Defining sub-targets for deep decarbonisation—Keeping our eye on the ball

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Abstract

The European Union´s system for its 2030 energy and climate targets is eliciting considerable debate. The debate however seems to take limited account of the uncertainties and national differences that abound the pathway towards a low-carbon economy in the future. This paper elaborates on how these aspects may interact with targets´ optimality, showing that limited flexibility in a target strategy may lead to substantial additional costs to achieve the needed transition. The paper then touches on the importance of linking intermediate and long term targets. Finally, the paper discusses how target definitions and the current EU governance regime for energy and climate can lead to further inefficiencies. The paper concludes by providing a number of actionable suggestions to tackle these issues that can be combined into a comprehensive governance regime for 2030 and beyond.

Introduction

The European Union has formulated overall climate and energy ambitions that should simultaneously reduce greenhouse gas (GHG) emissions, reduce dependency on foreign energy sources and increase competitiveness of the European economy. Decarbonizing the European economy will require measures throughout the European energy system. A multitude of technical and non-technical measures to reduce emissions exist, including renewable energy, energy efficiency improvements, carbon capture and storage and electrification of energy demand. Integrated assessments have shown that the existing measures' combined potential likely suffices to reduce emissions in the EU by 80-95% in 2050. However, identifying the set of preferred measures to be taken, their optimal timing, and the required policy instruments to unlock them remains a difficult challenge.

With regard to competitiveness, it seems logical that the measures to achieve the long term goals should be selected and implemented as part of a cost optimal strategy as much as possible. For this goal, costs should be interpreted from a societal perspective and over the full transitioning period. The costs of fully transforming the current EU economy to a low carbon economy are expected to be substantial, at least in comparison with a baseline that does not take into account costs of externalities such as climate change damages. Keeping the costs close to minimal may therefore be an important success factor.

Theoretically, any additional constraints in achieving a required GHG emission reduction would lead to additional costs compared to a situation where the market could 'undisturbedly' find the optimal solution. This is one of the main arguments for proponents of a European energy and climate system that sets targets only for GHG and does not set targets for other indicators, such as renewables and energy efficiency. This paper acknowledges however that besides costs, a whole array of other important decision criteria exist that may justify setting additional targets. An obvious one could be that the EU has not only GHG reduction set as the overarching goal for its energy and climate strategy, but also reduced dependency on foreign energy sources. Moreover, additional targets can provide guidance for translating the abstract concept of CO2 emission reduction into more concrete actionable requirements or providing a more secure climate for investments. In this way, targets can serve as signposts for developments of various elements that are needed to solve the complex decarbonisation puzzle. Nonetheless, additional targets, their definitions, and the way they are pursued can have bigger or smaller impact on overall costs.

Objective of this paper

The paper discusses various aspects of the current EU decarbonisation strategy that seem sub-optimal from a cost perspective. The paper focuses on issues related to energy efficiency, but does so from a systems perspective that includes supply. It aims to provoke thinking on these aspects in order to improve the way cost considerations may be taken aboard in future policy.

- First, it elaborates on how the overall system uncertainties relate to setting targets for decarbonisation.
- Then it looks at the translation of the long term decarbonisation challenge into intermediate targets, focusing on 2030.
- Thirdly, it discusses the distribution of targets among member states, taking into account divergent national circumstances.
- Fourthly, it investigates how target definitions may impact target feasibility, through selection of eligible measures and associated costs.
- Finally, it discusses the (mis)match between the governance levels for targets and policy instrumentation.

In all cases the paper discusses how current practice may lead to deviation of an overall cost-optimal decarbonisation strategy. Taking stock, we draw lessons for a future target system design.

The EU triple target system and decarbonisation strategy

On the pathway to deep decarbonisation in 2050, the EU has so far set intermediate GHG targets for 2008-2012 (following the Kyoto protocol) and 2020 and has recently also adopted a GHG target for 2030. In its ‘low carbon economy roadmap’ [EC 2011], the EC has stated that a cost efficient GHG reduction trajectory towards 2050 follows signposts of 40% reduction in 2030 and 60% reduction in 2040. As part of the GHG reduction strategy, the commission has set additional targets for renewable energy (RE) and energy efficiency (EE). The bottom line for deep decarbonisation is that, ultimately, total energy demand should match the available supply from low-carbon energy sources. The choice for these additional targets aligns with the understanding that deep decarbonisation requires interventions at both the supply side and demand side of the energy system. Moreover, these targets make the sought-after measures more tangible for stakeholders, creating a more secure investment climate. As such, the targets can be considered supportive sub-targets for the overarching GHG target and generally also aid in reducing dependency on foreign energy sources. It is worthwhile to note however, that besides renewable energy and energy efficiency, various other types of measures may contribute to sustainable energy supply and demand reduction respectively. As will be discussed further below, the focus on these two types of measures through specific sub-targets may implicitly diffuse attention for other decarbonisation options.

