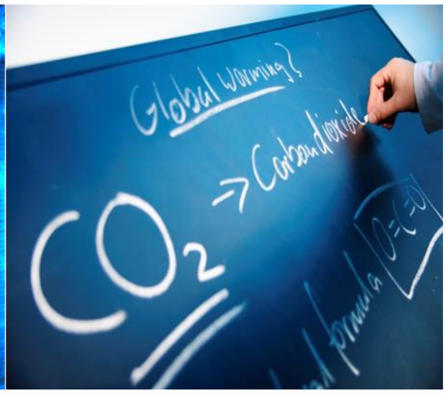

Joint Policy Brief of the ENTRACTE and CECILIA2050 projects

Content

The original idea: the EU ETS as the flagship of an ambitious EU climate policy…

The so-called 20-20-20 targets that were adopted in 2009 made EU a forerunner in the implementation of a stringent climate policy. The European policy is based on three pillars: (i) a 20% reduction in greenhouse gas (GHG) emissions relative to 1990 levels, (ii) a 20% share of renewables in EU energy production, and (iii) a 20% energy efficiency improvement, all to be reached until 2020.

The EU Emission Trading System (EU ETS) was meant to have a key role in the achievement of the 20-20-20 targets, thus serving as the "flagship" of Europe's climate policy, and a central piece in the set of policy instruments that the EU applies. Introduced in 2005, the EU ETS is still a relatively new policy instrument, and at the time of its introduction there were only few experiences with comparable instruments that could be studied. In addition, the multi-level decision-making structure in the EU and the interaction with a large number of other policy measures and targets, both in the domain of climate and energy policy, complicated the task of designing an effective and efficient scheme, and ensure its consistence with the existing set of policies. And on top of all this, right after the 20-20-20 targets were adopted, the EU was hit by an economic crisis that made several of the underlying assumptions on policy stringency and reaction obsolete.

… but the flagship has never left the harbour

As a result of these factors, the carbon price signal from the EU ETS has remained weak. Except for short periods – as in 2008, before the full scale of the economic crisis became evident – the price per ton of CO_2 emissions has mostly remained around 15 Euro; and since late 2011 it has never again risen above 10 Euro. At this level, the EU ETS is not able to generate a strong enough incentive to perform some of the tasks it is expected to contribute to – such as triggering a fuel switch from coal to gas, stimulating investments into energy efficiency, let alone encourage innovation towards low-carbon technologies.

Thus, while the last decade has seen ambitious rhetoric, strong political declarations and ambitious targets set for European climate policy – the impact of pricing tools in bringing about changes on the ground has been limited. Apart from the flailing flagship EU ETS, there have also been no successful initiatives for more ambitious carbon taxes through the Energy Taxation Directive, in order to strengthen the carbon price signal for emitters not covered by the ETS. A couple of EU countries (such as

Ireland, Sweden, and in the second attempt France) have introduced or increased carbon taxes – but in the majority of EU countries, changes in climate-related taxes were confined to particular sectors (e.g. air ticket charges), technologies (e.g. emission-adjusted vehicle registration taxes) or locations (e.g. congestion charges).

The main constraint towards a wider use of carbon pricing tools, and towards exploiting the full potential of economic instruments in the transition to a low-carbon economy, appears to be political reluctance. As such, carbon pricing works: while there is always room for improvement in the design of carbon pricing tools, carbon pricing has proven to be functioning in principle, and carbon pricing tools have delivered what they were expected to deliver.

The EU ETS has achieved its core objective: to reduce emissions of the covered installations.

Assessing the performance of the applied policy instruments has been one of the core tasks of the ENTRACTE research project. The economic crisis reduced demand and thus emissions. Hence, it is not straightforward to identify the amount of emission reductions due to the implementation of the EU ETS. Using comprehensive firm-level data on companies regulated across Europe as well as French plant-level data for manufacturing firms, ENTRACTE analysed the contribution of the EU ETS to actually realized emission reductions.[1]

The analysis of French installations shows that regulated plants reduced emissions by an average of 15.7% between 2005 and 2012 (see Figure 1). The analysis showed that the most important abatement option has been a switch from coal and oil to gas. Moreover, the econometric analysis finds no evidence at the European level that the EU ETS had any impact on turnover or employment level of regulated firms, suggesting that the EU ETS has reduced carbon emissions without jeopardizing the competitiveness of the companies regulated under the EU ETS.

