intervention logic

- Needs
  - Several Member States have an urgent need for a modernisation of infrastructure in the power sector;
  - This needs investments in clean technology and renewable energy;
  - Diversification of the energy mix is also desirable.
- Objectives
  - A modernisation of the power sector (including power plants and transmission networks) should be incentivised;
  - Support should be granted for this purpose;
  - The increase of electricity prices for consumers should be limited.
- Actions
  - Free allocation may be granted as derogation from auctioning to certain operators of power plants, provided it can be ensured that this support is used for modernisation of the power sector.
  - The Commission is to provide rules for the uniform application of the free allocation by Member States.
  - Member States have to provide investment plans for ensuring that the value of the free allocation is steered to be used for the required investments.
  - The Commission has to approve Member States' allocation and investment plans under Article 10a.
  - In order to ensure the efficient use of the funding, transparent monitoring and reporting of allocations, emissions and investments by Member States is required.
- Intended/expected results
  - Systematic upgrading and modernisation of the power sector's infrastructure is observable.
  - Electricity generation efficiency increases, energy mix becomes diversified.
  - Information about progress made is publicly available.
- Expected impacts
  - Member States' auction revenues are reduced accordingly.

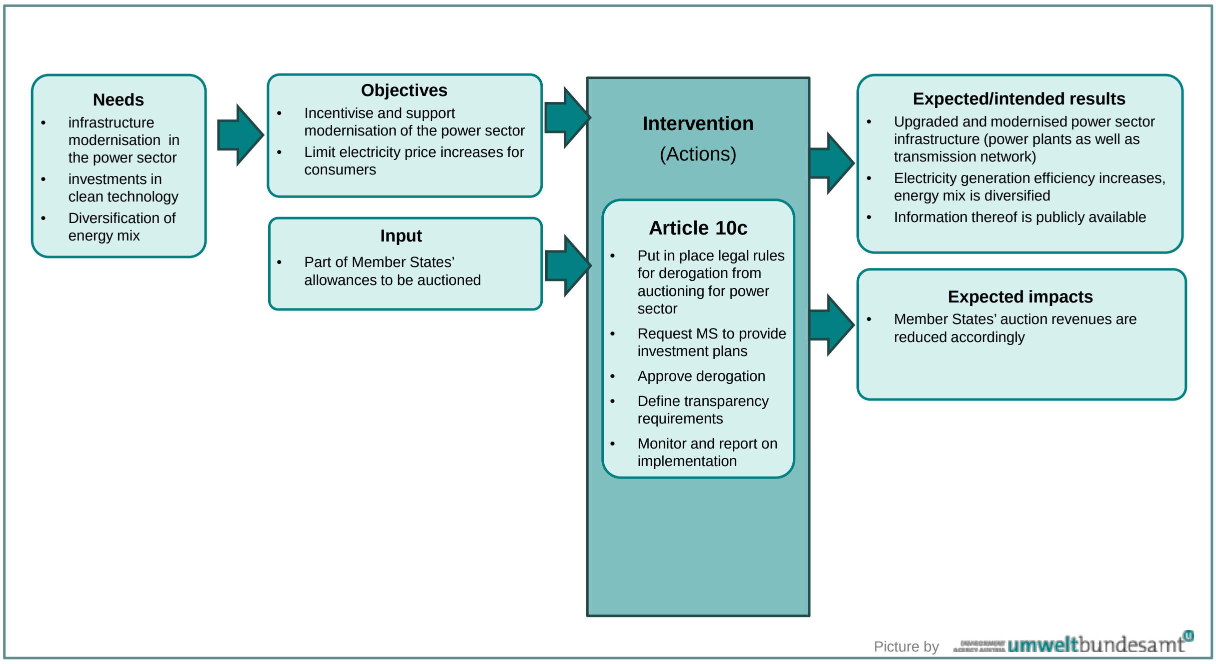

Figure 48: Detailed intervention logic for the evaluation area "Article 10c derogation for the power sector".

3.9.3 Relevance

For evaluation of the relevance of the Article 10c derogation, the following evaluation questions were used:

- To what extent does the free allocation to certain installations in the power sector support the overall target of the EU ETS, i.e. stimulating GHG emission reductions?
- In particular, are longer-term investments in GHG reduction stimulated?

Of the three countries analysed, GHG emission reduction data is available only for Romania, which estimates that its Article 10c investments reduced emissions by 1 040 435 t CO_2 in 2013. Information on the types of investments is only available in the national language.

According to analysis[424] undertaken by the non-governmental organisations CAN-Europe, WWF and Greenpeace, the majority of investments in Poland and Czech Republic will not lead to diversifying their energy mix or to reducing their dependency on coal. In Poland, for example, none of the 378 investments[425] listed in the National Investment Plan relate to solar or wind power generation. Out of 27 investments classified as "renewable energy" 24 are investments in biomass co-firing with coal.

[424] CAN-Europe, WWF, Greenpeace, "Stronger Together. Investment support and solidarity mechanism under the EU's 2030 Climate and Energy Framework". Brussels, 2014, Download under http://www.wwf.eu/media_centre/publications/?229051.

[425] In line with Decision C(2012) 4609, around 30 of those investments were excluded from the National Investment Plan. The cited study still includes those, and should therefore be understood only as indicative information.

There are further indications that the investments do not equally reflect the objectives of increasing energy diversification, avoiding the support of dominant market positions, or changing the energy mix: For Romania only one investment was described in detail – a gas-fired power plant intended to be more efficient than the country's current power fleet average[426]. Most of Poland's investments constitute modernisation of existing power plants[427], which might result in a more efficient electricity production but do not diversify energy production. Our analyses showed only 7 investments which clearly indicate that these are investments in biomass-coal co-fired installations (out of 40 investments in biomass installations).

In the Czech Republic, roughly 85% of the investments will be used for the modernisation of heat producing installations rather than facilities in the power sector, according to Environmental Law Service and the Centre for Transport and Energy[428]. In principle, the electricity sector is named as the main investment target, but other sectors are allowed to receive funds if adequate justification is provided. The above mentioned study, however, cites no justifications. The study also analysed the degree to which Czech Article 10c investments increase the variety in the energy mix, and found that about 45 % of the Czech investments are expected to go into the upgrading of coal-fired installations.

3.9.4 Effectiveness

For evaluation of the effectiveness of the Article 10c derogation, the following evaluation questions were used:

- To what extent was the free allocation of allowances under Article 10c actually used?
- Is there evidence that investments have been initiated which would not have happened without this support?
- Is there evidence that the free allocation did support the decarbonisation of the electricity sector, did not lead to undue distortion of competition on the internal electricity market and did not reduce the incentives to reduce emissions?

The possibility to allocate free allowances to power plants was used by eight countries: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania. Ten countries were eligible for the allocation of free allowances. Latvia and Malta would be eligible, but decided not to use the derogation[424]. For 2013, only Hungary and Cyprus allocated the maximum number of free allowances. Most other Member States allocated between 81 % (Bulgaria) and 94 % (Czech Republic) of their maximum allowed number of free allowances. Poland allocated 15 % (11 million allowances in total) less than its maximum, which is in total numbers a significant result. Lithuania used only 55 % of its maximum, but because of the overall low number of allowances, the total

[426] Department of Energy of Romanian's Government, "Report on the Implementation of Romania's National Investment Plan for 2013", 2014. Download under: http://energie.gov.ro/files/download/690fe9ad37f6a64

[427] Ministerstwo Srodowiska, Rzeczpopolita Polska (2013): Krajowy Plan Inwestycyjny.

[428] Environmental Law Service and the Centre for Transport and Energy, "Optional Derogation: Transitional free allowances for power generators in the Czech Republic". 2011, Download under http://frankbold.org/sites/default/files/publikace/report-on-czech-10c-application_final.pdf

number of unused allowances is only about 260 000 allowances (for data refer to Table 18 above).

The question whether the investments under Article 10c might have happened without this support could not be answered. The level of detail required to find this evidence – including targeted research in the relevant Member States' national languages and individual case studies – was beyond the scope of this analysis.

Article 10c's contribution to long-term decarbonisation cannot be analysed empirically, because several countries (in our sample: Czech Republic and Poland) are not reporting the volume of CO_2 emissions which their investments will reduce. As explained for the "relevance"-question above, many investments go toward upgrading existing fossil fuelled facilities – this limits the extent to which they can contribute to the long-term transformation and diversification of the energy mix.

The lack of available and consistent empirical data on investments and their impacts renders an analysis of their potential competitive distortion in internal power markets infeasible at this time.

3.9.5 Efficiency

For evaluation of the efficiency of the Article 10c derogation, the following evaluation question was used:

- Were the value of free allowances and administrative efforts involved justified, given the effects achieved in terms investments initiated and CO_2 avoided?

The Czech Republic reported investments in modernisation of installations and upgrading the network worth 1.1 billion € in 2013. For this year the value of the allocated free allowances is estimated at 189 million €[429]. For 2014, Czech infrastructure investments were worth nearly 1.2 billion €, while the estimated value of the free allowances in that year was about 100 million €[430].

For Poland, eligible costs for the individual installations were reported at 1.15 billion € in 2013. The value of the allocated free allowances was estimated at 975 million € in that year[431].

For Romania the system is a bit different because the allowances have to be paid by the operators. The money flows into a national investment fund. In 2013, 71.3 million €[432] were paid and went into the investment fund. The payments were only made in the first quarter of 2014. The investments of the National Investment Plan will be financed by the national investment fund, for which financing requests could only be submitted by May 2014.

From the available data, it can be seen that substantial amounts were invested in the installations. For the Czech Republic and Poland the value of investment

[429] Czech Ministry of Environment (2014): Monitoring Table 2013.

[430] Czech Ministry of Environment (2015): Monitoring Table 2014.

[431] Ministerstwo Srodowiska, Rzeczpopolita Polska (2014): Tabela nr 2. Zestawienie dla grup kapitałowych.

[432] Department of Energy of Romanian's Government (2014): Romania's Payment Report for the allocation year 2013 under Article 10c of the revised EU ETS Directive.

was higher than the estimated value of free allowances for all years (for which data was available). Especially for the Czech Republic the investment was ten times higher than the estimated value of the free allowances (which is for 2013: almost 900 million € of investment and for 2014: approximately 1 billion €). For Poland the investments are about 175 million € higher than the estimated values of free allowances.

Unfortunately, of the selected countries (Czech Republic, Poland and Romania) only Romania reported on the avoided CO_2 emissions of one installation which are about 1,040,435 t CO_2 emissions for the year 2013. This means that neither effectiveness nor efficiency in terms of total greenhouse gas reductions fostered by Article 10c can be evaluated.

3.9.6 EU-added value

For evaluation of the EU-added value of the Article 10c derogation, the following evaluation questions were used:

- What is the added value of this funding being regulated at EU level? Could a similar effect also be achieved by national measures (e.g. using EU ETS auctioning revenues for funding according to environmental state aid guidelines)?
- Can evidence be found of any (undue) distortion of competition in the EU electricity market as a consequence of Article 10c allocation?

Our analysis could not find evidence that any distortion of competition in the EU electricity market because of Article 10c allocation occurred. Furthermore the Commission carried out state aid assessments on all Member States' applications under Article 10c. Thus it can be concluded that the risk of distortion of competition was addressed.

3.9.7 Coherence

For evaluation of the coherence of the Article 10c derogation, the following evaluation questions were used:

- To what extent is the Article 10c allocation coherent with the overall EU ETS framework?
- To what extent is it coherent with other policies in this field, in particular the NER 300 and other funding in the energy sector (e.g. RES subsidies, the European Regional Development and Cohesion Funds)[433]?

The main objective of the EU ETS is to reduce greenhouse gas emissions in the covered sectors. Furthermore, "ensuring the highest degree of economic efficiency" and "eliminating distortions to intra-Community competition" are important principles of the Directive. Member States with relatively lower per capita GDP should receive special support.

In general, the objective of free allocation under Article 10c is to incentivise retrofitting and upgrading of infrastructure and to promote clean technologies that diversify the energy mix. Such investments have indeed been made: in the

[433] Due to timing and budget constraints this analysis has to be very brief.

three countries analysed, financing of power plant infrastructure upgrades exceeds the value of the allocated free allowances (see chapter: 3.9.5). However, the extent to which these have reduced CO_2 emissions remains unclear. Most of the investments appear to be in upgrading existing fossil fuel infrastructure, such that emission reduction (beyond mere efficiency improvements) and diversification of the power mix are not sufficiently achieved in these countries.

The objectives of Article 10c and the NER 300 are coherent. The latter is based on Article 10a(8) of the revised EU ETS Directive. It allows for the use of 300 million allowances from the New Entrants' Reserve (NER) to help stimulate demonstration projects for CCS and innovative renewable energy technologies. Projects should use technologies which are not yet commercially viable. Both Article 10c and the NER 300 promote investments in clean technologies. While the NER 300 focuses on innovative technologies in renewable energy and CCS, the transitional free allocation supports retrofits and upgrades of infrastructure as well as investment in clean technologies (including renewable energies). In neither case are the technologies ranked by degree of innovation.

Cohesion Policy is divided into several receptors. For energy it is divided into investment in conventional energies and in renewables & efficiency. The renewables & efficiency receptor is further split into: wind, solar, biomass, hydroelectric & geothermal, energy efficiency & co-generation.

For the EU's multiannual financial framework (MFF) 2007-2013 the expenditures for the relevant countries (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania) were 4 billion €. Half of this was invested in energy efficiency and co-generation. The expenditure for biomass was about 880 million €. Substantial investment in renewable energies and energy efficiency is done via Cohesion Policy, so it is clearly complementary to the transitional free allocation.

3.9.8 Transparency

For evaluation of the transparency of the Article 10c derogation, the following evaluation questions were used:

- Are the current requirements of the Directive on public reporting effective?
- In particular, does publicly available information show the number of free allowances actually allocated, the investments implemented/planned and the classification of investment types?

For the analysis of transparency, the webpages of the responsible ministries of Poland, Czech Republic and Romania were scanned for available information, such as the application to the Commission, the Decision by the Commission, the monitoring reports, the investment plans and any additional relevant information. For Poland the Ministry of Environment is responsible, for Romania the Department of Energy (of the Ministry for Energy, Small and Medium Enterprises and Business) is the relevant authority, and in the Czech Republic it is the Ministry of Environment. The availability of the key documents varies between the different Member States.

Poland

For Poland different versions of the national investment plan are accessible and the monitoring report on free allowances for 2013 is available. Furthermore, documents on the methodology used are available. The application to and the Decision of the European Commission could not be found. A contact person for issue of free allocation is mentioned on one of the webpages. All documents at the Polish webpage were available only in the national language.

The earliest possible allocation data for Poland was 9 April 2014. The indication of the publication date of the monitoring report on the webpage is 8 December 2014.

Published documents include information on the installations intended to receive investments and the short characterisation of the investment (in Polish). Many investments focus on the modernisation of power plants, modernisation of energy infrastructure and 40 installations that invest in biomass-related technology. There is also investment in gas-fired power plants[434]. The information on proposed allocation of allowances, the released allowances and the unreleased ones are included for each installation. For Poland 77 816 762 allowances were foreseen and 65 992 703 were issued in 2013[435].

Czech Republic

A monitoring table on the investments and the type of investments for every installation in the Czech Republic exists for 2013 and 2014. Furthermore, the national allocation table contains data on the quantity of free allowances for every installation. It is also available for 2013 and for 2014. A description of the methodology is available online. Also the original data sheets filled in by each installation with contact person and realised investment is publicly available. The application to the European Commission is published on the webpage. The decision of the Commission is also available (in the national language) (C(2012)4576 final). The monitoring table, the national allocation table, the methodology report and the application are published in English.

For the Czech Republic, the earliest allocation date indicated in the status table at the Commission's webpage is 29 January 2014. A clear publishing date for the monitoring table and the national allocation table for 2013 could not be found on the webpage. The documents' names include the date 5 November 2014. It might be assumed that the two documents were published in November 2014. Furthermore, it should be mentioned that the monitoring table and the national allocation table for 2014 is marked with the date 22 October 2014.

The documents include the allowance allocation foreseen for each installation as well as a brief description of each investment and its value. Ideally, the description of investments would also allow for the type of investment to be derived, but the description is not fully included in the monitoring table, so that a statement on the types of investments is not possible. The Czech monitoring

[434] Ministerstwo Srodowiska, Rzeczpopolita Polska (2013): Krajowy Plan Inwestycyjny.

