On the design of an EU climate and energy policy framework for 2030

with special reference to renewable energy

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Abstract

This report assesses some key instruments for EU climate and energy policies towards 2030 with special regard for dedicated stimulation of the share of renewable energy in the EU's energy mix. The paper reflects among others on the question which headline targets and instruments would enable effective climate policy, whilst serving the three so-called trilemma pillars of energy policy well. Key question on headline targets is whether a binding GHG emissions reduction target for 2030 suffices or, alternatively, that it is to be complemented with other headline targets with special reference to the uptake of renewables. Having considered the general 2030 climate and energy policy framework, it takes a closer look at options for post-2020 renewable energy policy making in the EU. Note that the first four chapters were drafted before the Commission published its proposed package on 22 January 2014, whilst chapter 5 discusses the latter package.

Contents

List of acronyms and abbreviations

ACER	Agency for the Co-operation of Energy Regulators
boe	Barrel of oil equivalent
CDM	Clean Development Mechanism
CEER	Council of European Energy Regulators
CHP	Combined Heat and Power
CSP	Concentrated solar power
EE	Energy efficiency
EED	Energy Efficiency Directive (Directive 2012/27/EU)
ENTSO-E	European Network for Transmission System Operators for Electricity
ESCO	Energy service company
ETS	EU emissions trading scheme
EU	European Union
EUA	European Union allowance; the right to emit 1 t CO_2 under the EU ETS
GHG	Greenhouse gases
Gt CO_2-eq.	Giga (10^9) tonnes of CO_2 equivalent GHG emissions
MENA	Middle East and North Africa
MS	Member State(s)
NSCOGI	North Seas Countries' Offshore Grid Initiative
pa	Per annum
ppm	Parts per million
PV	Photovoltaics
RD&D	Research, development and demonstration
RES	Renewable energy sources
RES-E	Renewable electricity; electricity generated from renewable sources
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade organisation

Summary

On January 22 2014, the European Commission published its proposed components for the 2030 climate and energy package. This paper addresses some key instruments for EU climate and energy policies towards 2030 with special regard for dedicated stimulation of the share of renewable energy in the EU's energy mix. We conclude that a credible EU wide carbon price signal is needed for effective climate change policy and that the proposed ETS reserve mechanism insufficiently contributes to this requirement. We have two recommendations to improve the ETS. Moreover, we suggest to improve the robustness of the EU internal climate policy, dedicated renewables and energy efficiency policies and measures are necessary.

The overriding objective of EU climate change policy is to prevent a human-induced mean global temperature rise exceeding 2^0 Celsius. This warrants effective EU internal and, what's more, effective EU external climate change policy. The key enabling pre-condition to make this happen is to establish a credible EU-wide carbon price signal: this gives a statement of the political determination to internalise, at least a major part of, the climate change externality. Furthermore, it will improve the business case for low carbon investments. Besides, it enables a more assertive external climate change policy; in principle, given the importance of the EU block in world trade a carbon import duty can be a potent instrument.

For now, an EU-wide carbon tax does not turn out to be political feasible. Yet a lot of political capital has been spent to introduce the EU ETS as a second-best solution for EU-wide coverage of the ETS sectors. As such the establishment of the ETS is a major accomplishment. Yet the travails of the EU allowance price during the first two trading periods and the beginning of the third one, attest to the urgent need to introduce fundamental reforms to the ETS design.

A reformed ETS design will have to allow *inter alia* automatic *ex post* public interventions in the supply of allowances, based on transparent pre-set rules. The adjective 'automatic' alludes to the feature that these interventions will not be subject to discrete ex post decision-making, prone to lobbying by special interest groups. To that effect, the Commission proposes the introduction of a market stability reserve mechanism with certain automatic triggers when among others the number of

allowances in circulation moves outside the 400 – 833 million allowances interval. This mechanism does not imply interventions in the total number of allowances. Typically, when EU GDP growth over several years will be lower (higher) than anticipated, the stock of allowances accumulated in the reserves mechanism will grow (shrink) over time with an upward (downward) pressure on the carbon (EU allowance) price. Hence, starting out from a zero stock of allowances, the mechanism is poised to reduce carbon price instability and initially raise the carbon price to some extent. However, the carbon price trajectory over time remains surrounded by large uncertainty. Hence the proposed reserves mechanism would seem to provide insufficient credibility improvement.

This paper suggests to consider automatic price-triggers based on a pre-set price floor and price ceiling, gradually rising over time. Such price triggers will provide a credible price signal and, at the same time, reduce negative carbon price versus renewables and energy efficiency policy interactions. Moreover, the administrative (cost) feasibility of expanding the coverage of the ETS to retail energy consumption should be considered.

