Working Documents Series

No. 2, October 2016

Policy interaction between the EU Emissions Trading System and the Renewable Energy Directive

Author	Organisations
Noriko Fujiwara (*noriko.fujiwara@ceps.eu*)	CEPS
Project Coordinator	
Heleen de Coninck	Radboud University

In Brief

The EU has opted to integrate climate and energy policies. Although the merits of this approach have been acknowledged, in practice, EU stakeholders such as the power and trading sectors are concerned about the detrimental effects of renewable energy (RE) support measures on the EU emissions trading system (ETS). The over-achievement of the RE target meant that the power sector did not contribute GHG emissions reductions beyond what would be delivered through the ETS, but reduced the demand for ETS allowances (EUAs) and lowered EUA prices. Emissions reductions delivered by RE support measures such as Feed-in-Tariffs (FiTs) have higher abatement costs than those delivered through cap-and-trade systems such as the EU ETS. It is important to understand how the RES Directive affects the ETS, to identify the conditions under which the directive will undermine the purpose of the ETS, and to limit such an effect.

The CARISMA Project started in February 2015 and received funding from the European Horizon 2020 programme of the EU under the Grant Agreement No. 642242. CARISMA intends, through effective stakeholder consultation and communication, to ensure a continuous coordination and assessment of climate change mitigation options and to benefit research and innovation efficiency, as well as international cooperation on research and innovation and technology transfer.

Working Documents are not formal deliverables of CARISMA, but highlight preliminary findings of the project for the purpose of discussion. Working Documents are not as extensively reviewed as formal project deliverables.

The author is grateful to Sarah Deblock and Corinna Grajetzky for their comments and suggestions. Nevertheless, the sole responsibility for the content of this Working Document lies with the author. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission is responsible for any use that may be made of the information contained therein.

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1 Introduction

The EU energy and climate package for the year 2020 contains three climate and energy goals: a 20% reduction of greenhouse gas emissions, a 20% increase in share of renewable energy, and a 20% increase in energy efficiency, which are called '20-20-20' targets. The first two goals and associated legislative proposals were launched simultaneously and as part of a package. When the EU Directive for the emissions trading system (ETS) was revised for the period 2013-2020 (Phase III) (EU 2009a), the effects of the Renewable Energy Directive (RED) (EU 2009b) on the ETS were taken into account, assuming a renewable energy (RE) target to be set at 20% (EC 2008a). This means that neither the RED nor the revised ETS Directive was enacted in a vacuum and the impact assessment for the 2020 package was duly conducted with the assumption of coexisting energy and climate policies in place (EC 2008b).

Now, based on the improvement in data availability and experiences with Phase I (2005-2007) and Phase II (2008-2012) of the ETS, we have obtained a better understanding of how energy and climate policies may interact under different political and economic circumstances. It is increasingly recognised that there are possible detrimental effects of 'overlapping policies' that target the same sector, such as electricity. Using this insight, we can draw lessons for enhancing the performance of the ETS and safeguard the system against external pressures under unforeseen circumstances. The latest ETS reform proposal for Phase IV (2021-2030) (EC 2015a) provides us with an excellent opportunity to review the current designs and respond to the challenge in a more systematic way.

The analysis in this working document of the RED effects on the ETS is based on the existing literature, including *ex post* evaluations of consecutive ETS Phases, and defines the scope in the following three aspects:

- It limits the period of literature survey coverage to what was published by the EU and member states in the five-year period from 2011 to 2015, enabling us to include some *ex post* assessments of the ETS during Phases I and II;

- It focuses on two main sources of literature, one from the research sector (both scientific and policy research)[1] and the other from market participants (the power and trading sectors);[2] and
- It examines the effects of the EU RED on the EU ETS in terms of 'overlapping policies'.

This analysis not only looks at the policy and policy instruments but also at targets such as the RE target and the target for the ETS sector, which are crucial drivers for change in this particular case study.

[1] Such as Berghmans et al. 2014; Drummond 2014; EC 2015b; Gloaguen and Alberola 2013; Jalard et al. 2015a; Healy et al. 2015; Hood 2013; Koch et al. 2014; Lehmann and Gawell 2011; Löschel and Schenker 2015; OECD 2011; Rey et al. 2013; Sartor et al. 2015; and van den Bergh et al. 2012.
[2] Such as IETA 2015, EFET 2016, Nordeng et al. 2015 and 2014. Note that two FP7 projects focusing on climate policy mix, CECILIA2050 (Rey et al. 2013) and ENTRACTE (Löschel and Schenker 2015), are included in the survey as far as they address interaction between the ETS and RE Directives focusing on the EU level.