[435] Ministerstwo Srodowiska, Rzeczpopolita Polska (2014): Tabela nr 2. Zestawienie dla grup kapitałowych.

table includes the allowances proposed to be issued, allowances to be transferred and allowances finally issued for each installation[436].

Romania

The Romanian government has published information on the implementation of the National Investment Plan for 2013 online. Furthermore, a payment report for the allocation year 2013 is available. Romania bases its free allocation on payments into a National Investment Fund, which will be used for the financing of investments in modernisation of infrastructure and renewable energies. Therefore, the payment report includes how much was paid into this fund for the allowances.

The application to and the decision of the European Commission could not be accessed on the Romanian website. The National Investment Plan with all the proposed investments is also not published. The documents on the implementation of the National Investment Plan and the payment report are available in English.

For the Romanian documents no official publishing date could be found. However, document properties revealed that the documents were created on 15 October 2015.

The available documents for Romania include the proposed and issued allowances for 2013. Out of the maximum of 17 852 480 allowances, 15 748 011 allowances were issued, based also on the fact that operators paid for the allocation of these allowances[437]. The remainder will be auctioned. One of the installations in the investment plan started operations. It is an investment in a combined cycle gas turbine – an energy-efficient natural gas-fired power plant. It is stated that this investment contributes to the diversification of the national energy mix, that it increases competitiveness of the Romanian energy sector and helps ensure energy supply. The CO_2-emissions reduced through the investment are estimated at just over one million tonnes in 2013, based on comparison to the average CO_2 emissions of the country's fossil fuel fired power plants.

Romanian documents also indicate to which installations (run by which operators) allowances will be allocated and how many allowances are foreseen to be allocated between 2013 and 2020 for each installation.

The following table summarises the transparency data for the three countries analysed. The Czech Republic ranks highest in transparency, being the only one to publish the application to and the decision by the Commission – these are key documents for the understanding of the process as a whole. Czech publications also include the original factsheets filled by the companies. How-

[436] E.g. Czech Ministry of Environment (2014): National Allocation Table of the Czech Republic for the period 2013-2020 pursuant to Article 10c of Directive 2003/87/EC. Czech Ministry of Environment (2014): Changes to National Allocation Table of the Czech Republic for the period 2013-2020 pursuant to Article 10c of Directive 2003/87/EC. Czech Ministry of Environment (2014): Monitoring Table 2013. Czech Ministry of Environment (2014): Monitoring Table 2014.

[437] Department of Energy of Romanian's Government (2014): Report on the Implementation of Romania's National Investment Plan for 2013, Department of Energy of Romanian's Government (2014): Romania's Payment Report for the allocation year 2013 under Article 10c of the revised EU ETS Directive.

ever, other important information – such as the type/description of investment – is not fully accessible. Romania and Poland do not publish the application and the decision of the Commission. Poland lacks quantitative information on realised investments. Only Romania estimated and published CO_2 emissions reductions by the implemented investments. The Czech Republic[438] and Romania[439] published their information in English, Poland[440] only in Polish. No independent audit reports could be found at the time of writing.

Table 19: Summary of the analysis on published information

Member State	CZ	PL	RO
MS application available online (yes/no)	Yes	No	No
2013 monitoring report available online (yes/no)	Yes (in EN)	Yes (in Polish)	Yes (in EN)
Timeliness of publication	Reports for 2014 were available in March 2015	Report for 2013 published on 8 Dec. 2014	Report for 2013 published in October 2014
Number of investments carried out clearly indicated (yes/no/partially)	Yes (in EN)	No	Yes (in EN)
Number of issued/unused allowances clearly indicated (yes/no/partially)	Yes (in EN)	Yes (in Polish)	Yes (in EN)
Intended and realized performance of completed investments clearly indicated (e.g. reduced GHG emissions indicated)	No	No	Yes (in EN)
Independent audit reports available (yes/no)	No	No	No

[438] http://www.mzp.cz/cz/bezplatna_alokace_na_elektrinu, accessed 11 March 2015.
[439] http://energie.gov.ro/anunturi, accessed 11 March 2015.
[440] http://www.mos.gov.pl/kategoria/5688_instalacje_wytwarzajace_energie_elektryczna/, accessed 11 March 2015

3.9.9 Conclusions

Relevance: Free allocation under Article 10c amounted to about 7 % of total EU emissions in 2013. Eight of the ten eligible Member States made use of the derogation. Three of them (Romania, Poland and Czech Republic) have been evaluated in more detail.

Effectiveness: As eight out of ten eligible Member States use this measure, which requires evidence for concrete investments, it must be assumed that to some degree the Article 10c derogation is effective. However, it could not be determined whether those investments would also have happened without Article 10c. Furthermore the analysed investment plans show only a limited number of investments regarding renewable energy sources, or more generally diversification of the energy mix. As only limited data is available in relation to the first years of the implementation, it is not possible to assess to which extent such investments are expected to contribute to the EU ETS' overall target of decarbonisation of the economy.

Efficiency: Investments reported were found bigger than the value of allocated allowances in the three Member States evaluated. However, since only one Member State reported also on avoided emissions, it cannot be evaluated for the Article 10c instrument as a whole whether it is efficient in terms of emission reduction.

EU-added value: No distortion of competition as consequence of Article 10c could be found. However, it was not possible to determine within the scope of this study whether funding of similar investments would have been possible at national level.

Coherence: Article 10c funding has been found coherent with the overall EU ETS target, although the practical outcome could not be verified regarding resulting GHG emission reductions. It was also found coherent with (or complementary to) other types of funding, such as renewable energy support schemes or the NER 300 programme.

Transparency: While all evaluated Member States published some information on the use of the Article 10c allocation, none of them published complete information. Only part of the information is available in English. In particular information on investments taking place and on GHG emission reductions are very fragmented.

3.10 ETS and small operators

3.10.1 Introduction

Small and medium enterprises (SMEs) are often referred to as the backbone of the European economy. To support SMEs in lowering their administrative costs the "Think Small First" principle was brought to life and enshrined in the Commission Communication on SMEs in 2008, referred to as the "small business act for Europe"[441] (SBA).

The Communication sets out ten principles aiming to guide the conception and implementation of policies both at EU and national level to create a level playing field for SMEs throughout the EU. This Communication identifies compliance with administrative regulations to be amongst the most burdensome constraint, as reported by SMEs; a consequence of disproportionate regulatory and administrative costs in comparison to larger businesses. It also acknowledges that climate change, scarcity of energy supplies and sustainable development are key challenges for SMEs, which have to adopt more sustainable production and business models.

Regulators should therefore ensure that policy results are delivered while minimising costs and burdens for business, e.g. by reducing the level of fees requested by the Member States. Furthermore, regulators should rigorously assess the impact of forthcoming legislative and administrative initiatives on SMEs, the so-called "SME test" as outlined in the Commission's impact assessment guidelines[442].

In 2011, a review of the SBA[443] was released, concluding that some progress was made and all Member States acknowledged the importance of the SBA's rapid implementation. However, approaches taken and the results achieved vary considerably across Member States. While most of them have adopted national targets for reducing administrative costs, only a few Member States have integrated an "SME test" into their national decision making approach.

The importance of SMEs is also feeding into the EU's "smart regulation"[444,445] initiatives, further promoting the "Think Small First" principle. In 2014, the European Commission adopted a further Communication "For a European Industrial Renaissance"[446]. This document also highlights the importance of SMEs and identifies that inflexible administrative and regulatory environments continue to hold back their growth potential.

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[441] COM(2008) 394 "Think Small First" a "Small Business Act" for Europe, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0394

[442] SEC(2009) 92, "Impact assessment guidelines", Download under http://ec.europa.eu/enterprise/policies/sme/files/docs/sba/iag_2009_en.pdf

[443] COM(2011) 78, "Review of the "Small Business Act" for Europe", Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0078:FIN:en:PDF

[444] http://ec.europa.eu/smart-regulation/index_en.htm

[445] "Smart regulation – Responding to the needs of small and medium-sized enterprises", COM(2013) 122, Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0078:FIN:en:PDF

[446] Communication "For a European Industrial Renaissance", COM(2014) 14, Download under http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2014:0014:FIN:EN:PDF

Against this background, Article 27 of the EU ETS Directive provides Member States with the flexibility to exclude small installations[447] from the EU ETS, provided that they are subject to measures that will provide equivalent emissions reductions. All aspects of this EU intervention are described in section 3.10.2.

Note: SMEs are defined in terms of number of employees (< 250) and annual turnover or balance sheets below certain thresholds. Installations with low emissions are defined by annual emissions and rated thermal input – those two definitions do not necessarily correspond. Nevertheless the evaluation uses both terms synonymously since the EU ETS covers a significant number of SMEs, and many of them fall under the group of low-emitting installations. Therefore the desire to support SMEs and the EU ETS's objective of efficiency are well linked in this section of the evaluation report.

3.10.2 Intervention logic

The evaluation is based on the following aspects of the intervention logic:

- Needs:
  - Respect the "Think Small First" principle
- Objectives:
  - Achieve emission reductions by small installations at lowest possible administrative costs without sacrificing environmental integrity;
  - Avoid distortion of competition between installations within the same sector but different in size;
  - Avoid distortion of competition between installations located in different Member States.
- Action:
  - Provide Member States with the option to exclude small installations from the EU ETS if they are subject to measures that will provide equivalent emissions reductions, as set out in Article 27 of the EU ETS Directive;
  - Define appropriate eligibility criteria for opt-out, including transparency measures and rules for a potential re-introduction of installations in the EU ETS;
  - For ensuring a level playing field, ensure that the Commission has to approve any opt-out.
- Intended effects:
  - Small installations reduce emissions as effectively as under EU ETS, but at the same time more efficiently if excluded from the EU ETS (i.e. administrative costs is reduced);
  - Overall the EU ETS is credible due to robust rules and transparent results;
  - Harmonisation of exclusion approaches and equivalent measures put in place by giving the Commission the right to object to exclusions.
- Unintended effects:

[447] In accordance with Article 27 of the EU ETS Directive, small installations are installations emitting less than 25 000 t CO_2(e) annually and, where they only have combustion activities, have a rated thermal input below 35 MW.

- Less harmonisation than in the case all installations remain in the EU ETS due to flexibility given to Member States on defining equivalent measures;
- Less transparency regarding the effectiveness and efficiency of achieving emissions reductions by small installations than in the case all installations remain in the EU ETS.

- External factors:
  - Interventions for promoting SME's (e.g. other support initiatives for small installations).

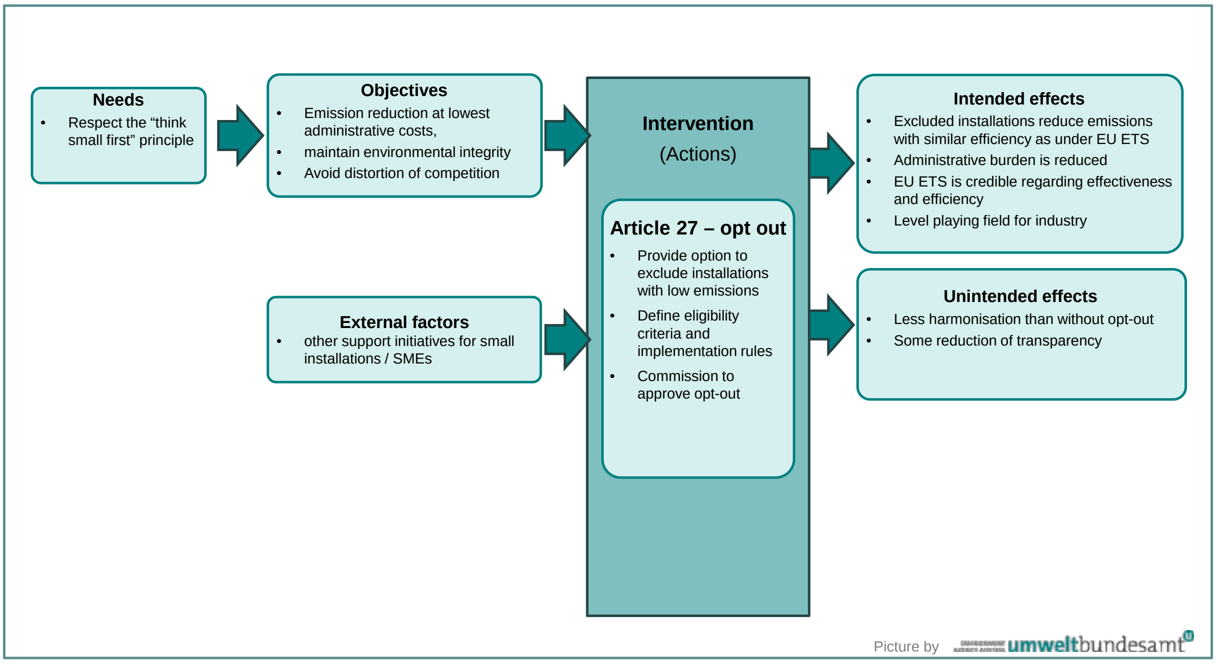


Figure 49: Detailed intervention logic for the evaluation area "ETS and small operators".

3.10.3 Relevance

The relevance of opting-out low-emitting installations from the EU ETS is evaluated using the following questions:

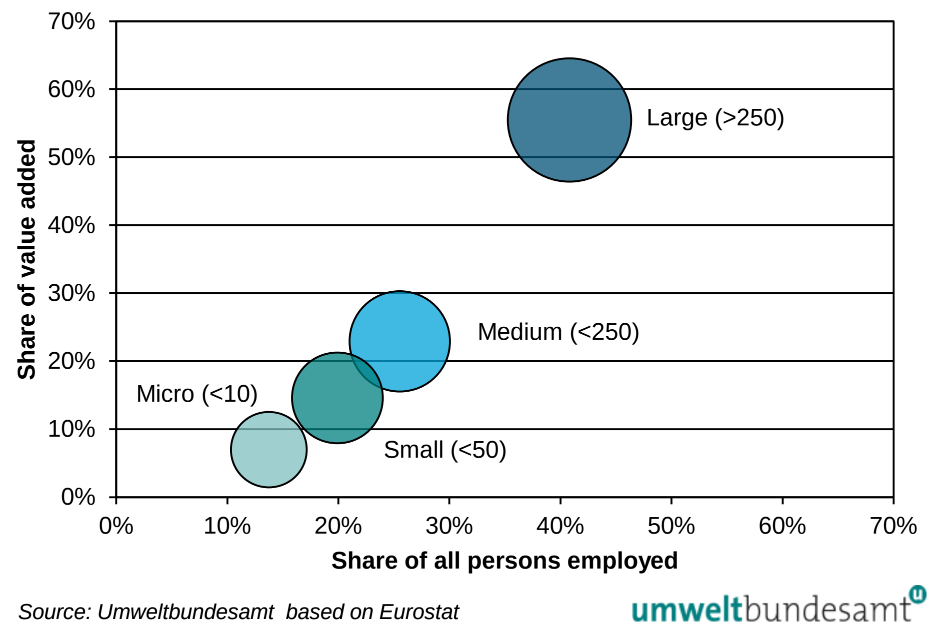
- What is the economic importance of SMEs in manufacturing in the EU?
- What is the share of installations satisfying the criteria for opt-out under Article 27 of the EU ETS Directive (i.e. emitting less than 25 kt CO_2 per year, and in case of combustion activities below 35 MW rated thermal input) and the share of their emissions in the EU ETS?
- Is there evidence that the EU ETS creates a significant (administrative) burden on installations with low emissions which justify an exemption of such installations from the EU ETS?
- Which Member States made use of the opt-out provision? What is the share and type (sector) of those installations and corresponding emissions they account for? In what level of detail have Member States published information for public comment?

3.10.3.1 Economic importance of SMEs in manufacturing

According to Eurostat data[448], SMEs, i.e. enterprises with less than 250 employees[449], account for about 60% of all persons employed and for about 45% of value added in manufacturing industries (Figure 50). Figure 51 shows that regarding value added by sector, the highest shares of SMEs are found in printing (>85%), manufacture of wood and products thereof (about 80%), manufacture of textiles and manufacture of fabricated metal products (both about 75%).