Translation to Member State targets

The EU GHG target is split between the EU and individual members states (MS) through the Effort Sharing Decision (ESD) and the EU-Emission trading system (ETS). MS are responsible for achieving their ESD (non-ETS) target, whereas the ETS emissions are an EU responsibility. The 2030 GHG target for non-ETS, as the earlier 2020 target, will be differentiated per country, although the distribution key still remains to be decided. The ETS target is a common target for all ETS-regulated sources in the entire EU and is thus not specified on a territorial level. Depending on market characteristics, the ETS should theoretically find the least-cost abatement potential across the EU and could lead to differentiated physical emission reductions between MS and translocation of activities among MS. The RE sub-target for 2020 has been differentiated per MS, but the target for 2030 is set as an overall binding target for the EU, without further translation to MS targets. For EE, a nationally binding target was initially absent, but at EU level a target has been indicatively set at -20% in 2020 and mandatory national elements have been introduced with the adoption of (article 7 of) the EED in 2012. The mandatory national elements are not differentiated across MS. For 2030, a EU-wide indicative EE target has been set at -27% compared to energy demand in the reference projection for 2030 and is still under further debate currently.

The targets for GHG, RE and EE are selected in a political negotiation process, guided by extensive analysis of their combined impact on the European energy system and its economy [EC, 2014]. Given the parallel ambition for the energy and climate package to increase competitiveness of the EU economy, it seems straightforward to assume that cost-optimality for the EU economy should be an important parameter for selecting appropriate targets for the EU economy. The Impact Assessment indicates that the adopted target system for 2030 (GHG -40%, RE 27%, EE -27%) may form a relatively balanced set, given that the RE and EE targets are close to their modeled values in the scenario with only a headline -40% GHG target. Note however, that there is considerable debate on the methodology to assess e.g. the cost effectiveness of energy efficiency measures [Hermelink & de Jager, 2015; Gerdes et al, 2016]. There seems to be less attention for the consideration that the optimal efficiency contribution is linked to a certain distribution of effort over the MS, that does not seem to be reflected in the MS indicative EE targets nor obligations under the EED. The costs resulting from the target distribution may deviate significantly from the optimum. Moreover, it remains unclear to what extent this set of targets aligns with the cost optimal solution for Europe´s energy transition strategy up to 2050, as the impact assessment was not aimed at that purpose.

Setting targets under overall system uncertainties

A multitude of technical and non-technical categories of measures to reduce emissions exist, including production of energy from renewable sources, energy efficiency improvements, carbon capture and storage, electrification of energy demand. Not all of these measures simultaneously contribute to the other overarching goals (reduced dependency on foreign energy and increased competitiveness), although many measures for decarbonisation also reduce dependency.

Besides energy and climate measures, a range of autonomous developments determines future energy demand and supply, such as e.g. demographics, alterations in economic growth or structure, energy prices, etcetera. Given the uncertainty in the future development of costs and potentials for each measure, and the uncertainty in development of important societal drivers for the demand for energy services, it is difficult at this moment to determine the optimal future mix of measures. Correspondingly, it is difficult to pinpoint the optimal level of future energy demand, the level of energy demand reduction needed and the level of sustainable supply (and need for renewable expansion measures).

Due to these uncertainties, any inflexible target system may turn out to be sub-optimally chosen after developments play out. For instance, a target on absolute energy demand may not necessitate improving energy efficiency - as shown by the contribution of the economic crises to achieving the EU's 2020 energy demand target. Turned around, even when energy efficiency improvements are implemented abundantly, the other demand drivers could negate their effects towards an absolute energy demand target. This effect could be an argument to introduce flexibility in the target system that allows adjusting the targets to ongoing developments. Flexibility could e.g. imply to adjust targets to autonomous developments, or to adjust the balance between demand and supply side targets in case certain types of abatement measures turn out to be unexpectedly cheap or expensive. Flexibly defined targets then could help to stay closer to a cost-optimal pathway. Interestingly, the EU ETS - designed to be the EU flagship abatement instrument - does not differentiate between RE or EE or other types of measures. The EU ETS should therefore already lead to EE, RE and other measures, depending on whichever offers the least cost option, and thus aligns with a cost optimal strategy at least in theory.