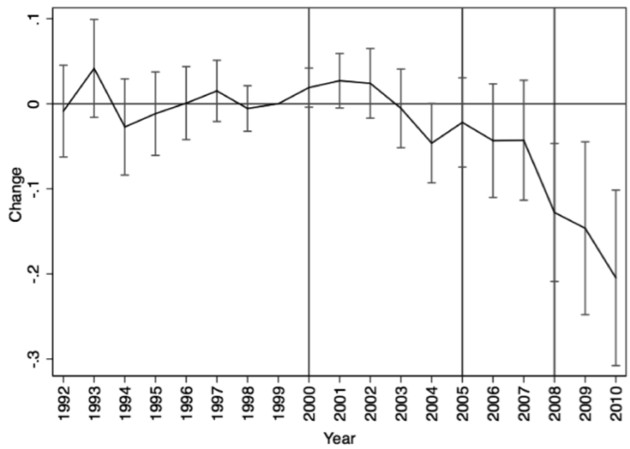

Figure 1: Impact of the EU ETS on the change in (log) carbon emissions of regulated industries. Source: Dechezleprêtre (2015)

The effects of the EU ETS vary across the EU – also due to differences in the practical implementation of the instrument, and the stringency of enforcement.

But the integrity and the success of the EU ETS relies upon consistent implementation of monitoring and enforcement across all participating states. Research conducted in ENTRACTE shows that compliance practice in the different Member States varies greatly due to differences in underlying principles of enforcement strategies, institutional settings and funding.[2] Since its start, the EU ETS has gradually reduced the level of decentralization. But particularly regarding enforcement, crucial elements remained within the domain of Member States. The effectiveness and reliability of the EU ETS, therefore, partly depends on the effort of each of the participating States. While compliance rates are currently high, efforts should be made to ensure more harmonized practice with a view to likely future price increases of allowances. A lack of compliance in one or a few Member States may harm the functioning of the ETS in the entire EU.

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[1] Dechezleprêtre, Antoine(2015): Report on the empirical evaluation of the impact of the EU ETS. http://entracte-project.eu/uploads/media/ENTRACTE_Report_Empirical_Evaluation_Impact_EU_ETS.pdf

[2] Verschuuren, Jonathan and Floor Fleurke (2014): Report on the legal implementation of the EU ETS at Member State level. http://entracte-project.eu/uploads/media/ENTRACTE_Report__Legal_Studies.pdf

Emissions Trading requires robust mechanisms for compliance and enforcement – which in turn comes with administrative burden.

But monitoring, reporting, verification (MRV) has costs for the regulated firms and installations which may affect overall effectiveness of the EU ETS. The analysis of such transaction costs for regulated companies reveals that these costs only had a moderate impact on marginal allowance prices, which implies that they do not distort the market in a substantial way.[3] But the analysis did identify substantial impacts on average costs in particular for small and medium enterprises (SMEs). This indicates a passive, compliance-oriented behaviour of these emitters, merely accepting the cost of allowances as another operating expense, rather than seeking for improvements of their carbon efficiency. Thus, the efficiency of the scheme could be enhanced if some smaller firms were allowed to opt out of the scheme, by placing the point of regulation at the carbon content of fossil fuels rather than measuring end-of-pipe emissions at the installation level.

Hence, empirical research shows that the design and implementation practice of the EU ETS still leaves some room for improvement in order to enhance the efficiency and effectiveness of the EU ETS, as well as the overall climate policy mix. But this does not affect the general finding that carbon pricing works – and the EU ETS is no exception. The main reason why the EU ETS so far has not exploited its full potential, and has not fulfilled the role of the flagship of EU climate policy, is a cap that has turned out to be too lenient – and insufficient political will to correct this fundamental flaw.