SMEs account for about 60% of all persons employed in manufacturing industries. This share is however widely dispersed across manufacturing sectors. The distribution across sectors is similar to the one for value added (see Figure 52).

It is of particular importance to recognise that the definition of small or small and medium enterprises does not match the definition of small installation, a definition expressed in terms of annual emissions. Moreover, the coverage of the EU ETS is not the same across sectors and installation sizes.



Source: Umweltbundesamt based on Eurostat

Figure 50: Relative importance of enterprise size classes in manufacturing (NACE section C), 2012, EU-28; each bubble size is proportional to the value added per person employed; Source: Eurostat [sbs_sc_ind_r2]

[448] Eurostat, annual enterprise statistics by size class for special aggregates of activities (NACE Rev. 2) [sbs_sc_sca_r2]

[449] The European Commission published guidance on the definition of SMEs which includes also thresholds on the annual turnover and balance sheet in addition to the number of persons employed. Throughout this chapter however, only a distinction between enterprises' size in terms of persons employed is made. Link to the guide: http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf

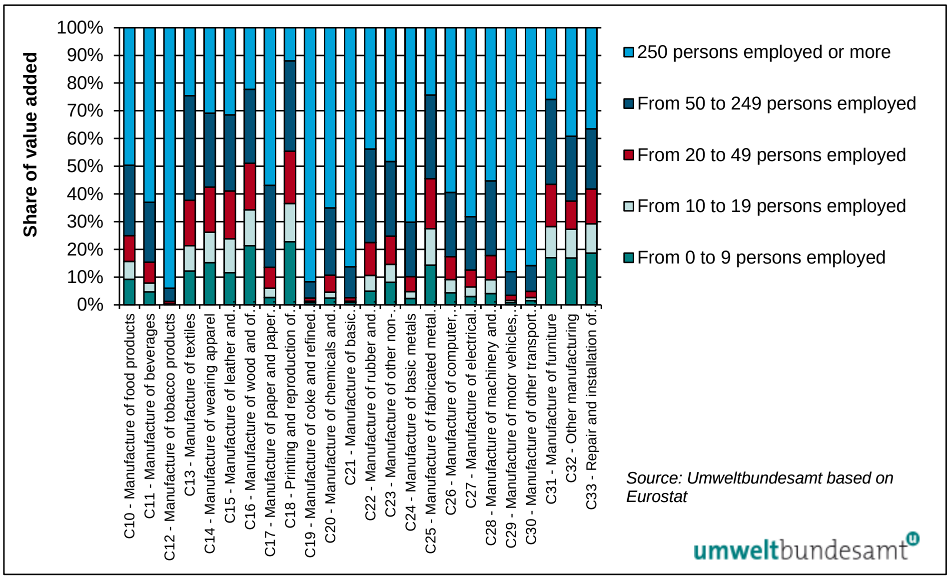


Figure 51: Relative importance of enterprise size class on value added in manufacturing sectors in 2012 in EU-28. Source: Eurostat [sbs_sc_ind_r2]

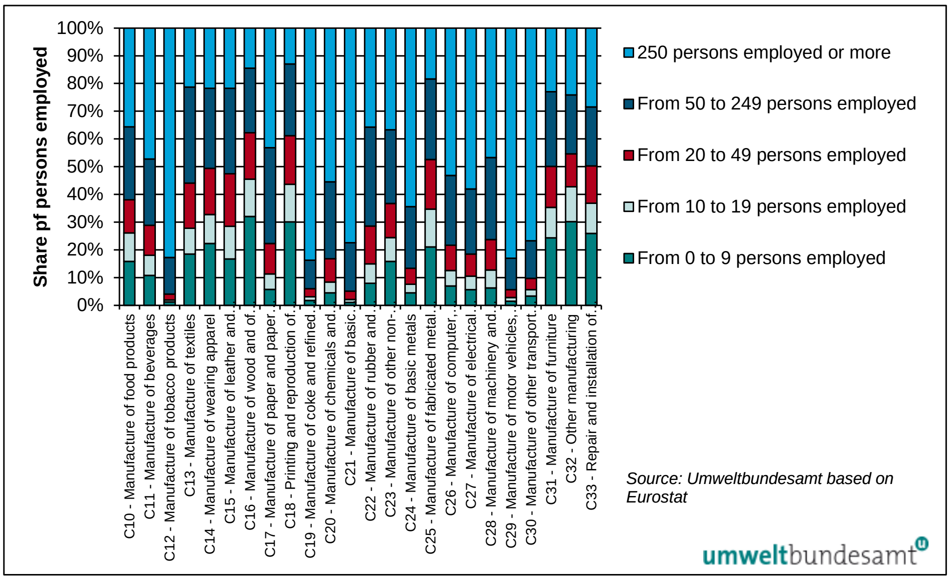


Figure 52: Relative importance of enterprise size class on employment in manufacturing sectors in 2012 in EU-28. Source: Eurostat [sbs_sc_ind_r2]

3.10.3.2 Small installations in the EU ETS

In 2013, there were approximately 11 000 installations included in the EU ETS (see section 3.1.3.1) carrying out at least one activity listed in Annex I of the revised EU ETS Directive. Emissions from those installations are however widely dispersed, varying from installations emitting less than 5 000 t CO_2(e) (about 3 500 installations or 30 % of all installations included in the EU ETS) to those emitting more than 5 Mio. t CO_2(e) (about 60 installations or 0.5 %), as shown in

Figure 53. Approximately 6 900 installations in the EU ETS are in the category of emitting less than 25 000 t CO_2(e). Those 74 % of installations contribute to only 2.7 % of emissions in the EU ETS, while installations emitting more than 500 000 t CO_2(e) (6 % of installations) account for 76 % of total emissions.

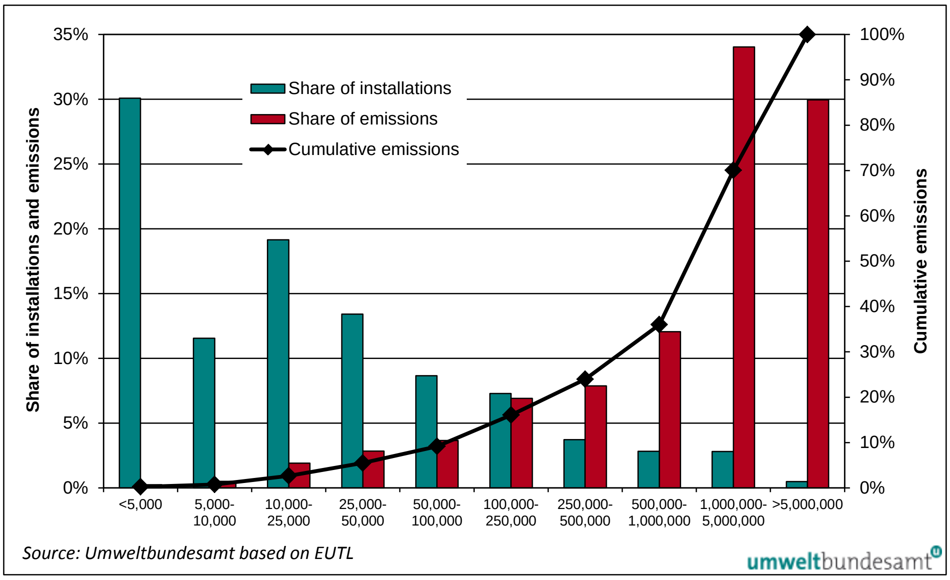


Figure 53: Share of installations and emissions related to annual amount of CO_2(e) emitted from installations. Source: Umweltbundesamt based on EUTL verified emissions 2013.

3.10.3.3 Distribution of transaction costs by size

The inverse relation between a high number of installations and a limited share of the overall emissions under the EU ETS points to higher transactions costs[450] per tonne emitted by small installations.

A recent study[451] on transaction costs incurred by EU ETS participants identified the following types of transaction costs, based on survey data from German EU ETS operators:

- transaction costs in permit trading, including subsistence/registry fees;
- transaction costs in the application for free allocation;
- transaction costs for compliance (monitoring, reporting, and verification);
- transaction costs from examining abatement costs.

As already discussed in section 3.6.6 on MRV costs, this study found that the average transaction costs in Phase II were in the range of 0.05 to 0.25 €/t CO_2, depending to a significant extent on the installation's annual emissions. This inverse relation between the high number of installations and their limited contri-

[450] In this context, transaction costs are costs incurred from participating in the scheme arising from monitoring, reporting and verification requirements, but not compliance costs (need to buy allowances).

[451] P. Heindl, "Transaction Costs and Tradable Permits: Empirical Evidence from the EU Emissions Trading Scheme", ZEW, 2012, Download under http://ftp.zew.de/pub/zew-docs/dp/dp12021.pdf

bution to the overall emissions under the EU ETS points to higher transactions costs[452] per tonne emitted by small installations. The largest share of those costs (about 69 %) arises from MRV activities according to this study.

As shown in Figure 40 in section 3.6.6 on administrative costs by size and sector, the most “representative” SME sector in that graphic might be the ceramics sector: Typically those installations have to monitor several source streams, but several simplifications apply to such small installations in the M&R Regulation. As Figure 40 shows, verification and subsistence fees are significant for them. It therefore does not come as a surprise that several Member States made use of the opt-out option for this sector.

It can be concluded that transaction costs seem to be significantly higher for smaller installations compared to the average. Differences in results between those country studies can be explained by the following aspects:

- The share of small, medium and large installations;
- The share each sector represents in all installations;
- The legislative requirements for MRV activities;
- The registry or subsistence fees imposed.

Since all of the available studies provide results for Phases I and II, it has to be noted that future studies will most likely demonstrate more harmonised costs incurred in Phase III, in particular for MRV activities.

3.10.3.4 Member States implementing Article 27

Article 21 of the revised EU ETS Directive requires Member States to submit each year a report on the application of this Directive on the basis of predefined questions in a questionnaire[453]. According to those reports, seven Member States[454] made use of this option at the start of the third trading phase (Table 20). The total amount of emissions from installations excluded adds up to about 4.5 Mt CO_2e per year, representing 9% of the verified emissions from installations not excluded from the EU ETS and emitting less than 25 000 t CO_2(e) per year and only about 0.3% of the total verified emissions in the EU ETS in 2013[455]. Out of this total, the sectors combustion of fuels and ceramics account for 82% of excluded annual emissions.

Obviously, Member States have not opted-out all the installations that would be eligible according to Article 27 of the EU ETS Directive. Figure 54 shows the verified emissions per Member State in 2013 from installations with annual emissions below 25 kt CO_2e and emissions from opt-out installations. Similar to the whole EU ETS, it can be seen that excluded emissions are a smaller share on the Member State level as well.

[452] In this context, transaction costs are costs incurred from participating in the scheme arising from monitoring, reporting and verification requirements, but not compliance costs (need to buy allowances).

[453] Commission implementing Decision (2014/166/EU) of 21 March 2014 amending Decision 2005/381/EC as regards the questionnaire for reporting on the application of Directive 2003/87/EC of the European Parliament and of the Council. Reports are available at http://rod.eionet.europa.eu/obligations/556/deliveries

[454] Iceland also made use of the exclusion. However, the evaluation focussed on EU Member States only.

[455] Based on EUTL verified emissions for 2013

Table 20: Annual emissions from installations excluded from the EU ETS in accordance with Article 27 of the Directive [kt CO_2(e) per year]

Annex I activity	DE	ES	FR[456]	HR	IT	SI	UK	TOTAL
Combustion	10	275	90	5	247	88	1 594	2 311
Bulk organic chemicals	-	11	-	-	41	-	4	56
Ceramics	-	-	-	81	974	22	317	1 394
Glass production and mineral wool	-	310[457]	-	-	16	13	3	341
Iron & steel production	-	-	-	2	-	-	7	9
Ferrous metals production or processing	-	-	-	-	5	-	13	18
Non-ferrous metals production or processing	-	-	-	-	92	-	-	92
Pulp & paper production	-	66	-	21	14	-	123	225
Lime, dolime and magnesite	-	-	-	-	23	17	-	40
Secondary aluminium production	-	-	-	-	11	-	-	11
TOTAL [kt CO_2(e) per year]	**10**	**662**	**90**	**109**	**1 423**	**140**	**2 061**	**4 495**

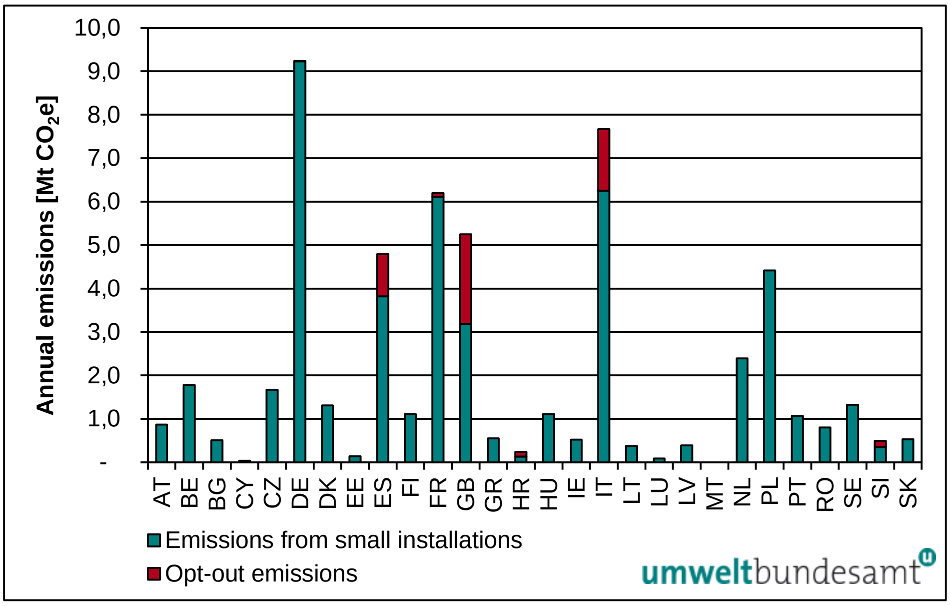


Figure 54: Annual Emissions from small installations (installations with annual emissions < 25 kt) and from opt-out installations, 2013 data; Source: EUTL, Article 21 reports

[456] The Article 21 report by France does not contain a figure, but is known to have considered making use of opt-out. According to private communication of the authors, associated emissions could be in the range of 90 kt CO_2.

[457] The Article 21 report contains the same figure for glass production and mineral wool, which raises suspicion of a copy & paste error.

3.10.4 Efficiency

The efficiency of opting-out low-emitting installations from the EU ETS is evaluated using the following question:

- Is there evidence that the opt-out reduced the administrative costs for those installations?

3.10.4.1 Equivalent measures put in place by Member States

In June 2011, the Commission distributed a non-paper[458] to Member States outlining several aspects deemed important for "equivalent measures" in line with Article 27 of the Directive. It is therefore no surprise that all Member States making use of opt-out followed a more or less similar approach in terms of imposing costs for CO_2 emissions on excluded installations. This was achieved by requiring installations excluded to pay certain fees or taxes. In general, the payable amount is determined by the difference between the excluded annual emissions[459] and an annual "emission target", multiplied by the carbon price. The latter reflects a representative price based e.g. on recent spot prices or auctions. The annual "emission targets" are either based on:

- the free allocation the excluded installation would have received under the EU ETS, including adjustment by a correction factor (e.g. the linear reduction factor of 1.74% per year), or
- historic emissions in 2005, annually reduced by a factor in line with a linear reduction of 21% until 2020.

It can be concluded that Member States have taken similar approaches for defining equivalent measures regarding the carbon costs incurred by installations.

Regarding simplification of the MRV requirements for excluded installations, in particular verification requirements differ across Member States and associated costs probably do so as well. In the UK for instance, excluded installations can either have their annual emissions verified or can submit a self-verified report. For the latter, emissions are verified by the Competent Authority using a risk based approach. In Italy, installations still need third-party verification by an accredited verifier, but he may be "off-site" (for installations not opted-out, verifiers must make site-visits[460]). However, every year a random sample of 5% out of the excluded installation is subject to on-site third-party verification by an accredited verifier. Installations with average annual verified emissions of less than 5 000 tonnes between 2008 and 2010 may have the Competent Authority performing checks instead.