2 EU Policy Landscape: Climate and Energy

The revision of the ETS Directive (ETSD) and the RED were launched simultaneously in 2009 as part of the 2020 climate and energy package and were the first EU attempt to integrate climate and energy policies. Building on the three targets towards 2020 on GHG emissions, renewable energy and energy efficiency, an updated climate and energy policy framework for the period 2021-2030 was adopted by the European Council in October 2014. The targets for this period are:

- at least a 40% cut in GHG emissions compared to 1990 levels (a 43% cut in GHG emissions from the ETS sector compared to 2005 levels);
- at least a 27% share of RE consumption;
- at least 27% energy savings compared with the business-as-usual scenario.

The GHG target for the ETS sector was set at the EU level in Phase IV (2021-30). For renewable energy, unlike the 2020 target, which was broken down to member state levels, the 2030 target was set at the EU level.

The coexistence of the EU ETS and other instruments can be justified for several reasons (see also the next section): to correct market failures, to correct policy failures, to improve the design of the system and to meet multiple targets and objectives[3] (Sijm 2005 in Rey et al. 2013 and in Löschel and Schenker 2015; Lehmann and Gawel 2011; OECD 2011).

The coexistence of the two directives has been subject to criticism, however. The risks that these overlapping policies would cause environmental ineffectiveness and cost-inefficiency (to be examined in the following sections) led to recommendations to rely on the ETS and to abolish other renewable electricity sources (RES-E) support measures which increase abatement costs beyond the equalised carbon price (e.g. both Frondel et al. 2008 and Sinn 2011 in Lehmann and Gawel 2011; Löschel and Schenker 2015). Most of the recent literature reviewed for

[3] Energy security is one of these other policy objectives that interact with climate change mitigation (e.g. OECD 2011; Lehmann and Gawel 2011).

this analysis, however, would reject this conventional wisdom, which is labelled as a ‘carbon market only’ approach (Sartor et al. 2015).[4]

The 2020 climate and energy package was also a strategic policy choice in 2008 to support the Conference of Parties (COP) in negotiating a global climate agreement[5] by mainstreaming climate policy in all the relevant EU policies. In this mind set, EU energy policy, especially when relying on RE and energy efficiency (EE), could contribute to the EU's climate policy and the EU's position in international climate negotiations. This policy landscape has changed significantly since the start of the European Energy Union in 2015. This strategy has a stronger focus on the supply side, particularly security of energy supply and the internal energy market, with EU climate policy contributing to the Energy Union. Nevertheless, the role of the ETS as the main European instrument to meet its 2030 GHG target in the most cost-effective manner was not only confirmed in the European Council Conclusions in October 2014 (Council of the EU, 2014) but also reaffirmed in the EU's post-Paris strategy published in March 2016 (European Commission 2016).

[4] Sartor et al. (2015) argue that such an approach is incapable of driving cost-effective investment in low-carbon technologies during the transition, at least under current technologies.
[5] The COP15 was held in Copenhagen in December 2009. https://unfccc.int/meetings/copenhagen_dec_2009/meeting/6295.php

3 Case Study

3.1 Coexistence of the EU ETS and RE support measures

Hood (2013) distinguishes two policy areas: *climate policies* refer to those policies that set emissions reductions as the primary goal and primary outcome, and *energy policies,* which are implemented primarily for energy-related reasons, with emissions reductions being an ancillary benefit. Certain policy interactions need careful management, particularly interactions that can take place between a cap-and-trade system and other policy instruments that address *the same types of emissions from the same sources* (OECD 2011) or *emissions in the same sectors, and over the same timeframe* as existing energy policies (Hood 2013). Interaction between the ETS and RE Directive falls under these conditions, targeting GHG emissions from the power sector between 2008 and 2012 and between 2013 and 2020.[6] The cap on allowances was set at a national level in Phases I (2005-07) and II (2008-12) while it is determined by a Linear Reduction Factor (LRF) at the EU level in Phase III (2013-20) and after.[7] Delivering most of the emission reductions required to meet the ETS cap through energy policies[8] rather than the ETS would make EU allowance (EUA) prices dependent on the success of the energy policies (Hood 2013).