Intermediate targets in the light of long term decarbonisation

Up to this point, we have only discussed the balance between supply and demand side measures in relation to the goal of deep decarbonisation in 2050. However, to be consistent with keeping global warming at (well below) 2 degrees, the cumulative GHG emissions for the EU until 2050 are limited. Early emission reductions can therefore allow for higher emissions later, which necessitates thinking about the optimal reduction pathway overall. As noted earlier, the EC has laid down its anticipated GHG trajectory in the ‘low carbon economy roadmap’, and set the EU GHG reduction target for 2030 at -40%. The current discussions focus mostly on translating the intermediate GHG reduction target into underlying intermediate sub-targets. However, this section reflects on the positioning of the intermediate sub-targets within the long term strategy. It argues that pursuing intermediate targets independently from long term needs may lead to deviations from a cost-optimal pathway.

Timing of measures can play an important role in their costs and can differ between categories. Making optimal use of natural moments for replacement or investment significantly reduces costs compared to early depreciation of assets. It thus make sense to tune targets in a way that aligns with such moments. In day-to-day politics however, targets are often viewed as independent actualities, their individual achievement preferably realized against minimal costs. The discussion on the EU 2030 targets, and the analyses underpinning their impact assessment, also seem to follow this interpretation.

Such interpretation is fundamentally different from the comprehensive perspective in which different targets and target-years are interrelated. After all, deep decarbonisation in the longer term may require different measures than least cost approaches to achieve intermediate targets. This comprehensive, long term perspective allows a more nuanced view with regard to the measures needed to achieve the intermediate goal. For instance, the perceived ‘risk’ of going beyond what is strictly needed to achieve the target may be reduced, as it is likely that further efforts will be necessary anyway, to comply with later targets. Similarly such a view could justify a slowdown of efforts in some situations to better match natural intervention moments.

Care should thus be taken that measures to comply with intermediate targets also make sense from a deep decarbonisation perspective and will not be made redundant by further reaching interventions later. In a cost-optimal strategy, the 2030 targets should follow from the measures that are required by 2030 to achieve the 2050 target (see Figure 1). Note that sub-these targets could include other measures besides RE and EE. The resulting set of sub-targets for supply side and demand side measures could thus deviate from the cost optimal balance to achieve the 2030 GHG target independently from the longer term needs.

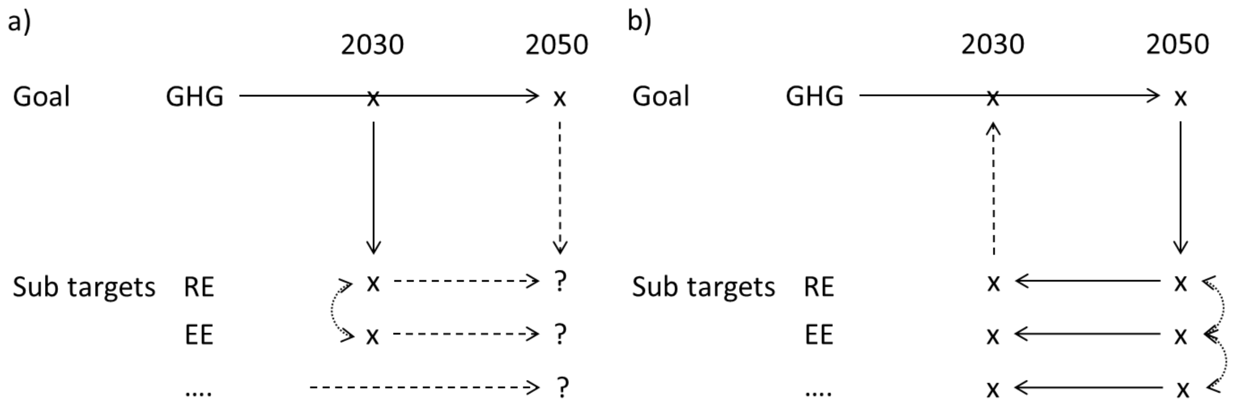

Figure 1a. The current approach to target setting derives the intermediate sub-targets from the intermediate GHG target without connecting to longer term decarbonisation needs.
Figure 1b. A more cost-optimal approach first derives the long term decarbonisations needs and from there derives intermediate sub-target