Reducing the administrative costs incurred by monitoring and reporting (M&R) obligations seems not to have been a viable option in the Member States using opt-out. It is expected that the flexibility allowed in the Directive's implementing measures on M&R provides enough cost-efficiency also for small installations. It

[458] "Exclusion of small stationary installations according to Article 27 of the ETS Directive" for Working group 3, 17 June 2011, not published.

[459] Based on simplified MRV rules

[460] This requirement may be waived by competent authorities in special cases, if the verifier can still achieve a reasonable level of assurance in verification. This is the case in relatively rare cases only, e.g. where automatized off-site metering is possible.

is concluded that achieving further cost savings in M&R might be at the expense of environmental integrity, an effect which is to be avoided.

3.10.4.2 Administrative costs for excluded installations

As argued in section 3.10.4.1, administrative costs incurred by excluded installations cannot be completely avoided since some MRV activities will have to be carried out to ensure equivalence and environmental integrity of the applied measures. Obviously, savings can be observed in registry fees and permit trading costs. The biggest impact on reducing administrative costs however stems from simplified requirements for third party verification. The UK Department for Energy and Climate Change published a detailed impact assessment accompanying the exclusion decision[461], estimating the annual savings to be about 3 600 € for the average excluded installation. This amount was expected to be only partly offset by the amount to be paid for the risk-based verification performed by the Competent Authority (700 € per year) as part of the equivalent measures. Adding those figures to the annual savings for registry fees amounted to total annual savings of about 3 500 €. Assuming that the average excluded installation emits about 10 000 t CO_2e annually, this amount represents savings of about 0.35 €/t $CO_2(e)$. This is consistent with the results found in the literature mentioned above[372,373], which reveals that costs associated with verification accounted for up to 50 % of the total costs in MRV activities in Phase II in small installations. As shown in section 3.10.4.1, the costs associated with verification and registry/subsistence fees to the regulator contributed to about 80 % of overall costs to small installations in UK[371].

It has to be noted that the two Regulations on Monitoring & Reporting and Accreditation & Verification, both implementing measures of the revised EU ETS Directive, provide many simplifications for small installations as of Phase III in order to enhance cost-effectiveness. It therefore remains to be seen to what extent costs can still be lowered by opting out once studies on MRV costs become available for Phase III.

3.10.5 Effectiveness

The effectiveness of opting-out low-emitting installations from the EU ETS is evaluated using the following questions:

- How did equivalent measures put in place perform against not opting-out in terms of providing incentives for emissions reductions and maintaining environmental integrity?
- Have the equivalent measures put in place by Member States improved competitiveness against extra-EU competitors and avoided market distortions between installations in the same sector or in other Member States?

[461] Department for Energy and Climate Change, “EU ETS Small Emitter and Hospital Phase III Opt-Out”, 2012.

3.10.5.1 Equivalent measures: impact on emissions reductions

As has been shown in 3.10.4.1, the equivalence between the EU ETS and the measures put in place for excluded installations lead to similar CO_2 costs for installations, i.e. also the incentive to reduce emissions is in a similar order of magnitude. However, economic theory suggests that those types of transaction costs which depend on emission levels distort the pure carbon price signal faced by the operator. They are part of the installations 'cost-minimisation' problem and therefore potentially influence decisions on abatements or permit trading[89]. Since section 3.10.4.2 has shown that excluded installations are very likely to see their transaction costs reduced, one may assume that excluded installations will face a less distorted carbon price signal than installations in the EU ETS (i.e. lower CO_2 costs). However, savings due to exclusion have been found to predominantly occur in verification, registry and subsistence fees (section 3.10.4.2). These transaction costs are nearly independent of emission levels, except for MRV costs which may be significantly reduced in some types of GHG abatement measures (e.g. fuel switch from coal to gas or biomass). Excluded installations will see similar transaction cost reductions by abatement measures. The advantage brought about by exclusion will therefore not have a significantly distorting impact on the CO_2 price and will therefore not change the incentive to reduce emissions.

3.10.5.2 Equivalent measures: impact on environmental integrity

As concluded in section 3.10.4.2, the current MRV requirements provide many simplifications aiming to enhance overall cost-effectiveness while maintaining environmental integrity via risk-based verification approaches. Therefore, the expected cost savings for MRV for excluded installations (see section 3.10.4.2) may be marginal, except that equivalent measures for excluded installations may further simplify the process of verification (see section 3.10.4.1). However, those simplifications may be at the expense of environmental integrity. If the verification risk, e.g. the risk that errors in emissions reports remain unidentified, is increased by softening verification requirements, a tonne emitted may no longer be a tonne reported. Although the overall impact on the environment will be low because the total emissions of excluded installations are low, this is an inconvenient possibility. However, it must be noted that such risk lies *outside* the EU ETS, and will not compromise the environmental integrity of the EU ETS itself. Nevertheless, it would attract critics and might harm the system's credibility.

3.10.5.3 Equivalent measures: impact on competitiveness

It is not straightforward to assess the potential impact of the different options on competitiveness. This is in particular true for small installations carrying out only the broad combustion of fuel activity, the most common activity amongst installations currently excluded from the EU ETS in accordance with Article 27 (see Table 20). This is because this "sector" is very heterogeneous, with installations exporting electricity and district heat but also some other manufacturing industries for which no specific activity is applicable, e.g. food processing, production of wood-based panels or fine chemicals, etc.

For the second most common sector, ceramics, it can be stated that competitiveness is of high concern. Most of this sector (NACE v.2 code 23) has been identified of being exposed to a significant risk of carbon leakage and is therefore on the carbon leakage list[462] for 2015-2019. The reason is the trade intensity above 30% (Article 10a(16)(b) of the revised Directive), while costs for direct and indirect emissions are below 5% of gross value added in all but one subsector.

In 2014, the European Commission released a report on energy prices and costs in Europe[463]. The report highlights that increases in energy costs may lead to relocation of activities to outside the EU and that it is therefore important to have solid knowledge on the role of SMEs. It recognises that many factors other than energy costs may play a role on activity relocation, including tradability of the manufactured goods or other competitiveness factors. The report concludes that SMEs are traditionally more closely bound to local economies and, consequently, may be less likely to relocate. Although the administrative costs incurred by SMEs under the EU ETS are different from changes in energy costs, the same qualitative principles apply.

3.10.5.4 Equivalent measures: impact on market distortions

The impact on competition and market distortions brought about by opt-out depends on the magnitude to which administrative costs can thereby be reduced and on the equivalence of economic incentives if excluded from the EU ETS. Differences in those factors, compared to competitors in the same sector either included in the EU ETS or located in another Member State, are caused where different equivalent measures are being put in place by Member States.

As shown in section 3.10.4.2, savings have been found to predominantly occur in verification, registry/subsistence fees and are estimated to be in the range of 3 500 € per year. The impact of this on competition against installations in the same sector or in other Member States is however considered limited.

3.10.6 EU-added value

The EU-added value of opting-out low-emitting installations from the EU ETS is evaluated using the following question:

- What is the EU-added value of harmonised rules for exclusion of installations at EU-level?

In section 3.10.4.1 it has been shown that the approach of putting in place equivalent measures was similar for all Member States in terms of substituting the cost for allowances by payments compensating for the amount of emissions exceeding a predetermined reference, e.g. the amount of free allocation. If approaches had been fragmented, risking that installations are not treated equally

[462] Commission Decision 2014/746/EU of 27 October 2014 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019, Download under http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32014D0746

[463] SWD(2014) 20, "Energy prices and costs in Europe", Download under http://ec.europa.eu/energy/sites/ener/files/documents/20140122_swd_prices.pdf

across the EU, the Commission would have objected to Member States applications in accordance with Article 27(2) of the revised EU ETS Directive. By setting out harmonised rules on exclusion criteria and entitling the Commission to object to applications, the risk of unequal treatment and market distortions is limited.

However, the simplifications in verification requirements as part of the equivalent measures vary across Member States. As emphasised in section 3.10.5.2, this potentially poses a (rather theoretical) risk that those simplifications undermine environmental integrity. As a consequence, it may be argued that even more harmonisation and provisions at the EU level are beneficial.

3.10.7 Coherence

The coherence of opting-out low-emitting installations from the EU ETS is evaluated using the following questions:

- Are the opt-out provisions consistent with the other objectives of the revised Directive, such as a transition to low-carbon economy, implementation of the 'polluter pays' principle, harmonisation and reduced administrative costs?
- To what extent are the opt-out provisions coherent with other interventions which have similar objectives (e.g. other support initiatives for small installations)?

As concluded in the previous section 3.10.6, equivalent measures put in place ensure that excluded installations incur similar costs for the amount of emissions exceeding predetermined references. Therefore, exclusion provisions are not in conflict with the 'polluter pays' principle set out in Article 191(2) of the Treaty on the Functioning of the EU[110].

The European Union has set up several funding instruments and programs supporting SMEs[464] in:

- getting access to finance and markets[465];
- driving innovation[466];
- flourishing on a regional level as well as promoting internationalisation[467].

Certainly, there are many more ways how SMEs can get support and there surely are several Member States initiatives in this regard. However, as mentioned in section 3.10.3.1, the definition of SMEs does not fully match the definition of small installations. What is even more important, only a small fraction of all SMEs are installations covered by the scope of the EU ETS and only a smaller part of general SME funding impacts climate and energy topics.

Nevertheless, some aspects can be identified where SME support works in favour of the EU climate and energy targets. For instance, facilitating access to finance and funding innovations might enhance wider uptake of low carbon and

[464] European Commission, "European Union Support Programmes for SMEs – An overview of the main funding opportunities available to European SMEs", 2012; download under: http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=5778

[465] http://ec.europa.eu/growth/access-to-finance/index_en.htm

[466] http://ec.europa.eu/programmes/horizon2020/en/h2020-section/sme-instrument

[467] http://ec.europa.eu/growth/smes/business-friendly-environment/regional-policies/index_en.htm

energy efficient technologies. Incentives via this route may be understood as reducing the costs for examining abatement technologies (see sections 3.10.3.3 and 3.10.5.1), hence lowering transaction costs and making the EU ETS more efficient. It could be argued that such funding support constitutes subsidies which may cause market distortions compared to larger installations. However, most of this funding (access to finance, markets, etc.) is aiming to make up for competitive disadvantages small companies have compared to larger ones, rather than to introduce new ones.

3.10.8 Conclusions

74 % of the 11 000 installations in the EU ETS emit less than 25 000 t CO_2 per year and are therefore potentially "installations with low emissions" which can be excluded from the EU ETS under Article 27 of the Directive. However, they are responsible for only 2.7 % of emissions in the EU ETS. Although MRV requirements are less burdensome for small installations, it is confirmed by studies that the relative transaction costs per tonne emitted are the higher, the smaller the emissions are. In a few cases with particularly low fossil emissions, transaction costs have been found to even exceed allowance costs in years with a low carbon price. The option to exclude small installations from the EU ETS is therefore relevant. However, only seven Member States made use of the opt-out of small installations, excluding thereby about 0.3 % of the total verified emissions in the EU ETS in 2013.

Because Member States followed guidance by the Commission, "equivalent measures" regarding a (financial) emission reduction incentive are relatively similar and can be considered indeed equivalent to the incentives under the EU ETS. Thus, environmental integrity is safeguarded. This is further supported by the observation that Member States in general did not waive monitoring and reporting requirements for excluded installations.

Reduction of transaction costs can be observed for installations excluded from the EU ETS. Reasons are mostly the avoided verification costs in some Member States, and the fact that no Registry accounts and no trading are required. However, any potential distortions of the CO_2 price signal by such measure remain insignificant. It can therefore be concluded that the ability of the EU ETS to incentivise cost-efficient emission reductions remains unaffected. Furthermore no significant impact on competitiveness of affected industries has been identified.

Legislation at the EU level in connection with guidance and the need for approval by the Commission have led to an EU-wide harmonised approach to exclusion of installations with low emissions, albeit only few Member States made use of it. This ensured a level playing field between installations inside and outside the EU ETS, and in different Member States. It furthermore helped to ensure the environmental integrity of the EU ETS and of the measures for installations excluded.

There is a wide range of support schemes available to SMEs at EU and Member State level. The exclusion option under the EU ETS is well coherent with this support environment.

3.11 Impact of EU ETS on households

3.11.1 Introduction

Electricity costs: In 2014 the European Commission published a Communication[468] and a more detailed report[463] on energy costs and prices in Europe. The report focusses on current trends in wholesale and retail prices and underlying drivers in gas and electricity markets. For household prices of electricity for instance the report found that on average EU household electricity prices increased by more than 4 % per year between 2008 and 2012. Changes in the level of taxes and levies have been identified as the main drivers behind this increase. Furthermore, quite significant variation between Member States behind this average was found.

Another report[51] by the European Commission investigated further drivers behind electricity prices. As that report does not identify the carbon price signal as one of the price drivers for household's electricity bills, and as electricity prices in general are discussed in another section of this report (3.1.4.3), this section of the evaluation focusses on district heating as the other issue for households which faces an influence by the EU ETS.

District heating: Article 10a(4) of the revised EU ETS Directive lays down that district heating (DH) and high efficiency cogeneration shall receive free allocation, for economically justifiable demand. For each installation, the eligible amount for free allocation was determined in the NIMs[469] based on historic amount of heat energy exported for the purpose of DH multiplied by a heat benchmark (expressed as "t CO_2 per TJ")[470]. The provisions of Article 10a(4) aim in particular at shielding private households from quick increases of heating costs due to the pass-through of CO_2 costs.

DH markets are fundamentally different from electricity and gas markets, even though all energy carriers are transported through networks and consumed as final energy by private households. DH is mainly an urban occurrence and therefore a more local or regional form of energy supply than electricity and gas. This is because district heating is only economically feasible where concentrated heat demands exist, so that heat distribution is viable. Figure 55 provides an overview of cities with DH systems and of the heat demand density in Europe[471].

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[468] COM(2014) 21: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on "Energy prices and costs in Europe", Download under **http://eur-lex.europa.eu/resource.html?uri=cellar:d252db5d-8102-478a-b2ce-5147c62e9467.0001.05/DOC_1&format=PDF**

[469] The National Implementation Measures pursuant to Article 11 of the Directive. Further rules for determining the amounts of free allocation are defined in the "CIMs" (Community Implementing Measures, also referred to as the "Benchmarking Decision", laid down in Decision 2011/278/EU on the transitional and harmonised rules for free allocation, the implementing measure in accordance with Article 10a of the revised EU ETS Directive.

[470] The benchmarking rules also contain a special rule regarding DH only used for private households, for which the amount of free allocation can be increased for a transition period, if the emissions associated with heat for private households are higher than the benchmark.

[471] D. Connolly, B. V. Mathiesen, P. A. Østergaard, B. Möller, S. Nielsen, H. Lund, U. Persson, S. Werner, J. Grözinger, T. Boermans, M. Bosquet, D. Trier, "Heat Roadmap Europe 2: Second pre-study for the EU27", Department of Development and Planning, Aalborg University, 2013. Download under: **http://vbn.aau.dk/files/77342092/Heat_Roadmap_Europe_Pre_Study_II_May_2013.pdf**

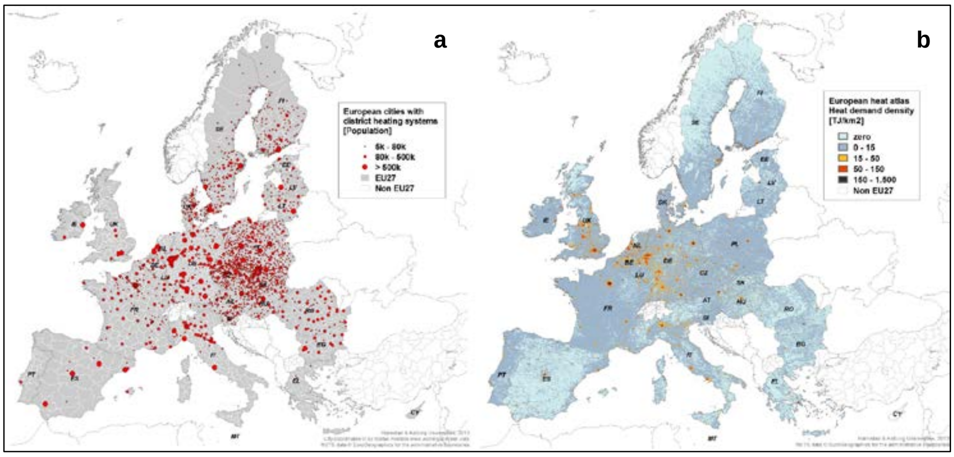

Figure 55: *(a) Cities with DH systems and (b) heat demand density in EU27, Source: Heat Roadmap Europe 2050*[471]

In principle, district heating is often environmentally desirable, as central heat production is often more efficient than if heat production is distributed to a multitude of individual boilers, in particular if produced via high efficiency Combined Heat and Power (CHP). It is furthermore leading to less air pollution, because emission abatement is more efficient in bigger installations. However, this is only true where distances between heat production and consumer are sufficiently small, i.e. where the DH network is dense enough. The EU ETS imposes a carbon price on DH producers if they use fossil fuels and if their installations exceed the relevant capacity threshold. Theoretically, CO_2 costs could discourage the production of DH, even if produced highly efficiently, if at the same time other residential heat, e.g. in domestic boilers, do not face similar costs. Consequently, if fossil fuels are used and the carbon price is passed through to consumers, households may have an incentive to shift away from DH towards other, potentially less energy- and GHG-efficient technologies. Granting free allocation to EU ETS DH producers aims at preventing such "inner-EU carbon leakage". Furthermore, it should support households (in particular those with low incomes, and those which cannot choose their heating source) by preventing their energy bills from undue cost increases. On the other hand, if costs are passed through by heat producers to households, windfall profits may be the result. Nevertheless, for DH installations using or converting to biomass, the EU ETS in addition provides free allocation.