The principal aim of the EU ETS is "to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner" (Article 1, EU 2003). Coherence with other objectives can be viewed as one of the evaluation criteria to assess ETS performance. For example, the objective to incentivise low-carbon investments would potentially conflict with the first objective to achieve GHG emission reductions in a cost-effective and economically efficient way (Healy et al. 2015). Rey et al. (2013) suggest that although the need to meet other policy objectives, such as inducing low-carbon innovation, could justify the coexistence of

[6] The literature reviewed for this analysis, which is economics-oriented, does not define or discuss a target. In the EU climate and energy policy landscape, specific targets are clearly defined (see p.1 and p.3 in this Working Document).
[7] In Phase III, the EU cap on allowances decreases each year by 1.74%, which is called a Linear Reduction Factor (LRF), of the average total quantity of allowances issued in 2008-12. This LRF will be 2.2% from 2021 in the latest proposal for the ETS Phase IV.
[8] Energy policies that would interact with the ETS include energy efficiency (EE) and technology deployment, such as RE deployment.

the two directives (Sijm 2005 in Rey et al. 2013), the interaction of the ETS with other instruments is affecting the functioning of the scheme. This effect may not be accidental, but can be partly attributed to a re-interpretation of the directive in a changing EU policy environment. More detailed observation below shows that i) the revision of the ETSD and the launch of the RED proceeded in parallel legislative processes; and consequently ii) the objective of the RED to promote energy from renewable sources has been reflected in new ETSD articles, 10 and 10a, which were added to the revised ETSD without changing the original purpose in Article 1.

Fujiwara and Georgiev (2012) identified possible achievements of carbon markets in addition to the cost-effective climate change mitigation: financing instruments to assist low-carbon development; and driving innovation and technology deployment for transition to a low-carbon economy. Possibilities to finance low-carbon development include the use of auctioning revenues for pre-determined purposes including RE development “to meet the commitment of the Community to using 20% renewable energy by 2020” (Art. 10 (b), EU 2009a) and the use of a new entrant reserve of up to 300 million allowances (NER300) for pre-determined purposes, including demonstration projects of innovative RE technologies in the EU (Art. 10a, 8, EU 2009a). The latter will become the Innovation Fund in Phase IV (2021-30).

3.2 Results of literature review

How do European stakeholders perceive the EU ETS and FiTs?

A majority of European stakeholders perceive the ETS as the main policy instrument to induce GHG emission reductions (e.g. Nordeng et al. 2015 and 2014; Fujiwara et al. 2015). Nevertheless, there are interesting changes in both stakeholders’ perceptions and member states’ preferences. First, there is a growing view that in contrast to conventional wisdom (Sartor et al. 2015), the ETS will remain the best but not the only instrument for EU climate policy, and can be combined with other policy instruments such as subsidies for RE (for variance in preference across member states, see Nordeng et al. 2015). Second, there is a shift in preference for policy instruments such as a shift from Feed-in-Tariffs (FiTs) to Feed-in-Premiums (FiPs) for supporting RE technology

deployment (e.g. Ragwitz et al. 2015). A FiT guarantees a fixed price above the electricity market price to producers of electricity from renewables for a typical period of 10-20 years. In contrast, a FiP is a per-unit subsidy for electricity from renewables added to the electricity market price (Marschinski and Quirion 2014).

Did the ETS induce low-carbon solutions such as RE?

In a survey question answered by about 75 compliant entities of the EU ETS, 19% responded that the EU ETS had induced their companies to reduce emissions in the early phase but that it had little impact at that moment. By comparison, 32% suggested that the ETS had caused and would continue to cause reductions, while 29% were of the view that it had not and probably would not cause any reductions (Nordeng et al. 2015). The 2014 data for the same question were in a similar range of distribution: 18% positive about the early phase but negative about the later stage; 34% positive; and 29% negative (Nordeng et al. 2014).

A survey commissioned by the European Commission found that carbon abatement and EUA prices were not the primary drivers for most companies and sectors to invest in carbon-efficient solutions. Nevertheless, the survey concluded on a positive note that the ETS played a supportive role in many decisions, especially in the early phase when the price was higher, inducing companies to minimise energy costs, to improve financial viability and profitability, to raise awareness of climate issues at management level and among employees, and to build capacity for more accurate monitoring and reporting of emissions (European Commission 2015).

A ZEW survey taken by German companies also shows that in 2009-13 the abatement of CO_2 was not the main driver but a side effect for them to decide abatement measures. The ZEW survey, in which German companies participated, also suggests that in the ETS Phases I and II the main drivers were the need for companies to reduce energy and raw material costs, and the need to improve the general efficiency of the production process (European Commission 2015).