Both RES penetration and enhanced energy efficiency reduce the import dependency of the fossil fuels importing Union. In 2012 the value of the EU's energy imports reached a level of €545 billion, i.e. 4.3% of the EU's GDP or €1090 per EU-27 citizen. €420 billion is the oil and €65 billion the gas import bill. Through reduction of the energy import bill and expansion of 'sunrise' industrial activity, cost-effective RES and EE stimulation contributes immediately to income and employment growth in the Union. This is amplified indirectly by the positive effect thereof on the Union's terms of trade.

Across the EU, fast cost-effective convergence and, at least partial (regionally and/or technology-specific) harmonisation of RES-E support schemes are needed. Except for small-scale generating installations, support schemes need to require renewable generating technologies to compete on the commodity market and assume balancing responsibility. At the same time, regulatory reforms of power market design and network arrangements are in order, levelling the playing field for renewable and other distributed operators in power, balancing and ancillary markets.

The calibration of the RES target might need to be adjusted after detailed further review. The Impact Assessment information provided so far is insufficient for gauging the affordability of the 27% RES target under scenarios including distinct options for ETS reforms.

1 Introduction

1.1 Background

Since long, the three 'trilemma' pillars of EU energy policy are:

1. Competitive energy prices and affordable energy costs.
2. Impact on the environment with special reference to greenhouse gas emissions.
3. Security of energy supply.

As for the second pillar, notably since the Kyoto Protocol agreement was adopted on 11 December 1997, European policy makers have tended to accord high priority to GHG emissions reduction.

In June 2009 the climate and energy policy package was adopted following agreement by the European Council in March 2007 on the so-called 20-20-20 targets. The 20-20-20 targets are:

- 20% GHG emissions reduction in the EU by 2020 with respect to the corresponding emissions level in 1990 (binding target).
- 20% share of energy from renewable energy sources in total final energy consumption in the EU, with differentiated corresponding targets for the EU Member States (binding targets).
- 20% energy efficiency improvement: gross domestic energy use in year 2020 is to be 20% less than the level projected for 2020 by a 2007 PRIMES baseline scenario with 2005 as the base year (indicative targets).

Currently, the issue of energy-related targets beyond 2020 is fiercely debated.[1] The debate unfolds against the backdrop of a quite ambitious but – at least so far – indicative long-term CO_2 target for the EU, i.e. -80-95% in 2050 compared to 1990 levels. This indicative target has been suggested by the European Commission and was reconfirmed by the European Council in February 2011.

1 See e.g.: EurActiv article: Big EU guns fire for 'crucial' 2030 renewable targets.7 January 2014

At the same time a severe economic crisis is hitting Europe with very little public money available for implementation of new, and intensification of existing, policy measures. The severe economic downturn puts a quite high premium on budget allocations for new, radical climate and energy measures, whilst notably as a result of the on-going economic recession higher taxation and surcharges on energy meet with rising resistance within European societies.

As 2020 is approaching, for making sound investment decisions, the European business sector and civil society are in urgent need of certainty about the regulatory environment beyond 2020. This goes especially for long-term investments in energy conversion plants, other energy-using capital goods, buildings, transportation means and energy-using durable consumer goods. Adequate, clear-cut and well-coordinated investment framework conditions throughout Europe will render the European economy and its energy sector more socioeconomically efficient, secure and sustainable.

At the same time, several targets are contemplated for implementation post-2020 with relevance for the climate and energy policy domains. The debate focuses especially on possible post-2020 targets for GHG emissions, the share of renewables in the energy mix, and energy efficiency against a counterfactual baseline for energy consumption.

1.2 Objective and main topics covered

This report assesses some key instruments of the EU climate and energy policy package in the next decade towards year 2030 with special regard for dedicated stimulation of the share of renewable energy. It seeks to outline possibilities for enhancing effectiveness and cost efficiency of the 2030 package, with special reference to renewable energy policy.

In spring 2013 the European Commission has launched a Green Paper summarizing the main issues to be addressed in designing a 2030 framework for climate and energy policies (European Commission, 2013a). This discussion paper addresses several topical issues related to the ones raised in the Green Paper, among which notably:

- Some key lessons learnt from implementing the 2020 framework.
- Raising confidence of investors in low carbon technology under changing economic conditions.
- The choice of targets towards 2030.
- Reducing negative policy interactions.
- Enhancing the effectiveness of the EU's external climate policy.
- Boosting the cost-effectiveness of RES deployment stimulation.
- Enhancing compatibility of RES deployment stimulation with the requirements of the internal market, whilst making allowance for technology- and MS-specific needs.
- Cost-effective integration of fluctuating renewables (wind, PV).