3.11.2 Intervention logic

- Needs:
  - Encourage the use of more energy- and GHG-efficient technologies such as DH from high-efficiency CHP installations.
- Objectives:
  - Protect DH exporting CHP installations in the EU ETS from unintended loss of market share due to households shifting to other (less efficient) types of fuel for heating on which there is no carbon price imposed;

- Protect low-income households from quickly increasing DH costs, where applicable;
- To the extent feasible, respect the 'polluter pays' principle, i.e. that more GHG efficient installations are rewarded by this system. The allocation should still promote the internalisation of external costs caused by GHG emissions in product prices.

- Action:
  - Grant transitional free allocation for DH for installations covered by the EU ETS.
- Intended effects:
  - Less distortion of competition between district heat suppliers covered by the EU ETS and other sources of heating used for space heating in households;
  - Limited costs for EU ETS participants, while facilitating longer-term transition to a low-carbon economy.
- Unintended effects:
  - Windfall profits for DH suppliers where they are able to pass through costs to households.
- External factors:
  - Other policies, in particular local/municipal policies e.g. subsidies for supporting DH supplied by efficient CHP plants or requirements to use energy of waste incinerators, subsidies for building of DH network infrastructure, etc.

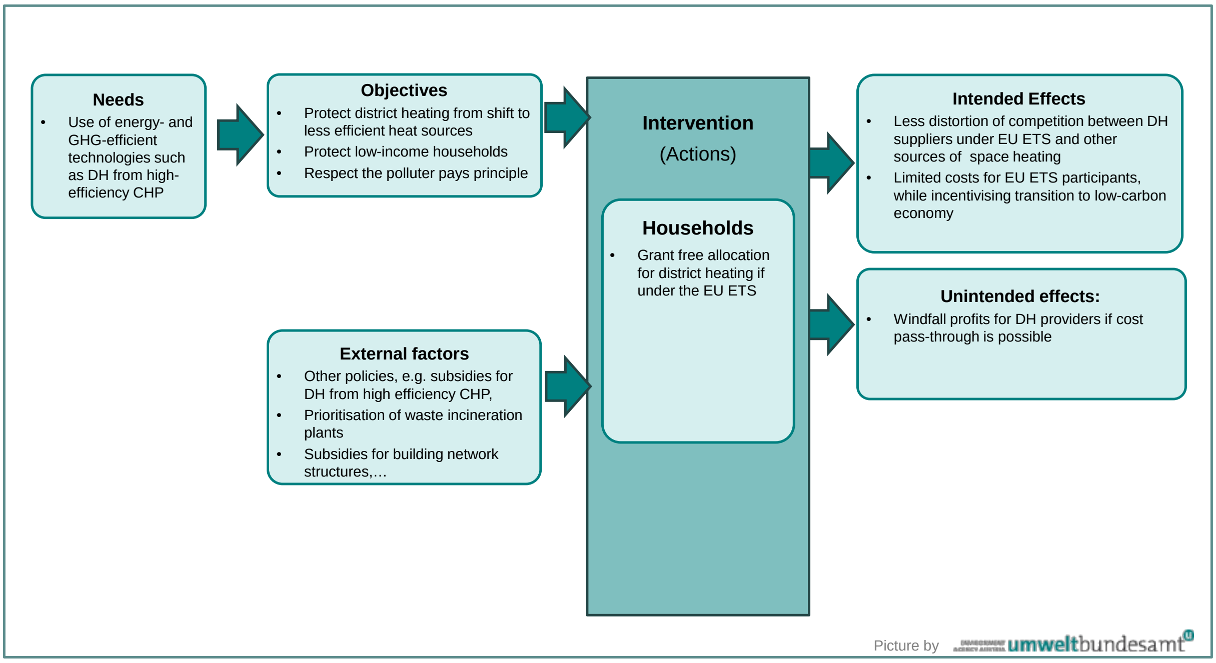

Figure 56: Detailed intervention logic for the evaluation area "District heating / impact of EU ETS on households".

3.11.3 Relevance

The relevance of the EU ETS regarding impacts on households is evaluated using the following questions:

- What is the share of household heating covered by DH in each Member State and to what extent is heat production thereof covered by the EU ETS?
- Is there evidence that DH producers were able to pass through CO_2 costs created by the EU ETS, thereby leading to an increase of energy prices and costs for households?
- To what extent do free allocation provisions for DH correspond to the needs of the energy and climate policy framework?

As outlined in section 3.11.1, DH is a municipal or regional product, not a widely tradable commodity such as electricity or gas. DH networks are characterised by being a natural monopoly and the fact that price setting is often subject to regulation, with network fees constituting a significant share of total costs. Hence prices and costs incurred may not be available on a representatively disaggregated level. Furthermore, prices are different for households and services, yet this distinction may not always be made in literature. This difficulty arises because data related to DH prices is not ascertained by national statistics like this is done for households' gas and electricity prices.

As far as the authors of this evaluation were able to ascertain, there is currently no empirical study publically available that sheds light on the impact carbon prices had on consumer costs. Consequently, there is also no empirical evidence whether producers where able to pass through these costs and if and to what extent free allocation impacted this.

Nevertheless, this section aims to improve the knowledge base in this regard by splitting the evaluation carried out in this chapter into the following sub-questions:

- What is the share of district heating in households?
- What is the nature and functioning of DH markets in the EU?
- How are DH prices formed and how did they evolve over time?
- What is the share of consumer's cost for DH and did they evolve over time?
- What conclusions can be drawn on the impact carbon prices and free allocation to DH potentially had on consumer prices?

3.11.3.1 Share of district heating in households

According to Eurostat energy balance data, residential heat consumption[472] accounts for approximately 10% of the total final energy consumption, excluding consumption of electricity, in the residential sector in the EU-28 in 2013 (Figure 57). However, this share varies strongly between Member States. Whereas DH is the dominant source of heat consumption by households in several Member States (SE, EE, FI, DK, LT), it plays no or almost no role at all in others. Amongst the later are many Southern Member States, such as ES, IT, CY, MT, PT but also some with colder weather conditions (BE, NL, UK).

[472] Final consumption of derived heat by residential sector

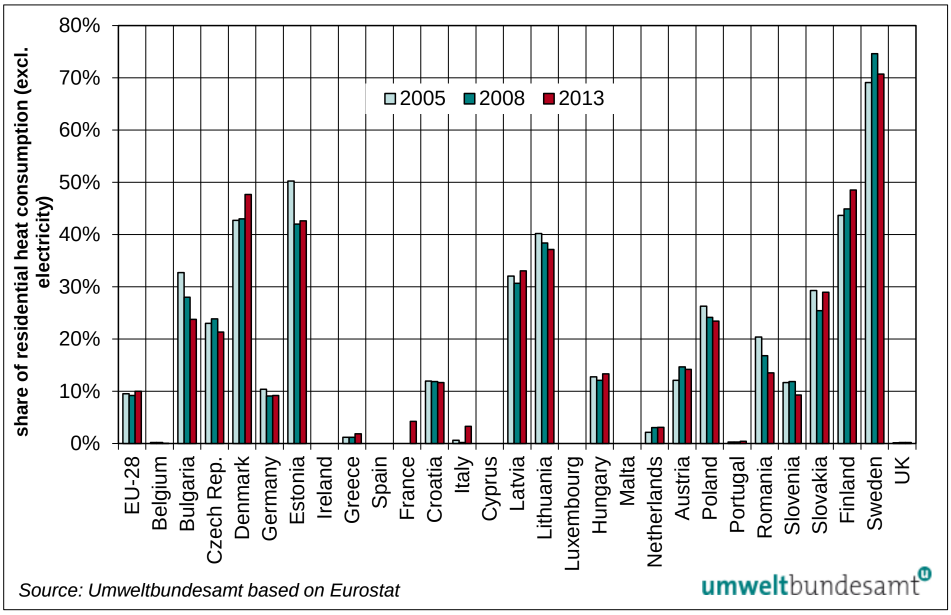

Figure 57: Final consumption of derived heat by the residential sector as share of the total final energy consumption, excluding electricity consumption, of the residential sector (not adjusted for heating degree days); Source: Umweltbundesamt based on Eurostat [nrg_100a]

The historic trend shows that the shares remain more or less stable within each Member State in the period 2005-2013. Interestingly, a steadily declining share can be observed for some new Member States such as Bulgaria and Romania. This can be explained by progressively less stringent DH regulation (see section 3.11.3.3) in those countries over the last decade, bringing about more competition and opportunities for switching to other energy products[473].

3.11.3.2 Share of district heating covered by the EU ETS

It is obvious that free allocation to district heating and its implications will be more relevant the higher the coverage of DH production by the EU ETS is. In order to estimate the share of DH production covered by the EU ETS, Figure 58 compares the total final energy consumption of DH of all sectors to allocation data derived from the NIMs[474].

NIMs data does not allow for making a distinction between DH for the residential sector and other sectors, and the system boundaries of the data used do not fully match those of Eurostat data. However, this comparison still allows a good overview of the coverage by the EU ETS. As Figure 58 shows, the EU ETS coverage of DH consumption is quite high for most Member States although the share varies. For the EU as a whole the EU ETS covers about two thirds of all final energy demand of DH. Therefore, the EU ETS itself and free allocation potentially have a significant impact on DH production and consumption.

[473] http://www.inogate.org

[474] The calculation takes into account the “historic activity levels” from non-CL exposed heat benchmark sub-installations being part of installations with the main economic activities of electricity production (code 40.1 under NACE rev 1.1) and DH production (code 40.3).

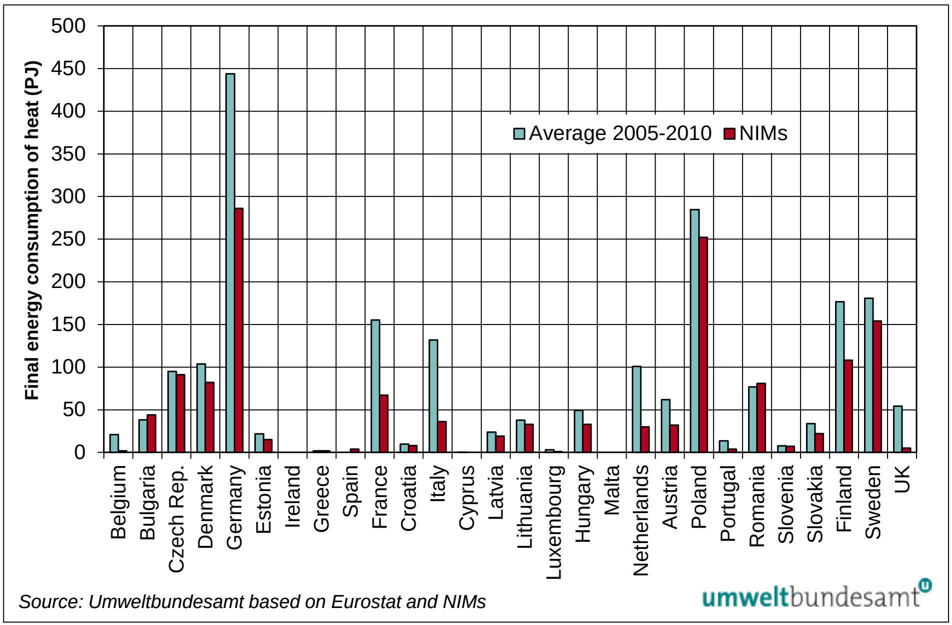

Figure 58: Final consumption of derived heat by all sectors compared to the historic activity levels of non-CL heat benchmark sub-installation in DH and electricity production sectors; Source: Umweltbundesamt based on Eurostat [nrg_106a] and NIMs.

3.11.3.3 Nature and functioning of DH markets

In 2011, a textbook[475] on the regulatory implications of DH was published under the INOGATE programme. It aims to build capacity for sustainable energy regulation in Eastern Europe and Central Asia by presenting an overview of experience gathered in the European Union (policies, action plans and case studies). In this regard, the textbook summarises how DH has grown across Member States and concludes that DH markets can be divided into the following two groups:

- Market driven regulation: Operation and development in free market conditions, with minimal state intervention (Finland, Sweden, Germany and most other old Members States of the European Union);
- Tight economical regulation and state control (common in Denmark, Lithuania, Poland, Czech Republic and most new Member States with historical DH systems).

[475] Lukosevicius V., Werring, L., "Textbook developed for the INOGATE Programme - Capacity Building for Sustainable Energy Regulation in Eastern Europe and Central Asia", Energy Regulators Regional Association (ERRA), 2011, download under: http://www.inogate.org/documents/RES_Textbook_FINAL_eng.pdf

Also in 2011, Ecoheat4.eu[476], another project supported by the European Commission's Intelligent Energy Europe programme, published a report[477] on Member States' existing legislative support for DH. It identified the following four groups of Member States:

- Consolidation countries (DK, FI, SE);
- Refurbishment countries (HR, CZ, LT, RO);
- Expansion countries (FR, DE, IT);
- New development countries (IE, ES, UK).

In most old Member States (e.g. Germany, Sweden, Finland), the INOGATE textbook[475] argues, district heating schemes were formed under normal free market conditions. There is minimal influence from state institutions required, such as regulation of maximum allowed profit or control by antimonopoly services. Consequently, regulation is market driven and accompanied by other mechanisms related to access to alternative heat supply forms, taxation, non-discriminatory policies etc. In Germany, for instance, it has become increasingly rare for local authorities to render the use of DH compulsory, as it goes along with the necessity of monitoring compliance and it also promotes the creation of a monopolistic situation. In Sweden, the main regulatory tasks are price presentation and comparison, annual reports, negotiation and mediation between parties.

By contrast, in Denmark, like in most former socialist states, municipal influence in the district heating sector is rather high[475]. Furthermore, it has adopted a general heat planning regulation, aiming to avoid competition between DH and alternative systems, such as gas or individual heating systems, according to the Ecoheatcool report[483].

It can be concluded that the European DH market is a fragmented one with different national or even local approaches taken, though two general types of approaches seem to emerge.

3.11.3.4 DH price formation and developments

The authors of the INOGATE textbook[475] show that in the "non-regulated" cases, DH prices are set by heat suppliers and occasionally controlled by the competition authority and consumer protection associations. In the case of more economically regulatory approaches, heat prices (tariffs for heating) are set by federal, regional or local government authority uniformly for the entire territory (region, city etc.) on a "socially acceptable level".

In Sweden, there is market surveillance but no DH price regulation, whereas in Denmark, both DH production and network companies are monopolies and regulated as non-profit undertakings[475]. However, carbon or emissions taxes[483] are imposed in both countries in order to drive the further uptake of renewables and improve energy efficiency.

The INOGATE textbook[475] identified three main ways that DH pricing or tariff settings are established in the EU:

[476] http://www.ecoheat4.eu/en/

[477] Aronsson B., Hellmer S., "Existing legislative support assessments for DHC", Ecoheat4eu, 2011, Download under http://www.diva-portal.org/smash/get/diva2:505983/FULLTEXT01.pdf

- free market conditions (alternative heating methods);
- independent energy regulator; or
- municipality or state institution.