The plan for 2030: reform the EU ETS to reinstate it as a key element of EU climate policy…

Notwithstanding the challenges that the current EU climate policy mix face, the EU has adopted a set of new, more ambitious climate goals for 2030. The reduction of GHG emissions (i) shall be accelerated to at least 40% below 1990 levels by 2030. This reduction breaks down into a 30% reduction below 2005 levels for those sectors not covered by the EU ETS, and a 43% reduction below 2005 levels within the ETS. The latter is to be achieved by tightening the rate at which the annual supply of allowances decreases, from the current 1.74% to 2.2% as of 2021. In parallel with these direct initiatives to reduce European GHG emissions, the EU has also set (ii) an EU-wide goal for renewables (27% of final consumption) and (iii) energy efficiency (27% improvement compared to a baseline).

… and address the allowance surplus that currently inhibits the effectiveness of the EU ETS

The EU ETS is currently paralysed by an accumulated surplus of 2 billion allowances, which prevents it from fulfilling its supposed function of triggering and coordinating decarbonisation efforts. The EU has adopted the Market Stability Reserve (MSR) as the principle tool to manage this surplus. Under the current regulation, the EU ETS Directive determines the annual supply of allowances in a rigid way; as the political and legal process around the backloading decision has shown, any change to the supply of allowances requires a protracted procedure. The MSR intends to make the annual supply of allowances flexible, so that it can adapt to changes, such as economic shocks or rapid technological advancements, which would otherwise result in a surplus of allowances. The challenge for policymakers is to design a flexible system that helps regulate an artificial market affected by future uncertainty, without letting that system become too complex. ENTRACTE has found that only long-term structural reforms – such as the introduction of an MSR – can incorporate the flexibility required by the EU ETS.[4] It is crucial to clarify the specific objectives of such a mechanism. If the MSR is primarily aimed at tackling future extreme and unanticipated variations in allowance demand, the instrument can indeed redistribute abatement efforts across the compliance phase and thus reduce total compliance costs from otherwise delayed abatement decisions.

[3] Heindl, Peter (2015): Report on the impact of transaction costs, adoptionof technologies and the interaction with EMS http://entracte-project.eu/research/report-impact-of-transaction-costs-adoption-of-technologie-interaction-with-ems/

[4] Taschini, Luca and Corina Comendant (2014): Report on cost containment mechanisms and market oversight. http://entracte-project.eu/uploads/media/ENTRACTE_Report_EU-ETS_Reform_and_Expansion.pdf

Still, depending on the growth performance of the EU economy, it may take another decade or more before the surplus the MSR will have absorbed the existing surplus, and before scarcity is re-established on the market for EU emission allowances. Depending on how much foresight one expects from the carbon market, this could mean another decade without a significant carbon price at the EU level. Other scenarios – such as the adoption of an EU-wide carbon tax to replace the EU ETS – appear highly unlikely given the high legal and political hurdles such a proposal would face, particularly in the current political context of the EU institutions and key Member States.

Why a strong carbon price is needed, now and in the future

A key question is whether the introduction of the MSR and the adjustment of the linear reduction factor will be sufficient to generate a carbon price soon enough and strong enough, so that the EU ETS can assume the role that was initially foreseen for it. A strong carbon price signal is definitely needed, and it is needed soon: in order to put the EU economy on track towards a low-carbon economy, the coming years are decisive. The EU has increased its climate ambition, with the adoption of a new set of targets for 2030, and the reiteration that it seeks to decarbonise its economy by mid-century – which translates into a reduction of GHG emissions of 80-95% below 1990 levels by mid-century.

In numerical terms, the challenge is to step up the pace of emission reductions significantly. During the 20 years since 1995, the annual rate of decarbonisation in the EU economy (i.e. it the carbon intensity in relation to GDP) has improved at a rate of 2.3% p.a.. According to scenarios modelled as part of the CECILIA2050 project, overall decarbonisation rates will have to rise to 3.1% p.a in the 2020s, 4.2% in the 2030s and up to 5.2% in the 2040s to meet the long-term climate targets while allowing for continued economic growth.[5] Tackling this challenge implies a need to transform large parts of the economy – the power sector, manufacturing, housing stock, transport, and the public and private infrastructure on which all these sectors rely.