In such a strategy, the uncertainty in the optimal package of measures for 2050 obviously transcends to the intermediate timeframe. This makes it more difficult to pinpoint any optimal set of targets, and may rationalize the perspective to optimize on achieving the intermediate GHG reduction rather than pursuing each of the targets within their long term trajectory. However, as noted, a long term perspective allows more nuance towards the intermediate targets. Moreover, when targets are set more flexibly to allow for ongoing developments as discussed, the total effort towards the intermediate targets can be balanced and compatibility with long term deep decarbonisation retained, at least for the major efforts to achieve intermediate goals. In the current debate on target setting for 2030, the further development towards 2050 does not seem to play any role at all.

The urgency to take into account compatibility with future needs is likely to grow further down the transition pathway. Interactions and overlap between different measures will become increasingly relevant, and costs of measures rise progressively with higher ambition. From today's vantage point with limited penetration levels of most measures, 'simply' stimulating each category of measures and picking low-hanging fruit seems a no-regret strategy. However, it is questionable for how long continuing such a strategy remains optimal further down the transition pathway when more costly measures need to be implemented. If chosen from a long term perspective, sub-targets could serve as 'means' to safeguard moving forward various elements that are needed in the overall strategy – in a way article 7 of the EED and elements of the EPBD could be interpreted as such. However, as will be discussed further below, differing national circumstances may require different elements to varying extents, making it difficult to find a suitable common definition for such sub-targets at the EU level and appropriately ambitious target-levels for each member state.

Distributing EU targets over member states, taking into account divergent national circumstances

In previous sections we have discussed target setting at the EU level. In this section, we zoom in on what such a strategy may mean for MS. It is important to consider that circumstances in MS differ substantially, both with regard to current penetration of various measures and to future potentials, costs, resources (GDP/capita) and societal preferences for decarbonisation options. These differences lead to the realization that, in principle, contributions between countries towards a cost-optimal strategy at EU-level could differ.

We use the concept of the marginal abatement cost curve (MACC)[1] to discuss how optimizing at the EU level may influence the mix of measures in countries. Let's imagine we could create a MACC for all measures across the EU to reduce GHG in 2050, e.g. by combining the available bottom-up MACC data for each member state. This MACC would then contain elements for all the different measures available in all MS. To determine Europe´s cost optimal package, we would need to select the measures to the left side of the cut-off point for the required abatement level (currently set at 80-95%). Sorting by category of measure, the result could automatically lead to the optimal balance between demand side measures and supply side measures, and would also allow to differentiate these between MS.

Costs and potentials for measures differ substantially between MS[2]. Marginal costs for measures can increase rapidly along the MACC, especially when nearing maximum potentials. For some MS, abatement from either supply or demand measures may run into higher marginal costs at lower contributions than for others. Therefore, the resulting split could lead to important differences between countries, with e.g. some countries having a higher share in demand side measures, and others having a bigger share in supply side measures. Also the overall contributions between countries could differ substantially. Already e.g. the EU database on countries' cost-effective energy efficiency potentials shows that there are vast differences between countries [Fraunhofer, 2009]. This feeds the idea that it would be cost optimal when some countries would contribute more (in terms of energy efficiency improvements) to the total EU strategy than others.

In theory, a cost optimal strategy should work towards achieving the long term optimal package of measures across the EU, regardless of their geographical distribution. Targets that lead to deviation from the optimum balance, may result in rapidly rising marginal costs and can lead to significant additional costs. This is valid for the EU target system as a whole, and may even be relatively more pronounced in individual MS. However, the distribution of MS contributions in physical terms leads to associated distribution of costs. The physical distribution of targets thus impacts the nationally differentiated economic carrying capacities and opportunities differently.