The authors make a further distinction of DH price setting mechanisms:

- In the free market condition Member States, companies usually set their prices using a combined cost and substitution[478] approach: district heating tariffs cover costs and are adjusted close to, but lower than, the next alternative cost of supplying a particular customer with heat;
- In the regulated DH market Member States, mainly a cost-plus[479] approach with elements of benchmarking (in cost adjustment) and economic incentives ("price cap" for part of the cost) is applied.

In general, in Member States where the DH sector is not regulated, pricing is not regulated as well. Prices are set by suppliers and the consumers decide whether the price is acceptable to them or not. The mechanisms of price setting are consistent with the market structures described in section 3.11.3.3. Table 21 provides an overview of the approaches taken.

Table 21: DH price regulation and monitoring principles in selected countries[475,480]

	Basically political price regulation	**Heavy touch price regulation (ex-ante)**	**Light touch regulation (ex-ante/post)**	**Pricing primarily based on alternatives**
Price setting mechanism	DH prices are based on normative costs but decided with political consideration and subsidies.	State regulator finally approves DH prices. In some countries political consensus is needed.	DH prices decided by company but controlled by regulator / competition office.	DH prices are set against customer's next best alternative.
Approach towards profits	No or strictly limited profit making.	Strong cost and profit monitoring and restriction of allowed returns.	Lightly regulated profit making. Focus on cost plus pricing principle.	Profits are based on market conditions.
Example countries	Romania	Estonia, Latvia, Lithuania, Poland, Hungary, Slovakia, Bulgaria	Austria, Finland, Germany, Czech Republic, Netherlands, Denmark	Sweden

It can be concluded that market structures and rules (see section 3.11.3.3), as well as the mechanisms for setting prices, vary considerably across Member States. Despite these differences, Resvik[480] identified the following main drivers for DH prices:

- Fuel mix, sources and prices;

[478] Under the substitution-based approach, the regulator allows a district heating company to set tariffs no higher than the price of competing heat sources, such as individual gas boilers. Substitution-based tariffs are market-oriented and have no direct relationship with costs.

[479] Cost-plus regulation allows companies to include in their tariffs those costs that the regulator considers necessary to ensure an adequate level of service to end-users.

[480] B. Resvik, "Business models today and tomorrow – regulatory regimes affecting the price strategies", Fortum Corporation, 2011; download under http://www.euroheat.org/Admin/Public/DWSDownload.aspx?File=%2fFiles%2fFiler%2fPresentations%2fParis+2011%2fTuesday+10+May%2f20110510_0900-1030_Session_1_Birgitta_Resvik.pdf

- Regulatory framework;
- Company pricing policy;
- Price of alternative heating solutions;
- Technical solution (such as CHP);
- Owner expectations;
- Operator's efficiency;
- Company size.

In 2005, the European Association for DH, Euroheat & Power[481], launched Ecoheatcool[482], a project co-financed by the EU Intelligent Energy Europe Programme. The aim of this project was to describe and analyse the European heating and cooling markets and demands. In 2006, the results published from this project[483] showed that there were no general surveys of European district heat prices being published, due to locally operating DH companies. Hence, DH prices are not fully transparent. By contrast, European gas and electricity prices are transparent since the introduction of the European Council energy price transparency Directive[484] in 1990.

However, Euroheat & Power carries out biannual surveys in the Member States on national price estimates and publishes averages of those prices in the European country-by-country reports. In Figure 59, the latest results for average district heating prices in 2009 and 2011 and average emission factors are shown. Values are however not available for all EU countries and years. It can be seen that prices vary significantly across Member States, with the highest price being almost three times as high as the lowest.

The lowest prices can be found in Hungary (9.3 €/GJ), Bulgaria and Poland. Prices were highest in Denmark (27.8 €/GJ), Sweden and Germany. A similar pattern emerges when looking at emission factors in 2011. The emission factor in Poland (102 t CO_2/TJ) was almost five times as high as in Austria (22 t CO_2/TJ) and variance across Member States was even more pronounced than for prices.

When comparing the evolution of prices from 2009-2011, it can be seen that prices increased in almost all countries, with Austria being the exception. The increases were largest in Sweden and Estonia (both ca. 25%) and in seven more Member States prices increased by more than 10% over those two years.

Price increases are amongst the lowest in Poland and Romania, whilst at the same time emission factors were the highest. There are however not enough data points to draw robust conclusions on causal relationships with decreasing carbon prices over the same period of time. However, no distinction is made between prices for households, services or other consumers.

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[481] http://www.euroheat.org/

[482] http://ec.europa.eu/energy/intelligent/projects/en/projects/ecoheatcool

[483] Ecoheatcool and Euroheat & Power, "Ecoheatcool Working Package 1 - The European heat market", 2006; Download under http://www.euroheat.org/Files/Filer/ecoheatcool/documents/Ecoheatcool_WP1_Web.pdf

[484] 90/377/EEC Council Directive of 29 June 1990 concerning a Community procedure to improve the transparency of gas and electricity prices charged to industrial end-users, Download under http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31990L0377

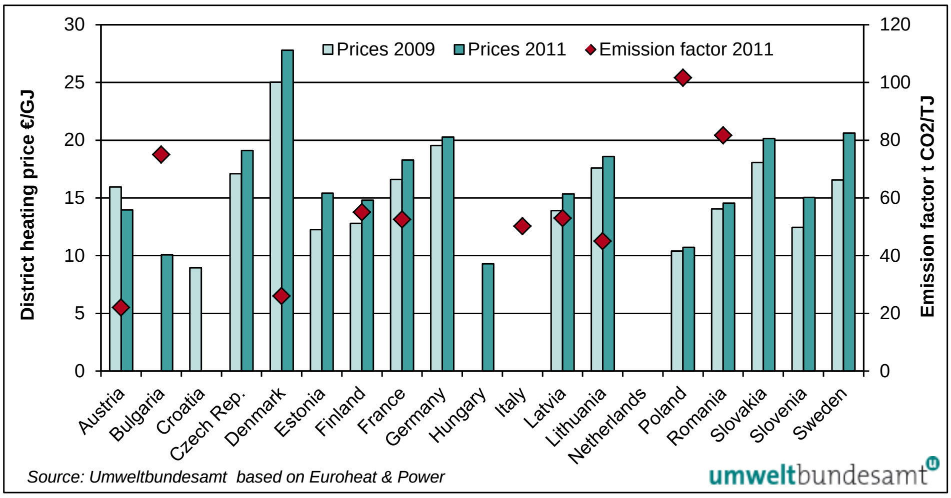

Figure 59: Average indicative district heating prices and emission factors; Source: Umweltbundesamt based on Euroheat & Power[485].

In 2012, a JRC report[486] has shown prices for 2004-2008. In the Ecoheatcool report[481], prices for the period 1999-2003 are provided, based on estimations in a previous study[487] (see Figure 61).

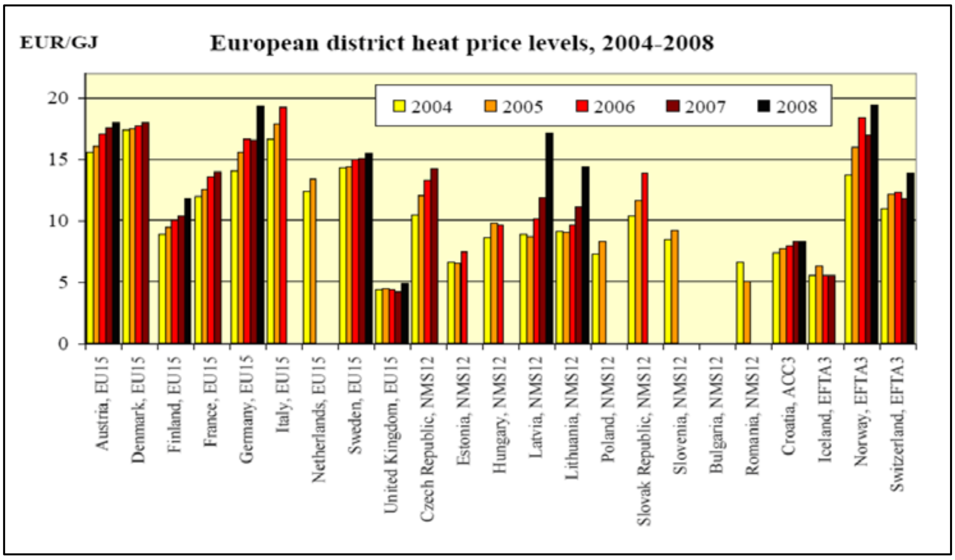

Figure 60: European District heat price levels 2004-2008. Source: JRC[486] 2012.

[485] Data downloaded from http://www.euroheat.org/Statistics-69.aspx. According to Euroheat & Power, these data have been provided by third parties (such as members of Euroheat & Power) and should therefore be considered only indicative, as they may be subject to error.

[486] D. Andrews, A. Krook Riekkola, E. Tzimas, J. Serpa, J. Carlsson, N. Pardo-Garcia, I. Papaioannou, "Background Report on EU-27 District Heating and Cooling Potentials, Barriers, Best Practice and Measures of Promotion", Joint Research Centre (JRC), 2012, Download under https://setis.ec.europa.eu/system/files/1.DHCpotentials.pdf

[487] S. Werner, A. Brodén, "Prices in European District Heat Systems", Proceedings of the 9th International Symposium on District Heating and Cooling, August 30-31, 2004, Esbo, Finland.

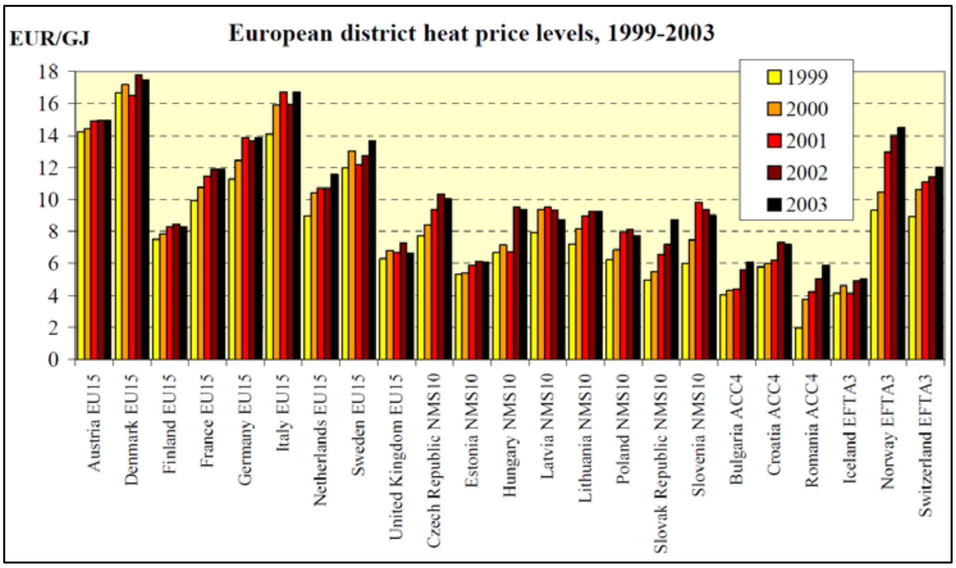

Figure 61: Estimations of national averages of district heat prices 1999-2003 without VAT, Source: Ecoheatcool[483] based on Werner & Brodén[487].

Although the studies for DH mentioned above do not disclose to an equal extent whether those prices include or exclude VAT, other taxes, levies or subsidies, the consistency in each Member State's trend suggests that the methodology used for all three periods is similar. However, those values reflect national average price for all consumers. No distinction is made between industrial, service or household consumers.

Interestingly, DH prices in all countries show a significant increase 1990-2011. A large proportion of this increase already occurred before 2005, the year the EU ETS came into effect. This observation casts even more doubt on the causal effect carbon prices may have had on DH prices vis-à-vis other influencing parameters. Moreover, it is even more difficult to estimate rates at which DH producers were able to pass through costs.

3.11.3.5 DH costs for households

The Commission's report[463] also examines the costs incurred by consumers, putting emphasis on the fact that these are the more important metric for consumers. Energy costs are determined by both energy price levels and by consumption. Therefore, costs are also impacted by e.g. switching from or to DH, the heat demand per dwelling, etc.

To evaluate households' costs for DH, the Harmonised Index of Consumer Prices (HICP) is a useful indicator. It is used for monetary policy decisions and is calculated in each Member State using a common methodology. The HICP assigns a weight to each consumption group (e.g. food, energy, transport, services) and is updated annually in each country based on household consumption data. The assigned weight represents the importance of goods and services in a country's consumption structure.

The applied weights for household's energy expenditures is shown in Figure 62 and contains energy products such as district heating[488], electricity, gas, liquid fuels and solid fuels. The results show that household's costs are relevant for the same Member States where the share of district heating in energy consumption is relevant (compare with Figure 57 in section 3.11.3.1), indicating the consistency of the data methodology. Furthermore, it can be seen that with the exception of Estonia and Latvia, other energy products pose higher costs to households with electricity being the most important one. Only for the two Baltic countries, DH costs are the highest amongst all energy products, accounting for 4.3% and 3.9%, respectively.

Figure 63 shows how costs for DH developed from 2005 to 2014. It can be seen that for most Member States costs remained stable. However, for some countries (Bulgaria, Czech Republic, Poland, Romania) a significant decrease can be observed. This may to some extent be explained by the observed shift away from district heating in some of those countries (as mentioned in section 3.11.3.1). By contrast, in some Member States (Germany, Estonia, Austria, Slovenia) there was a slight increase in the share of DH costs.

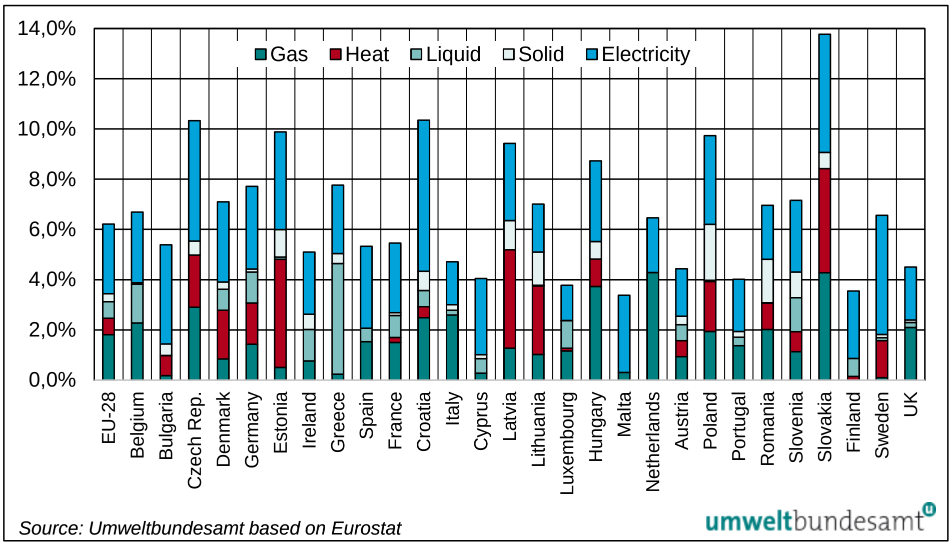

Figure 62: EU household expenditures on energy products excl. transport in 2014; Source: Eurostat [prc_hicp_inw]

As shown over the last sections, household's costs for DH seem to remain stable by and large, despite significant increases in prices in many Member States and a stable share of DH in households' energy consumption.

As argued above in this section, costs rather than prices can be seen as the key metric for assessing the impact the EU ETS had on households. Thus, the findings in this and previous sections suggest that any additional burden induced by the EU ETS on households via district heating seems limited, if there is any.