At the same time, other factors are not aligned with the aim of decarbonisation: in particular, the price of coal has fallen markedly in relation to natural gas and other fuels – in September 2015, for the first time ever, dropping below 50 US$ per metric ton, down from prices in excess of 120 US$ in 2011. This trend already creates a strong market pull towards the greater use of coal – leading towards carbonisation, not decarbonisation.

In theory, there is little dispute that a strong carbon price signal can and should be a key element in any strategy to bring about such a fundamental transformation, if the targets are to be achieved at reasonable cost. Research conducted in the CECILIA2050 and ENTRACTE projects confirms the finding of the IPCC's 5th Assessment Report that the transformation to a low-carbon economy can be affordable – but keeping the costs affordable requires, above all, a sufficiently strong carbon price. The carbon price is expected to provide a continuous incentive for emission reductions, to support the diffusion of low-carbon technologies, and to discourage investment into high-carbon infrastructure. Furthermore, it should distribute the reduction burden between emitters and between sectors – and ideally over time – in the most cost-effective way. While all this is clear in theory, it is equally clear that the carbon price currently set by the EU ETS is too low to trigger fundamental changes of the type required for a long-run decarbonisation. To provide a flavour of the level of prices that would be required if the carbon price were to become a driving force of the transformation, and to lead the EU economy onto a cost-minimising path towards decarbonisation: modelling conducted as part of CECILIA2050 suggests that a price above 70 Euro would be required already in 2020 to guide the transformation, and rising to levels as high as 300-460 Euro by mid-century. Compared to the current price level of around 8 Euro in the EU ETS, such prices may appear infeasible – yet it is also clear that the current prices, while having the benefit of being feasible, are too low to have much influence on the ground.

The risk of a delayed carbon price

Going forward, there is the risk of an asynchronicity between the ETS reform and the MSR on the one hand, and the transformation to a low-carbon economy on the other. Depending on the growth of the economy, a

[5] Meyer, Bernd, Mark Meyer and Martin Distelkamp (2014): Macroeconomic routes to 2050. CECILIA2050 Deliverable 3.3

meaningful carbon price may not be re-established before the late 2020s, or even the 2030s. By that time, modelling results from CECILIA2050 and other sources tell us Europe should be well advanced on the path to a low-carbon economy.

In particular, the power sector should be progressing towards decarbonisation: modelling results suggest that this sector should lower its emissions more rapidly than other parts of the economy – low-carbon alternatives are readily available, and increasingly so at low cost, and so are the policy instruments to support and coordinate their deployment. Added to this is the pivotal role of the power sector for the decarbonisation of other sectors: for road transport and buildings in particular, electrification is one of the options to bring about the drastic emission reductions required from these sectors. But as part of a decarbonisation strategy, electrification of transport and heating will only make sense if the power mix in the grid has been largely or entirely decarbonised – and if all economic potentials for improving energy efficiency have been realised.

But for the near to mid-term future role of carbon pricing, this spells the risk of a gigantic missed opportunity. A key consideration in this respect is whether additional (complementary) policies will be enacted in addition to the EU ETS (including general or technology-specific energy efficiency policies and support for renewable energies). *If no additional policies are enacted*, the result would be a missed decade for climate policy, running a high risk of locking the EU economy onto a high-carbon development pathway, and making it increasingly unlikely (or prohibitively costly) that Europe will change onto a decarbonisation pathway. *If strong additional policies are enacted*, those policies would take over most of the job that the carbon price was supposed to achieve, promote low-carbon options and squeeze fossils out of the market – and by doing so, would prolong the existence of the allowance surplus, and continue to suppress the carbon price. Yet the economic cost of this scenario could be high: additional, complementary policies would likely be adopted at the Member State level, e.g. to bring about an accelerated phase-out of coal-fired power generation as planned in Germany, or to provide domestic price support to the EU ETS as with the carbon price floor in UK. Going forward, this would result in a patchwork of complementary policies, some at EU and most at MS level, which is not necessarily consistent across Europe, let alone efficient in terms of distributing the emission reduction effort between sectors and countries.