For the targets on GHG reduction and renewable energy in 2020, aspects of costs, potentials, and economic carrying capacity have been taken into account, amongst other considerations, in the political negotiations, which has led to nationally differentiated targets. For demand reduction however, no such differentiation has been implemented so far. For 2020, each member state's indicative (non-binding) energy efficiency target (EED art. 3) is set at 20% below its demand projected for 2020; if the same approach is taken for the 2030 targets, this means countries' indicative energy demand for 2030 would be set at 27% below their projected 2030 values. All MS also have a uniform obligation under EED article 7. Given the different shapes of MACCs between MS, a uniform target is bound to lead to varying cost levels incurred to meet these targets. The lack of consistently calculated cost data on member state level [Gerdes et al. 2016] hampers comparison of the required efforts between MS, and it also obscures a view on the extent to which the national

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1 MACCs serve as insightful tool to understand the scope of measures, required to achieve a certain emission reduction, and related costs. A wide literature on the concept of MACC exists that we do not aim to reproduce in this paper. Highly simplified, a MACC allows to select a 'cut-off' for a package of measures, including only the cheapest measures adding up to the required emission reduction. All more costly measures would then be excluded, and would only come in play only at further reduction requirements. Unfortunately, practical reality is more complex, as e.g. measures are often interdependent, costs may be subject to learning effects, and low-cost potentials can be restricted by gradual penetration. Still, interdependencies and penetration restrictions can be modelled in dynamic integrated assessment models, and generalizations allow us to sketch at least the outlines.
2 Note that costs also differ depending on the stakeholder perspective. Optimal choices based on societal MACC may be not optimal from the view of end-users. Amongst others, taxes, subsidies, and different time preferences (discount rates), make costs from a stakeholders perspective deviate from societal costs. This paper however discusses cost-optimization from a societal perspective. It is up to MS to take account of the end-users interests, and choose appropriate policy instruments accordingly.

efforts actually match an optimal approach to the overall energy and climate targets on EU level. It seems that making available methodologically consistent and correct info on national societal costs for abatement measures could be very beneficial to making well informed decisions and keeping Europe closer to an optimal pathway.

There is and will remain a wide variety of potentials for demand and supply side measures among MS, each with their own history and experiences of (un)successful legislation. Within all uncertainty and variety, MS will likely have the most detailed picture of their most promising opportunities. Nonetheless, MS also vary with respect to their knowledge of saving options and costs, and may sometimes profit from other MS experience. Capturing all variety meaningfully in generic EU legislation seems to require a level of detail beyond the practical. However, an EU policy that disregards this variety and forces the MS into the same framework with limited flexibility seems to be a too crude approach and may lead to higher costs than necessary. Finding the middle ground thus seems the optimal way forward.

Effect of alternative target definitions on target feasibility and associated costs

Further complexity is introduced in the debate through the different scopes and definitions that are being used to discuss the energy efficiency target. The scope and definition of sub-targets may have a pronounced effect on the required measures to be taken, and therewith on incurred costs. In the discussion, there seems to be conceptual confusion on three levels: 1) between energy demand reduction and energy efficiency improvement, 2) in counting measures in terms of primary, final, fossil or renewable energy consumption and 3) in including impacts related to all energy consumption or under certain defined conditions only.

Figure 2 shows the relative effect of measures counted towards various scope definitions[3]. The figure shows that effects of measures towards energy consumption differ importantly depending on their definition, but also that the definitions score differently relatively for various measures. 'Wall insulation' for instance scores equally well on final consumption, primary consumption and fossil fuel consumption, whereas 'electric heat pump' scores well on reducing fossil consumption, but has no final nor primary consumption effect as the amount of heat consumption remains equal and the renewable heat source tapped into is counted towards primary energy. 'Electric cars' on the other hand have a large effect on final energy consumption, but may have only limited effect on primary or fossil consumption, and may not even lead to GHG abatement, depending on the characteristics of power generation.

3 In the figure, we have scaled each measure in such a way that it results in an overall emission reduction effect of one megaton CO_2. We have then indicatively calculated the corresponding values for reduction of primary energy demand, reduction of fossil fuel consumption and reduction of final energy consumption compared to the reference situation (in the Netherlands). Exception to this are the measures ´Electric car´ and ´Electric boiler´, for which abatement impacts towards ETS and non-ETS are in opposite direction. For these measures, we have scaled the measure in such way that it reduces GHG emissions in the non-ETS sector by one megaton.