[488] District heating is named as "heat energy" in Eurostat statistics

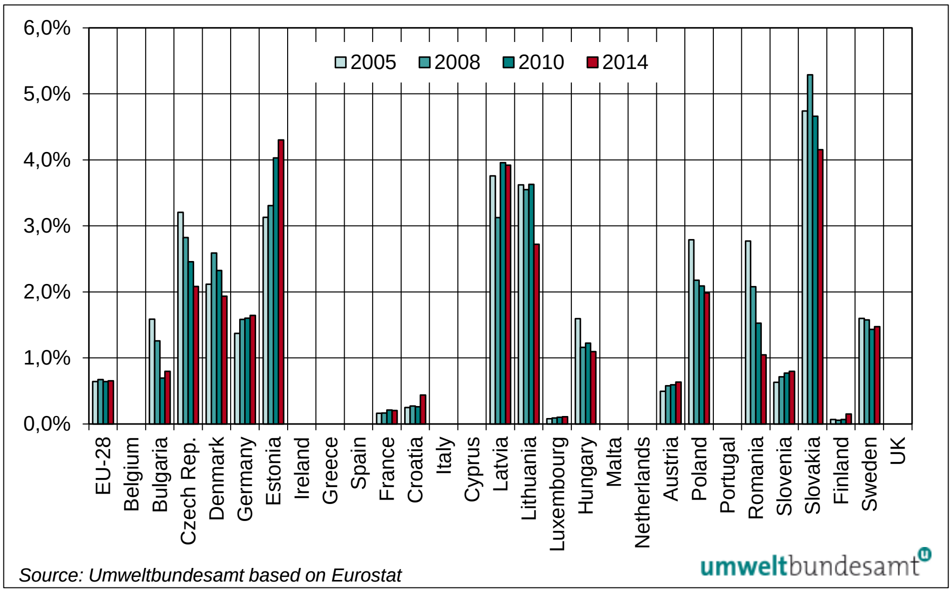

Figure 63: Historic trends (2005-2014) in EU household expenditures on energy products excl. transport; Source: Eurostat [prc_hicp_inw]

3.11.3.6 Free allocation for DH and the climate and energy package

Any additional DH costs to households can not necessarily be seen in isolation from other money flows. For instance, where households receive subsidies for thermal insulation of buildings or for switching to DH, increases of costs due to price increases will be offset to some extent. Furthermore, those subsidies may be seen in the context of reaching the other objectives of the EU climate and energy policies.

As a consequence, in order to discuss how free allocation to DH matches with the needs of the climate and energy package, it is important to recall what those needs are, why free allocation is granted to DH and to what extent this supports or conflicts with objectives. As outlined in section 3.11.2, the use of more energy and GHG efficient technologies such as DH by CHP should be encouraged to drive abatement and energy savings. Granting free allocation to energy-intensive industries aims to avoid competitive disadvantages compared to extra-EU competitors due to unilateral carbon pricing, i.e. avoiding carbon leakage (see section 3.4 on carbon leakage and free allocation). Although DH is not at risk to be relocated to outside the EU, imposing carbon costs on DH producers, while at the same time other residential heating does not face similar costs, poses a potential competitive disadvantage to DH. As argued above, DH is often produced very energy and GHG efficiently, e.g. using biomass or CHP. Therefore, free allocation to DH can be considered in line with the climate and energy target since it aims to avoid incentives for switching away from DH. For a more detailed analysis it has to be discussed how DH producers in the EU ETS are expected to react to carbon pricing and free allocation. Those aspects are discussed in section 3.11.4.

3.11.4 Effectiveness

The effectiveness of the EU ETS regarding impacts on households is evaluated using the following question:

- Is there evidence that free allocation prevented households from shifting to other energy carriers for heating (i.e. not covered by the EU ETS and/or potentially less GHG-efficient), where even possible?

Based on the background information on DH market structures (section 3.11.3.3) and on price setting mechanisms in section 3.11.3.4, the following principle qualitative considerations are identified:

In Member States with *free market DH*, substitution-based price setting mechanisms[478] and high competition with other energy products, it can be expected that carbon costs can only be passed through up to a level where other energy products would be cheaper. Having said this, it may be possible to exceed this level in the short term since switching heating systems if often a lagged response, due to long investment cycles. In the short- to mid-term, however, passing through costs may only be possible up to a level where less carbon-intensive technologies break even and enter the market, attracted by the increased prices. The latter effect is intended because carbon-intensive technologies are squeezed out of the DH market.

If *free allocation* is granted to *free market DH*, producers may choose not to increase their prices and use free allocation to compensate for the carbon price induced increase of costs, at least until the end of the lifetime of an installation. If so, there will be no increase of prices and costs to households but there will also be no price signal for low carbon technologies to enter the market. On the other hand, household consumers will not see increases in prices and costs. Where low-carbon DH producing technologies are not competitive, DH producers using carbon-intensive fuels may pass through their costs and enjoy windfall profits from free allocation. In this case, household consumers do not experience any benefit from free allocation but will face rising prices.

In Member States with *regulated DH markets*, cost-plus price setting mechanisms[479] and low competition with other energy products, cost pass through may be expected to be less of a problem. This can be explained by the nature of those DH markets being private or municipality owned and often non-profit organisations. Hence, costs may be passed through via the cost-plus approach up to a level where profits are zero again, like this is done for all other costs.

If *free allocation* is granted to *regulated DH markets*, costs may only be passed through up to a level where again profits are zero. It has to be noted that under strong regulation the concept of opportunity costs may not be valid anymore and free allowances may only be used to lower factual costs. Still, when reinvesting in new equipment the owners will take into account the opportunity costs and invest in low carbon alternatives, where economically viable. In regulated DH markets, household consumers can expect to see lower prices due to free allocation.

Based on those considerations, the following qualitative conclusions can be drawn:

- **Households shifting to other energy carriers for heating:**
  This should only be a concern in free market DH systems (Sweden, Finland, Germany and most old Member States) and only in the longer term. In regulated DH markets (Denmark and most new Member States) competition with other energy carriers is low, financially discouraged, or even prohibited.
- **Windfall profits:**
  Free allocation can create windfall profits in free market DH systems where low carbon DH technologies are not competitive at current carbon price levels. Even if they were competitive, DH producers might choose not to pass through costs and use free allocation as compensation, attenuating the price signal for low carbon technologies to enter the market in the short- to mid-term. In regulated DH markets, in particular where producers are non-profit organisations, windfall profits are not an issue.
- **Prices and costs experienced by households:**
  Prices are expected to increase in free market DH systems in the short-term unless low-carbon DH generation technologies are competitive. If prices are not increasing, this may be due to producers not passing through costs but using free allocation as compensation, as explained above. Therefore, cost savings for households may be at the expense of environmental effectiveness of the EU ETS. In regulated DH markets, prices will increase due to carbon pricing. This increase can be contained by granting free allocation.

After these more theoretical aspects, it is of particular interest to investigate the evidence obtained so far and the quantitative impacts of carbon pricing and free allocation on household prices and emissions reductions. However, as highlighted in section 3.11.3, hitherto this topic has been of little interest in literature. Moreover, section 3.11.3.4 has shown that – despite historic estimates for prices available at Member State level – only limited conclusions can be drawn about underlying drivers of cost increases and changes in the DH generation structure in terms of carbon-intensiveness. Therefore, to the best of the authors' knowledge, no empirical evidence can be found whether or not free allocation was effective in preventing households from shifting to other energy carriers for heating. Even if such an analysis were possible, it had to be noted that this would most probably only cover Phases I and II but fail to reflect the current situation under Phase III. However, the theoretical analysis suggests that households shifting away from DH might be less of a concern.

3.11.5 Efficiency

The efficiency of the EU ETS regarding impacts on households is evaluated using the following questions:

- How did free allocation to DH producers influence the costs incurred by households?
- Was the level of free allocation for DH justified, in particular when comparing levels between the first two and the third trading period? Is the approach used efficient?

3.11.5.1 Impact of free allocation on household costs

In section 3.11.3.5 it has been concluded that additional costs incurred by households since the introduction of the EU ETS seem limited, if any.

In section 3.11.4, theoretical considerations suggested that free allocation is expected to lower DH costs for households in Member States with regulated DH markets. In Members States with free DH markets free allocation may lower costs incurred by households where producers choose not to pass them through, yet likely at the expense of environmental effectiveness of the EU ETS (see section 3.11.4). However, empirical evidence on this matter has been found not available to date.

3.11.5.2 Efficiency of the level of free allocation

In general, to assess the efficiency of an action the sum of all effects and side effects needs to be compared to the effort that has been spent, e.g. administrative costs, subsidies granted, etc. Therefore, in order to assess whether the level of free allocation was justified or efficient, its effectiveness and any side effects need to be known.

In the absence of empirical evidence whether free allocation was effective in preventing households from increasing energy costs and from shifting to other energy carriers for heating, as discussed in section 3.11.4, only some qualitative conclusion will be drawn. In this section, it has been concluded that households shifting away from DH might be less of a concern, in particular in Member States with strongly regulated DH markets. However, free allocation may not be successful in preventing increasing energy cost for households, in particular in free market DH systems. In addition to that, it was discussed that free allocation may hamper emissions reductions in the short- to mid-term in Member States with free DH markets, if producers choose not to pass through costs.

Therefore, higher levels of free allocation, e.g. based on grandfathering as encountered in Phases I and II, will likely have been inefficient. This conclusion becomes more difficult when trying to assess levels in Phase III which will decline from an 80% share[489] of free allocation in 2013 to 30% in 2020. However, the findings in this chapter so far suggest that already at low levels of free allocation the downside effects exceed the benefits.

3.11.6 EU-added value

The EU-added value of the EU ETS regarding impacts on households is evaluated using the following question:

- What is the EU added value of harmonised allocation rules for DH at EU-level, in particular compared to the MS level intervention during Phases I and II?

[489] The percentage refers to the amount based on the heat benchmark. For highly GHG-intensive fuels, the share of free allocation compared to the installation's emissions will be even lower.

In the light of the fact that DH markets are very small and very regional compared to gas or electricity markets, one may conclude that there is only limited added value in having harmonised rules at the EU level. This may in particular be supported by the fact that DH systems can be divided into two very different groups, free markets and regulated markets.

Sections 3.11.4 and 3.11.5 show that higher levels of free allocation may not lower the risk of households switching to less energy efficient heating. Moreover, it may even bring along lower effectiveness of the EU ETS in terms of counteracting incentives for emissions reductions. Against this background, an argument could be made for not giving any free allocation to district heating at all, like for electricity. Although this may be difficult to achieve in the political process, it emphasises the importance of taking the decisions on the level of free allocation on the EU level, avoiding fragmented and less efficient action if Member States were to decide by themselves.

3.11.7 Coherence

The coherence of the EU ETS regarding impacts on households is evaluated using the following question:

- Is free allocation for DH consistent with the other objectives of the revised Directive, such as a transition to low-carbon economy, implementation of the 'polluter pays' principle, harmonisation and reduced administrative costs?

Inherently, the 'polluter pays' principle set out in Article 191(2) of the Treaty on the functioning of the EU is hampered where polluters receive subsidies on their emissions. Free allowances in an ETS constitute such subsidies, which remove to a large extent the factual costs which a GHG emitter, the polluter, has to pay.

This trade-off has to be acknowledged when DH production is subject to carbon pricings whereas at the same time other energy products for residential heating are not. However, the fact that DH producers in the EU ETS receive some of their allowances for free does not necessarily mean that the internalisation of external costs is suppressed. Although, as has been discussed in sections 3.11.4 and 3.11.5, in some cases free allocation may work against the EU objectives by distorting the price signal for low-carbon technologies to enter the market.

3.11.8 Conclusions

Relevance: District heating is a predominant energy source only in a few Member States, playing only a marginal role in the other Member States. About two thirds of all DH consumption in the EU is produced in installations covered by the EU ETS. Price formation in the DH sector follows a variety of mechanisms (from strongly regulated to free market mechanisms), and prices are very diverse across the EU. Information about price levels is fragmented, as no uniform reporting requirement exists. No significant correlation between DH prices and CO_2 emission intensities or the introduction of the EU ETS could be found. Findings thus suggest that any additional burden induced by the EU ETS on households via district heating seems limited, if there is any.

Effectiveness of free allocation to protect households: No actual evidence for price or cost increases for DH for households due to the EU ETS could be found. Consequently the impact of free allocation to DH producers could not be evaluated, either. However, some theoretical considerations show that a shift of households from DH to other energy carriers is only a concern in free market DH systems (most old Member States). In free markets, cost increases for households and windfall profits for producers caused by free allocation might be a concern. Furthermore, in these markets necessary investments for a long-term emission reduction might be delayed. On the other hand, in regulated DH markets (Denmark and new Member States), prices for households will increase due to the EU ETS, but costs would be contained by free allocation.

Efficiency: No empirical evidence was available for supporting the evaluation.

EU-added value: There seems limited value in regulating issues of DH at the EU level. However, in general decisions about free allocation and the level thereof should remain at EU level, avoiding fragmented and less efficient action if Member States were to decide by themselves.

Coherence: Free allocation is not in line with the ‘polluter pays’ principle. However, it could to some extent avoid incentives to move to other, potentially more polluting heating sources, and reduces that risk. It also provides a very strong incentive to switch from fossil fuels to biomass.

4 SUMMARY OF FINDINGS

If this report should be summarized in one sentence, it would be: “Yes, the EU ETS has been successfully implemented, but it can still be improved”.

The EU ETS Directive is highly relevant for the EU’s climate policy. It is effective in reducing GHG emissions from the sources covered, and it provides the incentives to reduce emissions efficiently (in terms of limited administrative efforts, and by incentivising emission reductions where they are most cost-efficient). The EU ETS in general is coherent with other EU policies, in particular in the areas of energy efficiency, renewables, other climate policies and environmental regulation for industrial installations. There is significant EU-added value in this legislation. However, this summary applies mainly to the overall design of the EU ETS. In practical implementation there are still a few areas which deviate somehow from this positive picture:

The biggest issue identified is the low carbon price brought about by the deep and prolonged economic crisis starting in 2008. While initially it was considered a big gain for the environmental integrity of the EU ETS that the cap was enshrined in the Directive itself, the unexpected drop in demand of allowances led to a carbon price shock from which the EU ETS has not recovered yet. As a consequence, several aspects of the EU ETS could not be fully evaluated, such as in particular the amount of emission reductions caused by the EU ETS or whether carbon leakage is an actual concern or only a theoretical concept. A clear result of the evaluation was that significant investments in low-carbon technologies, required for achieving the EU ETS’ long-term goal, are not taking place yet, as they lack economic viability with the current CO_2 prices. Furthermore the funding under the NER 300 programme had less available volume and auction revenues for Member States, which were intended to be used inter alia for measures of climate change mitigation and adaptation, were far below expectations. However, it must be noted once more that these “teething troubles” of the EU ETS only caused a sub-optimal performance of the EU ETS, while they cannot be claimed to be a proof that the EU ETS is not properly functioning in general. Furthermore the Market Stability Reserve will address the surplus and improve the system's resilience to major economic shocks by adjusting the supply of allowances to be auctioned (but this is outside the scope of this evaluation).

In the more detailed evaluation areas some other issues have been found. Like the low carbon price, these issues are making the EU ETS less efficient, but do not disprove the concept of the EU ETS itself: In the area of cap setting, the above-mentioned lack of mechanisms for reacting to price-shocks was mentioned. Under auctioning, an auction monitor has not yet been appointed. Furthermore the Directive cannot guarantee that auction revenues are used for climate related purposes by Member States. Regarding carbon leakage, further analyses should be carried out if the carbon price becomes significantly higher than at the time of this evaluation (first quarter of 2015). Currently it cannot be firmly established whether levels of free allocation are too high in some cases, thereby leading to windfall profits by industry and undue loss of auction revenues by Member States, or whether those levels of free allocation are appropriate for avoiding carbon leakage as soon as the carbon costs increase.

Similar uncertainty about the appropriateness of the measure applies also to the compensation for indirect CO_2 costs, with the additional issue that the measure is not uniformly applied across the Member States.

In the practical implementation of the EU ETS, i.e. monitoring, reporting, verification, accreditation, and exclusion of small installations, no big issues have been found. Little to no evidence at all is found in literature about problems in these areas, which hints at either little public interest or a real absence of problems. However, vigilance is advisable, since allowance prices rising in the future may also increase the incentive for fraudulent behaviour. Similarly, the centralised Registry system has proven reliable and secure, however this was only achieved after some severe security incidents during the second trading phase with Member State-based registries.