In the EU, 45% of the 75 responding ETS-compliant entities, in the survey mentioned above, regarded cost as a decisive factor in their investment

decisions, up from 38% in 2014, while 45% viewed cost as influential but not decisive, down from 58% in 2014 (Nordeng et al. 2015, 2014). When utilities were asked another question about how much the carbon price would influence their power forward hedging structure, half of the 30 respondents to this question answered "to little or no extent"; one third relied "significantly" on the carbon price; and the remaining 20% said "moderately" (Nordeng et al. 2015).

EUA prices could affect the level of RES deployment through the use of the new entrant reserve. The NER300 programme set up a reserve of 300 million allowances for Phase III whose sales can finance RE and Carbon Capture and Storage (CCS) projects in member states. In the first call (December 2012) for proposals to be funded from the sale of 200 million allowances, the European Commission made available a total value of €1.1 billion to 20 RE projects. In the second call (July 2014) for proposals to be funded from the sale of 100 million allowances, the Commission made available a total value of €1 billion to 18 RE projects and 1 CCS project.[9] The scale of the NER300 funding was much lower than initially anticipated due to lower EUA prices. Had EUA prices been higher, the amount of available funding for the NER300 programme would have been larger.

How did RE support measures affect the ETS?

The European Commission's impact assessment for the 2020 energy and climate package (EC 2008b) examined the impacts of various design choices to implement both RE and GHG emission reduction targets as part of a package. By 2010, emission reductions triggered by the RED were estimated at around 50 Mt CO_2 across the EU ETS sectors (CDC Climat 2012 in IETA 2015). Another assessment found that over the last six years, renewable capacity has led to a reduction in the power sector emissions of around 15 Mt every year.[10] If one simply adds up the data from these studies, the total amount will be approximately 130-140 Mt for the last ten years.

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[9] The amount of the NER funding is estimated to have leveraged additional funding from private sources, in the range of over €2 billion in the first call and over €860 million in the second call. http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm

[10] Outlook, Energy Aspects, July 2015, https://www.energyaspects.com/publications/view/greece-is-the-word

Based on the data from 12 member states in western and southern Europe between 2007 and 2010, an *ex post* assessment concluded that under the ETS cap, the deployment of RES-E displaced CO_2 emissions within the ETS sectors (within the power sector and from the power sector to other ETS sectors) and reduced the demand for EUAs, thereby lowering EUA prices (van den Bergh et al. 2012).

A case study on Germany showed that approximately 10-16% of the reduction in CO_2 emissions from the electricity sector between 2005 and 2011 could be attributed to the increase in the RE share of the energy mix (Weigt et al. 2012 in Gloaguen and Alberola 2013). The same group of researchers estimated the actual reduction in demand for EUAs between 2006 and 2010 to be a consequence of RES deployment in Germany's electricity sector. They concluded that CO_2 emissions from the electricity sector are reduced by 10-16% of what estimated emissions would have been without any RES policy (Weigt et al. 2013).

More recently, Berghmans et al. (2014) conducted an *ex post* assessment for CO_2 emissions from the electricity sector during ETS Phases I and II (2005-12). Their results show that a large share of CO_2 emission reductions in the sector came from an increase in RE generation, which reduces the emission levels of individual power plants. Most of the new RE generation capacity was put in place at the member state level in the form of FiTs or green certificates without a link to EUA prices. Although EUAs appeared effective in inducing emission reductions, especially at times when the EUA price was high, their effects were much smaller than what RE support measures such as FiTs achieved in reducing CO_2 emissions in the power sector (Berghmans et al. 2014).

Koch et al. (2014) based their assessment on an extended data set by i) including a full period of ETS Phase II (2008-12) and the first year of Phase III (2013) and ii) accessing data differentiated by hydro and other sources, such as wind and solar. Their results support the case that growth in RE deployment, especially that of wind and solar, played a strong role in lowering EUA prices. Yet their *ex post* assessment shows that effects of RE growth on EUA prices are empirically moderate and much smaller than what *ex ante* simulation-based assessments predicted (Koch et al. 2014).

How might RE support measures affect the ETS?

Recognising the limits of simulation-based assessments, it is still interesting to understand what future trends might look like. It is projected that overlapping EU policies, including EE, RES and Eco-Design Directives could reduce demand for EUAs by 1.1 billion tonnes by 2020 (IETA 2015). Based on a calculation of the impact on emission reductions from RE sources in 2020, the RE generation in the EU-28 between 2008 and 2020 would amount to a reduction in demand for EUAs of approximately 210 $MtCO_2$ (IETA 2015). Similarly, other reports assume continuation of RE uptake but on a smaller scale, due to a fall in the levels of subsidies[11] with annual emission reductions from RE in the range of approximately 10-15 Mt.[12]

3.3 Analysis

What are the main effects of RE support measures on the ETS?