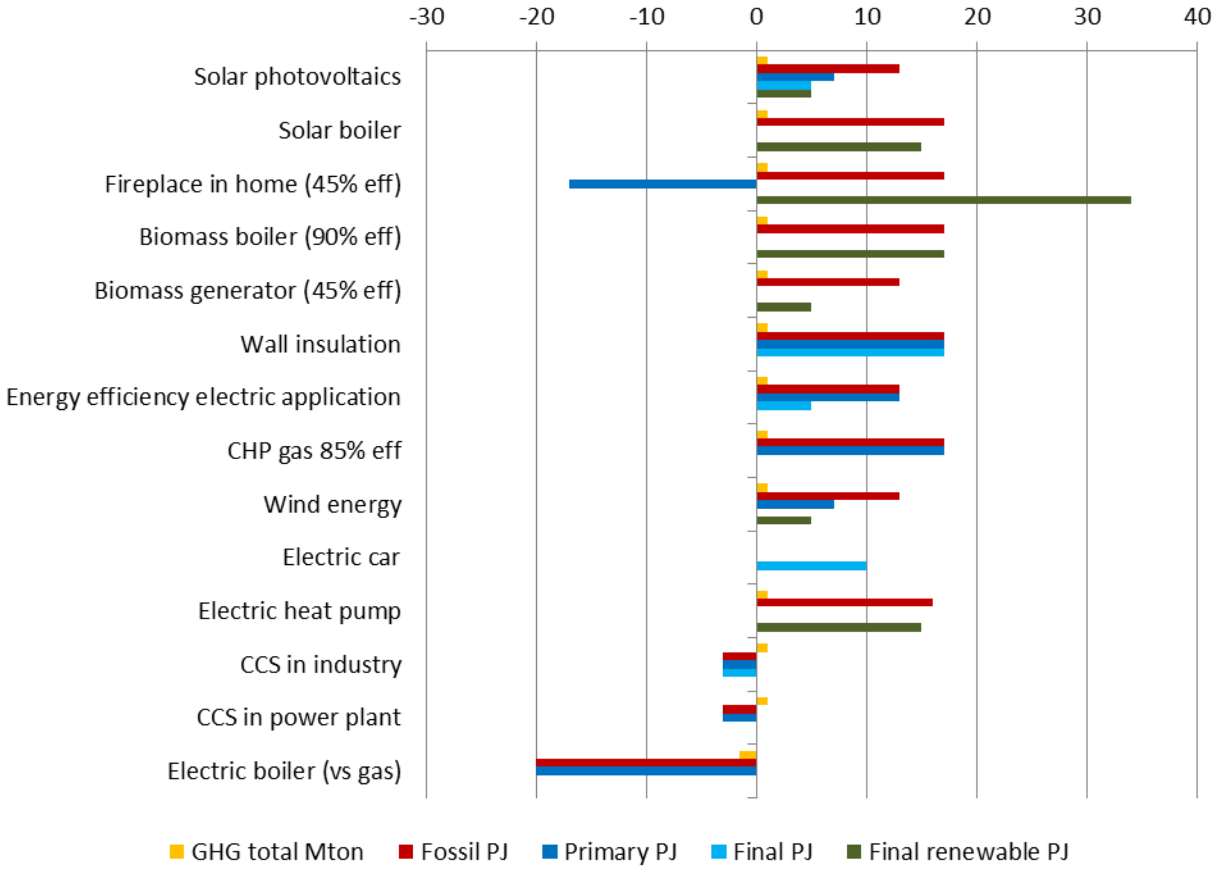

Figure 2. The relative effect of measures counted towards various scope definitions for energy consumption (see footnote 3). Positive values imply effects contributing towards energy demand reduction, overall GHG abatement or additional renewable energy consumed.

Given these relative differences, the prioritization of measures may change depending on the scope definition of a given target. Depending on the target definition, a country may thus opt to select a different set of measures. In fact, the current EED article 7 obligation leads to yet another definition for scoring measures towards energy consumption, looking only at saving effects on final consumption induced by national policies specifically aimed at efficiency improvement. When the prioritization following the definition of a sub-target differs from the prioritization following overall GHG abatement potential, deviation from the cost-optimal abatement path is likely. Moreover, as noted before, abatement measures that are out of scope for the various targets may receive limited policy attention and remain underdeveloped.