Sectoral implications of a delayed carbon price: the changing electricity market

In a scenario in which ambitious complementary policies drive the decarbonisation while the ETS remains sidelined, an additional practical challenge arises from the changing emission profile of the EU, which also changes the potential role of the carbon price in the process of decarbonisation. In this scenario, in the power sector of the 2030s, the carbon price would apply to an electricity market that is already largely decarbonised. Modelling carried out as part of the CECILIA2050 project, using the European TIMES model to map pathways for a decarbonised Europe and the role of the power sector in it, concludes that for a successful scenario, the carbon intensity of electricity generation will have to be 18% below the 2010 level of 342 g/kWh already by 2020. In 2030, this figure increases to 48%, and further to 91% in 2040. According to the model results, this pattern would hold by and large across the different parts of Europe, with some decarbonising faster than others. It is important to note that the model, as an economic optimisation model, merely looks for the cheapest route to decarbonise the power sector, and does not factor in political dispositions. According to the model, Eastern European countries – coming from a much more carbon-intensive base than most of the EU-15 – would see rapid decarbonisation of their power generation. Spain and Portugal would also experience a rapid decarbonisation, albeit starting from an already much cleaner base. By contrast, the model suggests that Scandinavia, Germany and the Benelux countries would see a relatively slower progress to decarbonisation.[6]

Yet irrespective of the actual spatial distribution, the implication is clearly that, already in the 2030s for most of the year and in many parts of Europe, power supply will be entirely renewable, and wholesale electricity

[6] Solano, Baltazar and Paul Drummond (2014): Techno-Economic Scenarios for Reaching Europe's Long-Term Climate Targets. CECILIA2050 Deliverable 3.1

prices will correspondingly fall to near-zero. This means that the conventional wisdom of how the carbon price signal finds its way into the price formation on competitive power markets, encourages fuel switch, and rearranges the merit order no longer applies, or only applies in those few hundred hours a year when renewables are not capable of providing all electricity. In addition, whatever the future design of the electricity market in Europe, it is likely to include some type of capacity mechanism. Investment decisions in non-intermittent technologies in the power sector will then mostly be driven by this capacity mechanism – yet how exactly the ETS carbon price can be incorporated into such a mechanism remains an open question.

Sectoral implications of a delayed carbon price: the need to balance industry, households and transport

A second implication is that, assuming that decarbonisation in the power sector progresses well in the next two decades, the remaining heavy lifting that is needed in the 2030s and 2040s will need to happen in other sectors, such as housing, transport and energy-intensive industries.

Regarding the role of pricing tools in the process, this spells further challenges: Housing and transport are sectors that are generally considered not very amenable to pricing. In both cases, multiple other market failures (landlord-tenant dilemma, lack of access to finance, lack of information etc.) limit the effect of pricing tools. As a result, very high price levels would be needed to change behaviour in these sectors. At the same time, the distributional implications of very high carbon prices are considerable particularly in the housing sector, which means that complementary policies are particularly important to avoid social hardships.

On the other hand, industry does tend to be more responsive to prices – but is also vulnerable to higher prices. While at current carbon price levels there has been no empirical evidence of “carbon leakage”, i.e. the relocation of production in response to climate regulation, this is likely to change for higher carbon price levels. Thus, a carbon price well above 100 Euro per ton might be required to trigger behavioural responses in transport and households – but would have serious implication for the economic viability of industrial production in Europe.

Thus, the scenario of a delayed carbon price entails that the carbon price can at best serve as a coordination mechanism to align the efforts between sectors – but not as a driver. Instead, the heavy lifting in terms of emission reductions in the 2030s and beyond, the decarbonisation in industry, housing and transport, will need to be prepared through a suite of targeted sectoral policies – such as radical innovation strategies in industry, retrofitting of the building stock, aggressive fleet standards in transport, promotion of new forms of mobility, electrification of transport and heating – and the rollout of the corresponding infrastructure. This would be done in anticipation of a higher carbon price, e.g. to cushion its impact when it occurs, but would need to happen without the support of a high carbon price – i.e. effectively regulating against market forces. Which is not impossible, but certainly difficult.