Although policymakers considered the effects of other policy instruments (e.g. EC 2008; OECD 2011; Hood 2013), they could not predict the magnitude of the overachievement of the RE target beyond what was envisaged when setting the ETS cap. Because the success of other policy instruments could not be predicted, they inevitably introduced uncertainty (Rey et al. 2013).

The above studies suggested that the overachievement of the RE target implied that the power sector contributed no additional GHG emission reductions to what would be delivered through the ETS, but reduced the demand for EUAs and lowered EUA prices.[13] On the one hand, an increasing deployment of RES triggered by the RES target reduced the amount of GHG emission reductions required to meet the ETS cap (Rey et al. 2013; Healy et al. 2015), thereby pushing down the EUA prices. On the other hand, the abatement costs of all RE technologies are relatively high, well above the average EUA price (Rey et al. 2013). The RE target therefore leads to higher costs than when the ETS is the only instrument,

[11] For the case of Germany, see Nordeng et al. (2015).
[12] Carbon Weekly, Energy Aspects, January 2016, https://www.energyaspects.com/publications/view/european-carbon180116
[13] For the role of RE in EUA price development compared with other factors, see e.g. Berghmans et al. (2014); Koch et al. (2014); and Gloaguen and Alberola (2013).

without additional GHG emissions reduction (Löschel and Schenker 2015; see also a 'carbon market only' approach in Sartor et al. 2015).

As the overall level of GHG emissions is fixed by the EU ETS cap, RES-E support schemes only result in a shift of emissions across the ETS sectors (Lehmann and Gawel 2011), which can also be called 'displacement of CO_2 emissions'. The *ex post* assessment of 12 member states in western and southern Europe between 2007 and 2010 found that part of the CO_2 emissions was displaced within the power sector and the other part from the power sector to other ETS sectors. The study showed that the CO_2 displacement from the power sector to other ETS sectors due to RES-E deployment can reach up to over 10% of historical CO_2 emissions in the power sector (van den Bergh et al. 2012).

What are the consequences?

A policy aiming to deploy RE could thus unintentionally promote the most emission-intensive technology by reducing their compliance costs (Löschel and Schenker 2015) and shifting emissions across the ETS sectors, as mentioned above.

As a result of perceived low EUA prices over the long term, most ETS-compliant companies in the power sector have stalled investment in newer and low-carbon gas-fired plants while maintaining operation of the existing coal and lignite-fired plants, which have lower operating costs (e.g. CEZ in European Commission 2015b). An energy market research group, AB Energiebilanzen, estimated that energy-related CO_2 emissions in Germany increased by 0.9% in 2015 due to increased demand[14] and more burning of lignite and natural gas. The figure would have been higher without a 10.5% increase in renewables-based power.[15] For the same survey, the research group commented on the RE that

[14] The group commented that "[T]he increase is primarily due to the weather, which was slightly cooler than the very mild previous year, and the associated higher demand for heating energy". "Germany's energy-related CO_2 emissions up 0.9% in 2015 -research group", Carbon Pulse, 21 December 2015, 3 February 2016, http://carbon-pulse.com/13587/; Also see AB Energiebilanzen.
[15] Ibid. Among other renewable technology types, wind power on land and off shore showed a plus of 50% compared to the previous year. The share of solar energy (photovoltaics and solar-thermal energy) increased by 6% and that of biomass by 2%. AB Energiebilanzen, Press Release, Nr. 06/2015, 21 December, 2015.

> "[W]ith regard to CO_2 emissions, [we] anticipate only a slight increase when compared to the previous year. It was possible *to cover a substantial portion of the increase in consumption with renewables and, thus, without any higher emissions"* (emphasis added).[16]

One may disregard the impact of approximately a 1% emission increase in energy-related CO_2 emissions due to fossil fuel combustion, which was partly offset by an approximate 11% increase in renewable-sourced electricity generation in 2015. However, this effect needs to be considered temporary and there is no guarantee of such an offset in future.

In short, prospects for a continuation of perceived low EUA prices led to an undesirable situation in which fossil fuel-fired power generation increases operation, thereby increasing CO_2 emissions.