The cost effects can be visualized in the MACC. Sub-target definitions put restricting conditions on the eligibility of measures in the MACC, and therewith exclude part of the total GHG abatement potential. The sub-target definition thus alters the resulting cost curve and also the total abatement potential it spans (Figure3). The more measures are excluded, the less maneuverability remains for MS to select options to achieve a given target. Especially when MS have limited potential (left) that fits the scope definition, high costs may be incurred specifically to meet the particular sub-target.

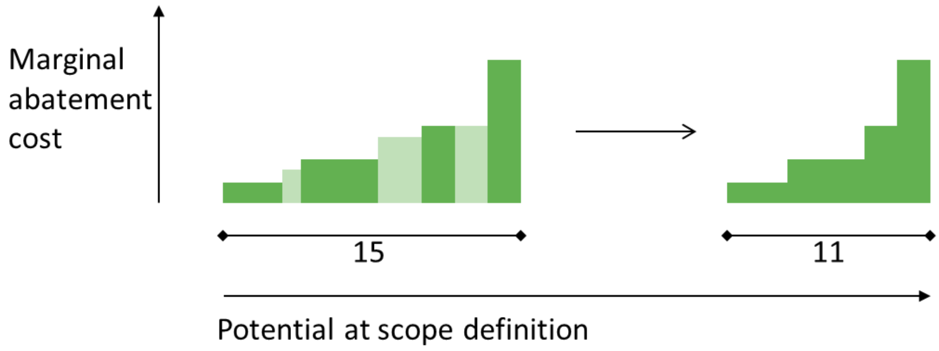

Figure 3. Scope definitions may restrict eligibility of abatement potential, possibly leading to lower effect or higher costs.

This effect may be expected to be relatively minor still for the 2020 targets, given that most countries are in the early stages of the energy transition; potentials will likely still be available at reasonable cost in most MS irrespectively of definition issues. However, results of a study to support the Dutch government show that for the Netherlands, the effect can already be pronounced for the 2030 targets [Daniëls and Koelemeijer, 2014].

It thus seems prudent to take into account the effects on costs when discussing the definition of targets. Some definitions may align better with the overall target than others, while possibly pursuing the intended goal just as well. This notion is also relevant for national governments negotiating on targets, since the costs incurred by a country to comply with a given target can vary considerably with different definitions. In earlier negotiations, the level of the targets has sometimes been agreed already before its scope was actually determined, which can lead to unpleasant surprises.

In order to distribute responsibilities and steer the needed developments across the EU, defining targets at MS level and mandating them to meet specific conditions makes sense to a certain extent. However, an approach that is inflexible, takes limited account of long term needs and takes little notion of specific circumstances in MS, runs the risk of mismatching the targets and possibilities at MS level, with unintended effects on costs. A governance structure that allows more flexibility for MS to divert their effort in line with national circumstances and opportunities, while retaining the possibility for the EU to monitor progress and safeguard developments when needed could avoid such a situation.

Matching governance levels for targets and instrumentation

Besides the cost-effectiveness of various measures and their potential in theory, costs are also determined by the effectiveness to unlock these potentials by the policy regime. Currently, a patchwork of policies and targets governs the energy and climate domain in the EU, with responsibilities and obligations set at various levels. GHG emissions from some sectors (ETS) are regulated at the EU level, whereas instrumentation of the remaining emissions is a national responsibility. The competence to regulate energy consumption – highly related to GHG emissions - is split as well, but in a different way. Generally, energy is a MS competence, except where it touches the EU internal market. This division has resulted in various instruments, targets and obligations to govern similar or at least interdependent processes.

Where the target and policy levels do not match, another risk for inefficiencies exists, because policy makers are more likely to prioritize the goals they are responsible for over others. The interdependencies in the energy system, and their correlation with GHG emissions, may lead to interference between instruments. One example is how national RE policies potentially undermine the working of the ETS, which, through lower prices of emission allowances, in turn leads to lower cost-effectiveness of energy efficiency measures in general but also forms a barrier for national instrumentation of energy efficiency policy in ETS sectors. Due to the leakage effect within the EU-ETS, the total EU GHG emissions do not even necessarily change as a result of such national interventions; emissions may simply occur elsewhere or at another time. Another example lays in the different articles of the energy efficiency directive, where national governments have no obligations towards the common article 3 goal, and where EU policy effects are strictly excluded from contributing towards the national obligations under article 7. This situation has led to debates on how to extract national policy effects and prove additionality, and in theory could even increase national reluctance to strengthen European instruments as that could imply less remaining 'national potential'. This governance structure thus rather leads to separation of national policy from European ones, instead of aiming for synergies in achieving the commonly shared goals.