The alternative: high-carbon lock-in and a standoff between climate targets and fossil-fuelled growth

In the less optimistic case, the absence of a strong carbon price, and the lack of ambitious complementary policies, would make it prohibitively costly for the EU to reach a low-carbon development trajectory, and thus ultimately force it to abandon its climate ambitions. In the absence of continued support measures, it is possible that the current dynamic in the development of renewable energy technologies withers away, and the transformation of the energy system grinds to a halt half-way through the process. In this case, the lack of a carbon price signal now, and the failure of the carbon price to adequately reflect the looming scarcity a decade hence, would trigger a return to coal, including investment into new coal-fired generation capacity. In such a scenario, growing emissions mean that the current surplus of emission allowances would be used up more quickly – but when the surplus is exhausted, Europe would find itself locked itself into a high-carbon infrastructure. In this case, the carbon price would rebound forcefully at some point – but reaching climate targets in an economy based on a fossil-fuel infrastructure would require a carbon price that is high enough to squeeze the dominating technology out of the market. It would come at the cost of depreciating investments, creating stranded assets, imposing a high cost on the overall economy, and creating massive political resistance. The political feasibility of this scenario, i.e. whether the climate targets could withstand the political resistance, is highly questionable.

Three options for the future of carbon pricing in the EU

Thus, in short: Carbon pricing has been proven to work. But an ETS can only be effective if there is scarcity on the allowance market, which is a direct result of how strict or how lenient the cap is set – which is a political decision. Likewise, a carbon tax can only as effective as the tax level that is set. Thus, the carbon pricing tools currently implemented in the EU fall short of exploiting their full potential. While there is some room for improving the design of carbon pricing tools, the main reason for this is lack of political will. The recently adopted MSR is a step in the right direction, but appears too modest to deliver a sufficiently strong carbon price signal soon enough. Instead, even with the MSR, there is the risk of a lost decade for carbon pricing, during a period when strategic choices need to be made for decarbonisation – including the development of new low-carbon technologies and the roll-out of a low-carbon infrastructure.

Going forward, this leaves three options for the role of carbon pricing in the EU:

1. Member States – at least the more ambitious ones – can muster the political will to enact strong complementary policies that drive the decarbonisation in key sectors. This would effectively make the ETS redundant, taking over its job through more technology-specific regulation, mostly implemented at the Member State level (e.g. to phase out coal, to promote renewables, storage and energy efficiency, or to encourage other low-carbon technologies). The resulting patchwork of policies could get the job done, but it would be heterogeneous, inconsistent and inefficient – and hence ultimately more costly than necessary.
2. The EU and its Member States adopt no, or only weak complementary policies, resulting in a lock-in into high-carbon infrastructure in power generation and transport, and insufficient attention to improving energy efficiency in industry and housing. Stagnating or rising emissions diminish the surplus, at which the carbon price shoots to high levels – but meets an economy that is locked onto a high-carbon trajectory. The resulting conflict between vested economic interests and climate ambition implies a high risk that the EU will be forced to abandon its climate targets.
3. The EU and its Member States can bring themselves to embark on a further, more ambitious reform of the EU ETS, which is capable of delivering a significant carbon price much earlier than the current MSR would. This could either take the form of a decision to eliminate the surplus – e.g. by expanding the scope of the EU ETS (to include transport and space heating as upstream sectors) without or with delayed adjustment of the overall cap, thus adding demand without changing the supply of allowances. Or it could contain an agreement on a long-term, predictably rising trajectory for the carbon price – effectively cancelling all auctions until the EU ETS price has returned to this trajectory. Either of the last two variants would be suited to make Europe's climate policy both more effective and more efficient, to counteract the risks of both fragmentation (resulting in lower efficiency) and a high-carbon lock-in. Yet, at present, neither of these two variants seems particularly likely to gain political support.