4 Discussion

Several stakeholders in the energy sector are concerned about the overlap of multiple instruments and multiple objectives. For example, RWE suggests the use of the ETS for climate policy and calls for market integration of RES, moving away from FiTs to FiPs (mentioned in section 3.2) and tendering schemes.[17] In addition to the ETS, Repsol believes that multiple targets derived from the RE, the Fuel Quality, and the EE Directives create a complex regulatory framework with additional risks for competitiveness and uncertainties (European Commission 2015b). CEZ even sees

> "a threat that the increased deployment of renewables, based on a non-market approach and relying on national support schemes, conflicts with the EU ETS as it creates emission buffers in the ETS with absolute targets" (CEZ in European Commission 2015b).

Such adverse effects have also been acknowledged by the research community (e.g. Sartor et al. 2015; Berghmans et al. 2014; van den Bergh et al. 2012).

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[16] Carbon Pulse, 21 December 2015, 3 February 2016.
[17] RWE, presentation at the 3rd POLIMP stakeholder workshop, Brussels, 11 February 2015.

Nevertheless, based on concerns about the capacity of the ETS to drive low-carbon technologies and innovation, a majority of the studies reviewed for this analysis recommend the continuation of combining different approaches, which they view as complementary, instead of relying on the ETS as the only instrument of EU climate policy. If EU and member state policymakers decide to continue with multiple approaches and policies, they need to work more closely towards greater coordination of these approaches and policies. There are three main suggestions to avoid and/or mitigate the possible detrimental effects of RE support on the ETS.

1. *The ex ante assessment of the ETS cap at the start of each phase, i.e. no ex post adjustment to the cap during the phase*

If EU policymakers choose to maintain complementary policies such as RE that would affect the ETS, such effects need to be fully accounted for when the ETS cap is set at the start of each phase through the review of the LRF (mentioned in section 3.1). At the start of a phase it is possible to adjust the baseline, depending on the need for a new policy to reflect progress towards the 2050 goal (80-95% GHG emission reductions from 1990 levels) and in international negotiations (IETA 2015). Aligning complementary policies with the ETS cap means that the ETS cap should be reduced by an equivalent amount of abatement expected from complementary investment support policies in the context of National Energy and Climate Plans (NECP) (Sartor et al. 2015, for NECP see EC 2015c).

2. *Transparency in information*

Greater transparency in information is needed to assess the adequacy of the ETS cap and to monitor impacts of abatement delivered through complementary policies such as RE. Essential data include GHG reductions and sub-sectoral allocation at an installation level, as well as costs and impacts of complementary policies (IETA 2015). For example, this requires differentiation of technology types, as the evidence for effects of RE measures on the ETS was robust in wind and solar, but not necessarily in hydro (Koch et al. 2014). In addition, energy traders argue that member states and the European Commission do not provide detailed fundamental assumptions at a local or aggregated level, particularly on

economic growth (GDP growth) and carbon intensity (emission per unit GDP) and that member states fail to inform stakeholders about the impacts that National Energy and Climate Plans would have on the ETS (EFET 2016).

3. The Market Stability Reserve

It was the *over-achievement* of the RE target that caused high uncertainty about the level of demand for EUAs (Jalard et al. 2015a).[18] While the Market Stability Reserve (MSR) primarily aims to restore the balance between supply and demand and enhance the ETS' resilience against external shocks, it can be regarded as the only and most effective instrument in place to mitigate the impacts of complementary policies, which were unpredictable or/and unavoidable, during the phase. It may not avoid the problem at its source but could repair the negative policy interaction effects by withdrawing allowances from auctioning (IETA 2015, see also Jalard et al. 2015b). The amount of withdrawal may be determined by an assessment of different scenarios assuming different rates of increase in abatement resulting from complementary policies such as RE (Sartor et al. 2015).

These three suggestions are not mutually exclusive but related to each other. Long-term scarcity should be ensured by the *ex ante* assessment of the ETS cap, which requires comprehensive data collection and periodic and systematic monitoring of impacts of abatement from complementary policies. Unavoidable effects of the latter could be mitigated to some extent through the use of the MSR.

[18] Unlike energy efficiency or offsets, the RE target itself was accounted for in the ETS cap-setting at the start of Phase 3. What was unaccounted for was the overachievement of the target. RE policies accounted for a large share of CO_2 emission reductions but their contribution to allowance surpluses did not contribute significantly to the increasing surplus, in contrast to the impacts of energy efficiency policies and offsets (Jalard et al. 2015a).

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