When it comes to the two funding mechanisms within the EU ETS, the NER 300 and the Article 10c derogation for the power sector, it must be noted that the evaluation was difficult due to a lack of public information. As has been stated in the dedicated chapters, both mechanisms do work in principle. Regarding Article 10c, transparency should be improved. While only limited data is available on the performance of completed investments, the decarbonisation is likely to reflect the fact that investments are mainly related to improving the efficiency of existing fossil fuel based installations rather than in renewable energy. The NER 300 would have benefitted from higher carbon prices. The NER 300 has not achieved the goal of supporting up to 12 CCS projects. This problem is however hardly attributable to the EU ETS Directive, but more to a lack of realistic projects at this time (i.e. in a situation with low CO_2 price and limited confirmation of such projects by Member States). Note that both funding mechanisms are non-essential elements of the EU ETS.

5 ANNEXES

5.1 Annex I: Carbon pricing around the world

The tables in this annex are based on reports by ICAP[490] and the Worldbank[491], and give an overview about existing and planned carbon pricing initiatives in countries and regions all over the world.

Table 22: Overview of jurisdictions with an ETS in force

Geographical Scope	Sectors Covered (% of total[492] emissions)	Definition of Cap/Target	Allocation Mechanism (Price of CO_2(e) in €[493])
EU + EFTA[494]	Power, Industry, Aviation (45 %)	Phase III (2013–2020): Centralized EU-wide cap for stationary sources: 2 080 Mt CO_2(e) in 2013, reduced by 1.74% annually. Aviation sector cap[495]: 210 $MtCO_{2eq}$ per year for 2013–2020 (not decreasing).	Auctioning & Free Allocation (7.95)
Switzerland	Power, Industry (11 %)	Mandatory phase (2013–2020): Overall cap of 5.63 Mt CO_2(e) (2013), to be reduced annually by 1.74%, to 4.9 Mt CO_2(e) in 2020. In 2015, the cap therefore amounts to about 5.44 Mt CO_2(e).	Auctioning & Free Allocation (n.a.)
Kazakhstan	Power, Industry (55 %)	Phase II (2014– 2015): 2014: 155.4; 2015: 153 Mt CO_2(e). This represents reduction targets of 0% and 1.5% respectively, compared to the average emissions of capped entities in 2011–2012.	Free Allocation (n.a.)
USA: RGGI[496]	Power (20 %)	Overall GHG Reduction Target by 2020: RGGI states have committed to one regional target to reduce GHG emissions from the regulated power sector by more than 50% of 2005 levels.	Auctioning (2.65)
USA: California	Transport, Industry, Power (85 %)	Second Compliance Period: (2015–2017): 2015: 394.5 Mt CO_2(e); 2016: 382.4; 2017: 370.4 Third Compliance Period: (2018–2020): 2018: 358.3; 2019: 346.3; 2020: 334.2 Mt CO_2(e).	Auctioning & Free Allocation (9.72)

[490] "Emissions Trading Worldwide – International Carbon Action Partnership (ICAP) Status Report 2015", Download under https://icapcarbonaction.com/images/StatusReport2015/ICAP_Report_2015_02_10_online_version.pdf

[491] "State and Trends of Carbon Pricing", World Bank, 2014. Download under: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/05/27/000456286_20140527095323/Rendered/PDF/882840AR0REPLA00EPI2102680Box385232.pdf

[492] Total emissions in the country / region across all sectors.

[493] Converted from US Dollars to Euros using the February 2015 monthly exchange rate: http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm

[494] EU-28 and Norway, Iceland and Liechtenstein.

[495] Note: Due to a temporary reduction in the geographical scope, the actual cap is smaller than the figure given here, which is consistent with the original scope of the Directive foe aviation in the EU ETS.

[496] Regional Greenhouse Gas Initiative, covering the states Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, Vermont

Geographical Scope	Sectors Covered (% of total[497] emissions)	Definition of Cap/Target	Allocation Mechanism (Price of CO_2(e) in €[498])
Canada: Quebec	Transport, Industry, Power (85 %)	Second compliance period: (2015–2017): 2015: 65.30 Mt CO_2(e); 2016: 63.19; 2017: 61.08; Third compliance period: (2018–2020): 2018: 58.96; 2019: 56.85; 2020: 54.74 Mt CO_2(e)	Auctioning & Free Allocation (8.84)
Japan: Tokyo	Industry, Commercial Sector (20 %)	Second Period: (FY2015–FY2019): 15% reduction below base year emissions.	Free Allocation (83.96)
Japan: Saitama	Industry, Commercial Sector (26 %)	Second Period (FY2015–FY2019): 15 or 13% reduction below base year emissions.	Free Allocation (n.a.)
Republic of Korea	Industry, Power, Transportation, Aviation, Commercial Sector, Waste (66 %)	Phase I (2015–2017): 1 687 Mt CO_2(e), including a reserve of 89 Mt CO_2(e) for market stabilization measures, early action and new entrants. 2015: 573 Mt CO_2(e); 2016: 562 Mt; 2017: 551 Mt CO_2(e)	Free Allocation (n.a.)
China: Beijing (Pilot)	Power, Industry, Buildings (40 %)	50 Mt CO_2(e) (2013)	Free Allocation (7.95)
China: Chongqing (Pilot)	Power, Industry (40 %)	125 Mt CO_2(e) (2013)	Free Allocation (n.a.)
China: Guangdong (Pilot)	Power, Industry (55 %)	388 Mt CO_2(e) (2013); 408 Mt CO_2(e) (2014)	Auctioning & Free Allocation (8.84)
China: Hubei (Pilot)	Power, Industry (35 %)	324 Mt CO_2(e) (2014)	Auctioning & Free Allocation (n.a.)
China: Shanghai (Pilot)	Power, Transportation, Industry, Aviation, Buildings (50 %)	160 Mt CO_2(e)	Auctioning & Free Allocation (4.42)
China: Shenzhen (Pilot)	Power, Industry, Buildings (40 %)	32 Mt CO_2(e) (excluding buildings)	Auctioning & Free Allocation (9.72)
China: Tianjin (Pilot)	Power, Industry (60 %)	160 Mt CO_2(e) (2013)	Free Allocation (3.54)
New Zealand	Industry, Power, Transportation, Forestry, Waste (54 %)	The NZ ETS has no fixed cap, in order to accommodate carbon sequestration from forestry activities, and to enable full access to international carbon markets. The NZ ETS legislation includes provision to introduce auctioning of NZUs within an overall cap on non-forestry sectors.	Auctioning & Free Allocation (0.89)

[497] Total emissions in the country / region across all sectors.

[498] Converted from US Dollars to Euros using the February 2015 monthly exchange rate: http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm

Table 23: Overview of countries with a carbon tax in force

Country	Coverage	% of Emissions Covered	Tax Rate per Tonne CO_2(e)[499]
Australia[500]	Large emitters form the industrial sectors, large gas consumers and landfill facilities	60%	A$ 24.15 (€ 16.62)
Canada: British Columbia	Consumption of fuels as well as peat and tires combusted for heat or energy	70%	CAN$ 30 (€ 21.16)
Denmark	Consumption of fossil fuels and electricity; industries subject to EU ETS are typically exempt	45%	DKR 167 (€ 22.43)
Finland	Consumption of fossil fuels	15%	Heating fuels: € 35.00 Liquid traffic fuels: € 60.00
France	Consumption of natural gas, heavy fuel oil and coal, transport fuels and heating oil not covered by the EU ETS	35%	2015: € 14.50 2016: € 22.00
Iceland	Gas oil diesel, gasoline, heavy fuel oil, petroleum gas and other gaseous hydrocarbons; firms included in the EU ETS are exempt	50%	From 2014: IKR 1,120 (€ 7.39)
Ireland	Natural gas, mineral oil, solid fossil fuels; firms included in the EU ETS are exempt	40%	Fossil fuels: € 20.00 Solid fuel: € 20 Natural gas & mineral oil: n.a.
Japan	Broadly all fossil fuels	70%	¥192 (€ 1.44) from April 1, 2014 set to increase to ¥289 (€ 2.17) stepwise over 3.5 years
Mexico	All fossil fuels apart from natural gas	40%	Depending on the type of fuel: Mex$ 10–50 (€ 0.60-2.98)
Norway	Mineral oil, gasoline, natural gas	50%	Depending on the type of fuel and usage: NKR 25–419 (€ 2.83-47.49)
Sweden	Fossil fuels used for heating and transportation	25%	Skr.1 076 (€ 115.40)
Switzerland	Fossil fuels with regards to their usage	30%	SFR 60 (€ 57.85)
United Kingdom	Fossil fuels with regards to their usage	25%	£18.00 (€ 24.07)

[499] For currency conversions, February 2015 monthly exchange rates were used: http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm

[500] Australia's carbon pricing mechanism was technically not a carbon tax, but during the initial fixed-price period it can be considered as such. Note that the mechanism was repealed with effect from 1 July 2014.

Table 24: Overview of countries and regions considering carbon pricing

Jurisdiction	Type of carbon pricing considered
Brazil (national level)	Tax or ETS
Brazil: Rio de Janeiro	ETS
Brazil: São Paulo	ETS
Canada: Manitoba	ETS
Canada: Ontario	ETS
Chile	Tax or ETS
China (national level)	ETS
Japan (national level)	ETS
Mexico	ETS
Republic of Korea	Tax
Russia	ETS
Thailand	ETS
Turkey	ETS
Ukraine	ETS
USA: Oregon	Tax
USA: Washington State	ETS
Vietnam	ETS

5.2 Annex II: Estimating administrative costs of free allocation

The estimate of administrative costs for the allocation system given in section 3.4.5.3 (Table 6) is based on the following assumptions:

- Number of EU ETS Member States and countries: 28
- Length of trading period: 8 years (2013-2020), with one NIMs process per trading period
- Total number of installations receiving free allocation: 10,000
- Percentage of new entrant cases (incl. extensions) per year: 5%
- Percentage of closures per year: 5%
- Tariff per hour (operator): 32.1 €/h
- Tariff per hour (CA): 41.5 €/h
- Tariff per hour (Commission): 70.5 €/h
- Tariff per day (verifier): 1,000 €/d

The following activities were taken into account:

- Operators:
  - Learning of rules, workshops, stakeholder meetings
  - Development of monitoring plan/methodology report at installations
  - Data collection at installations
  - Verification
  - Administrative process of submitting report to CA
- CAs:
  - Learning of rules, workshops, stakeholder meetings
  - Internal coordination
  - Methodology development for data assessment
  - Consultations with operators
  - Administrative process of submitting data to Commission
- Commission
  - Internal coordination
  - Prepare tools for Member States
  - Run helpdesk and obtain consultancy services
  - Assess MS data
  - Make formal decisions

The estimate was made separately for the NIMs process (once per eight years, i.e. total costs are divided by 8 in order to give the annual costs) and the NE&C cases. For putting the results into perspective, a hypothetical scenario of an "ex-post" allocation system has been included. For the latter it is assumed that the NIMs process is carried out every year, but no additional NE&C cases occur. Important assumptions include that for NIMs a heavy learning process is required for all participants, while this is less important for NE&C cases, as the

process is already known. However, the learning process will not decline to zero effort over time, as staff will change and new learning will be required. The same applies for the ex-post system, where learning requires less effort than the sum of NIMs and NE&C per installation. However, as NE&C applies to a small number of installations only, while updating applies to all installations in the ex-post case, the costs are higher in the latter case.

A similar assumption applies to the monitoring needs: For the ex-post system it is assumed that the monitoring of activities at sub-installation level will become routine work and will therefore be more efficient than under the NIMs. However, it is assumed that it would become more formalised and integrated in the current MRV system (in particular in the monitoring plan). This would, to some extent, make it more burdensome.

5.3 Annex III: Bibliography

5.3.1 EU Documents and Legislation

General remark:

All Commission documents can be found on the Commission's web site. Of particular importance for this study is DG Climate Action's homepage for the EU ETS: http://ec.europa.eu/clima/policies/ets/

All European legislation can be found on EurLex: http://eur-lex.europa.eu/

EU ETS Directive including amendments:

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5.4 Annex IV: List of Acronyms

AVR .... Accreditation and Verification Regulation: Commission Regulation (EU) No. 600/2012

BaU .... Business as Usual

CA .... Competent Authority

CCEV report .... (4th) Compliance Cycle Evaluation Report

CCS .... Carbon Capture and Storage

CEMS .... Continuous Emission Measurement System

CHP .... Combined Heat and Power (generation)

CIMs .... Community Implementing Measures pursuant to Article 10a(1) of the EU ETS Directive (also called "Benchmarking Decision", Commission Decision 2011/278/EU)

CITL .... Community Independent Transaction Log (was replaced by the EUTL from 2012 onwards)

CL .... Carbon Leakage

CPUP .... Cost-Per-Unit-Performance

CRF .... Common Reporting Format (used for national GHG inventories)

CSCF .... Cross Sectoral Correction Factor (pursuant to Article 10a(5) of the EU ETS Directive)

CSEUR .... Consolidated System of EU Registries

CSP .... Concentrated Solar Power

DETS .... Data Exchange and Technical Specifications

DH .... District heating

DRM .... Distributed Renewable Management

EBRD .... European Bank for Reconstruction and Development

ECAS .... European Commission Authentication Service

EEA .... European Environment Agency

EEA .... European Economic Area

EEPR .... European Energy Programme for Recovery

EEX .... European Energy Exchange, Leipzig, Germany

EIB .... European Investment Bank

EII .... Energy-Intensive Industries (in section 3.5 to be read as *Electricity*-Intensive Industries)

E-PRTR .... European Pollution and Transfer Register

ETC/ACM .... European Topic Centre on Air Pollution and Climate Change Mitigation

EU ETS............EU Emission Trading System as defined by the Eu ETS Directive, Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003

EUA ....European Allowance, tradable unit equivalent to the entitlement to emit one metric tonne of CO_2(e)

EUAA...............European Allowance for Aviation

EUTL................European Transaction Log

GEF ....Global Environment Facility

GHG.................GreenHouse Gases. Within this report this usually refers only to the gases currently included in the EU ETS under specific Activities listed in Annex I of the Directive: Carbon dioxide (CO_2), nitrous oxide (N_2O), perfluorocarbons (PFCs, of which only CF_4 and C_2F_6 are to be monitored)

GVA ....Gross Value Added

H2020 ....Horizon2020 (EU Research and Innovation Programme)

ICAP ....International Climate Action Partnership

ICE...................Intercontinental Exchange, London, UK.

IED...................Industrial Emissions Directive, Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

IFC ....International Finance Corporation (Part of World Bank Group)

IT......................Information Technology (note that at few occasions IT can also refer to Italy where Member State abbreviations are used)

ITL....................International Transaction Log

KYC ....Know-your-customer

MFF ....Multiannual Financial Framework

MiFiD ....Market in Financial Instruments Directive: Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014

MMR ....Monitoring Mechanism Regulation (Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013

MP ....Monitoring Plan

MRR.................Monitoring and Reporting Regulation: Commission Regulation (EU) No. 601/2012

MRV.................Monitoring, Reporting and Verification

MRVA ....Monitoring, Reporting, Verification and Accreditation

MSR.................Market Stability Reserve as established by Decision (EU) 2015/1814 of the European Parliament and of the Council of 6 October 2015 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC.

Note, however, that at the time of writing this report this Decision was not adopted yet. Consequently, when the MSR is mentioned in this report, its design is assumed as laid down in the related Commission proposal, COM(2014) 20/2.

NACE............... Statistical classification of economic activities in the European Community ("Nomenclature statistique des Activités économiques dans la Communauté Européenne")

NAP .... National Allocation Plan

NE.................... New Entrant (as defined pursuant to Article 3(h) of the EU ETS Directive)

NE&C............... New Entrants (greenfield installations and significant capacity extensions), and Closures (significant capacity reductions, partial cessations (and recoveries thereof), and full cessation of operations)

NER .... New Entrants Reserve

NER 300.......... Funding Programme which is based on 300 Mio. Allowances taken from the NER.

NGOs............... Non-Governmental Organisations

NIMs .... National Implementation Measures pursuant to Article 11 of the EU ETS Directive

PMR................. Partnership for Market Readiness (Programme run by the World Bank)

PPI .... Producer Price Index

R&D .... Research and Development

RES .... Renewable Energy Sources

SBA.................. Small Business Act for Europe

SET-Plan .... European Strategic Energy Technology Plan

SME................. Small and Medium Enterprises

UKIIF................ UK Innovation Investment Fund

UNFCCC.......... United Nations Framework Convention on Climate Change

USD .... US Dollars