In parallel: drive low-carbon innovation and investments, and roll out the low-carbon infrastructure

Irrespective of how the carbon price evolves, there is a need for dedicated policies to prepare the low-carbon economy by encouraging innovation in low-carbon solutions, and rolling out the necessary infrastructure. Even in the case of ambitious reforms to the EU ETS (option 3), it is unlikely that the carbon price itself will provide a long-term signal that is strong and credible enough to incentivise such innovation and investment – given the fundamental (technological, social) uncertainties, the market failures (e.g. knowledge spillovers), the path dependency and the network effects involved.

While the incentive effect of the carbon price may be limited for triggering such long-term changes, there is a case for using the ETS auctioning revenue to incentivise low-carbon investment, and to redistribute the associated risk – as already planned in the NER400 programme, albeit at a smaller scale.

Towards a more coherent policy mix for the EU: better understand and manage interactions between targets, and the corresponding policies.

While carbon pricing should be a cornerstone of any effective and efficiency climate policy, it is not a panacea: there need to be other policy instruments as part of a well-orchestrated policy mix. To improve the coherence of the policy mix, it is necessary to be clear about their specific function in the policy mix and their relation to the different policy targets, to anticipate and to manage the interaction of different policy instruments.

The three key targets of the EU climate and energy policy, a reduction of GHG emissions, an increase in the share of renewables energies, and an increase in the energy efficiency, all interact with each other through the energy system. Understanding and managing these interactions is crucial for efficient climate policy: In order to reach the respective targets cost-effectively, policy instruments have to be chosen, implemented and adjusted taking each other into account and minimizing distortions.

The ENTRACTE research generally confirms the standard economic insight that pricing emissions offers the best prospects of reducing emissions cost effectively. Further research indicates that prices for emission allowances become more sensitive to changes in electricity demand if the EU ETS is combined with a binding renewable target. [7]

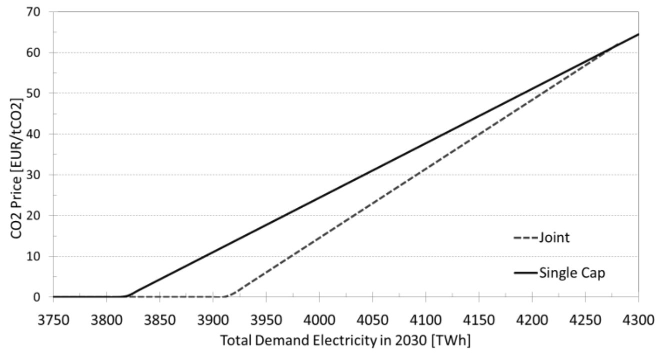

Figure 2: Simulation of CO2 price levels over a range of electricity demand levels. Source: Flues et al. (2014)

If policy makers value a stable carbon price signal as crucial for encouraging long-term investments in low-carbon technologies the combination of the two policy targets may have additional unintended negative consequences.

But ENTRACTE identifies also positive rationales for using multiple instruments complementary to carbon pricing. Addressing other externalities, typically related to innovation and technology adoption, can significantly reduce the costs of reaching the climate target. Addressing these externalities appropriately can reduce the compliance costs by a third compared to a scenario where a carbon price is the only instrument.[8] However, in reality it is extremely hard to calibrate these additional instruments correctly. Policy makers often lack the information necessary to implement these first best policy portfolios. Furthermore, the externalities may diminish over time since both knowledge spillovers and learning-by-doing effects diminish over time, thus reducing the scope for complementary instruments in addition to carbon pricing. Adding new policy instruments has therefore to be done with the utmost reservation because policy failures are a constant risk when designing extended policy portfolios. Otherwise the policy mix risks becoming a policy mess.

[7] Flues, Florens, Andreas Löschel, Benjamin Johannes Lutz and Oliver Schenker (2014): Designing an EU Energy and Climate Policy Portfolio for 2030: Implications of Overlapping Regulation under Different Levels of Electricity Demand, *Energy Policy 75*, 91-99

[8] Schenker, Oliver and Witajewski, Jan (2015):Report on the optimal policy mix in a global general equilibrium setting, http://entracte-project.eu/uploads/media/ENTRACTE_Report_Optimal_Policy_Mix_Global_General_Equilibrium_Setting.pdf

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