Nonetheless, it is clear that, in certain areas or sectors, generic EU legislation can be very effective, while for others, nationally differentiated approaches are more appropriate. E.g. in source regulations for applications, installations and vehicles, EU legislation is optimal, as it would be inefficient (not to mention tedious and unworkable for manufacturers) to operationalize such legislation individually per member state and distort the internal market. At the same time, for e.g. building standards, it makes most sense to determine policies nationally, due to nationally differentiated building stocks, spatial patterns and climate conditions. Similarly, policies addressing energy consumption through behavioral change would need a different approach in different cultures and may thus best be nationally differentiated as well. Based on the above, it seems there is room for improvement by making optimal use of the strengths at each policy level, while avoiding the pitfalls of conflicting incentives.

Ideally, the various instruments at EU or MS level reinforce each other and work in synergy towards the relevant targets, which currently is not always the case. A successful governance structure could offer an approach in which MS can tune their national efforts optimally to national circumstances and that at the same time allows national governments to build effectively upon European instruments. To be successful, this structure should include setting national commitments for a wide range of signpost-indicators, to steer the common European developments and also cover when and how European instruments may be formulated to optimally match national efforts. In this strategy, the EU could retain a role of supervisor and guardian of European progress overall, and as the negotiation platform for the distribution of MS efforts. Possibly, such a strategy could be implemented as part of the current EU Energy Union initiative.

Summarizing conclusion: Towards a new governance regime for the EU's energy and climate targets

In the preceding analysis, we have identified five elements in the current EU target setting approach that potentially lead away from a cost optimal energy and climate strategy:

1) The independent and fixed targets do not offer sufficient flexibility to deal with the large uncertainties that surround future developments and needs.
2) The current approach for determining intermediate sub-targets seems to be based on the costs related to achieving the intermediate GHG target rather than the requirements to achieve the long term goals of deep decarbonisation and security of supply.
3) MS differences with regard to costs and potentials are not reflected in the EE target setting strategy.
4) Scope definitions unnecessarily restrict the eligibility of potential measures.
5) A mismatch seems to exist in the governance structure between targets and instrumentation level.

We suggest that these elements could be addressed in an adapted framework for energy and climate policy that allows more flexibility for national differentiation of measures and adjusting to unexpected developments. Moreover the plans should already fully describe the expectations for the period towards deep decarbonisation in 2050 for a wide set of indicators, even if future developments are yet largely uncertain and policy delivery non-binding. Finally, the system should provide MS sufficient autonomy to optimally guide their nationally optimal measures towards a low carbon economy with limited dependence on foreign energy sources, while retaining an EU role for coordinating the overall pathway and setting overarching instruments to optimally match national efforts.

A system in which MS commit to a certain total obligation to be divided over a set of signpost indicators could potentially offer the required flexibility while retaining MS accountability. In such a system, MS can optimally cater to their specific circumstances and remain close to an optimal pathway for deep decarbonisation. The EU could retain a coordinative role for the overall pathway, e.g. through periodical stocktaking of current and expected progress towards nationally determined energy and climate pathways based on the indicators and making sure the various MS plans actually fit together to commonly achieve for the EU 2050 ambitions. Where relevant, flexibility mechanisms to stimulate optimal transnational cooperation could play a role.

In this framework, any intermediate target should be aligned with the long term targets in such a way that it forms an optimal waypoint towards achieving the measures needed in the long run. For this reason, targets should ideally be defined in such a way that they remain closest to their functional goals. To be successful, this approach should get MS to submit national energy and climate action plans that report developments, measures and effects transparently, ex-ante and ex-post, using comparable methodologies and definitions, so that overall progress towards various indicators can be objectified. To be fully effective, a governance structure should also cover when and how European instruments may be formulated to optimally match national efforts. This latter aspect may not need to differ much from the existing arrangements, except that such regulation should be implemented to facilitate achieving the mutually agreed MS commitments and should not lead to additional restrictions or requirements at MS level. Obviously, an adequate mechanism for renegotiation and adjustments may not be missing in such comprehensive long term strategy.

Coincidentally, the governance regime to be proposed through the Energy Union initiative offers a great opportunity to lay the foundations for the above framework.

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