This paper concludes with a succinct review of the package the Commission proposed on 22 January last.

1.3 Outline

The paper is organised as follows. In Chapter 2 a review is made of some potential main directions for post-2020 EU internal and external climate policy. Apart from direct climate policy measures to limit GHG emissions, the need for distinct, dedicated targets for the strongly related areas of renewable energy and energy efficiency is assessed in Chapter 3. Chapter 4 takes a closer look at renewable energy policy. In Chapter 5 a brief overview is presented of the 2030 framework package as proposed by the Commission on 22 January 2014, followed by a discussion of this package on key aspects.

2

EU climate policy targets and instruments towards 2030

2.1 Introduction

In recent documents that seek to set the stage for formulation of post-2020 energy and environment policy making, the Commission gives high priority to limiting GHG emissions (European Commission, 2011b and 2011e). This is done in a bid to keep (human-induced) climate change below 2°C compared to pre-industrial levels (e.g. European Commission, 2011b). The sheer nature of the climate issue suggests that the effectiveness of climate policy by the EU and/or its Member States has to be looked upon from a global perspective. This chapter takes stock of the main options for EU climate policy targets and instruments in the next decennium. The key question to be addressed is how the effectiveness of EU climate policy in mitigating global GHG emissions can be improved. Both the internal and external dimension of European climate policy is considered. Note that this chapter was written before 22 January 2014. The 2030 framework package proposed by the Commission on this date is passing the revue in the final chapter of this report.

This chapter starts with taking a brief view at global and EU GHG emissions trends. Some key aspects of the internal and external dimensions of EU climate change policy are addressed in Sections 2.3 and 2.4 respectively. Section 2.5 winds up this chapter with conclusions.

2.2 Global and EU GHG emissions

Global GHG emissions totalled 38.2 Gt CO_2eq.[2][3] and 50.1 Gt CO_2eq. in 1990 and 2010 respectively. Climate modelling still yields results subject to wide uncertainty. To date, climate modelling suggests that in order to meet the aforementioned climate change target global emissions should not exceed 44 Gt CO_2eq. and 17 Gt CO_2eq. in the years 2020 and 2050 respectively. Compared to business-as-usual emissions of 56 Gt CO_2eq. this would leave an emissions gap of about 12 Gt CO_2eq. in the year 2020 (UNEP, 2011). The underlying policy challenge is daunting. It is certainly a necessary condition that the EU is leading by example. But this condition is not sufficient to keep human-induced climate change in check. In 2010 the EU contributed 4.0 Gt CO_2eq. that is 8.1 % to global GHG emissions. Under baseline trends the already low EU share in global GHG emissions are set to shrink to a few percentage points only. If the stated non-binding EU objective of reducing GHG emissions by 80 to 95% by 2050 compared to 1990 levels will be achieved, the EU's share in global emissions will become quite marginal indeed. Hence, engagement of the EU s' trade partners –especially China and the U.S., being the world's largest GHG emitters –is all the more essential for achieving EU's ultimate climate policy objective to limit human-induced average global temperature rise to 2^0C.[4]

2.3 Internal climate change policy

So far, by global standards, the EU and its Member States have pursued a fairly stringent and effective internal climate change policy at significant costs. Under the Kyoto Protocol, the countries that were EU members before 2004 (EU-15) were committed in aggregate to an 8% reduction in average annual in-lands GHG emissions by the years 2008-2012 compared to their total emissions in the year 1990. Interim emissions statistics indicate that the EU-27 has achieved this target. Both the on-going economic downturn and implementation of dedicated policy instruments have contributed to this remarkable development. Moreover, the EU legally committed itself unilaterally to a reduction target of at least 20% by year 2020 compared to the EU's GHG emissions in the year 1990. Hereafter two possible major components of internal climate policy post-2020 are considered: the EU ETS and introduction of a carbon tax.[5]

2 Giga (10^9) tonnes of CO_2 equivalent.

3 http://edgar.jrc.ec.europa.eu/overview.php.

4 The PBL/JRC publication (Olivier et al., 2012), indicates that in year 2011 per capita CO2 emissions in China have reached 7.2 tonnes/cap, i.e. almost the same level as in the EU (7.5 tonnes/cap).

5 Carbon capture and storage (CCS) will not be considered in this report. Recently major technology acceptance problems have emerged, seriously hampering the role-out of CCS. Moreover, application by fossil power plants of this technology comes at high GHG reduction costs. This application worsens potential fossil fuel supply constraints on account of the energy penalty this application implies. The other way around, its high GHG reduction costs are prone to rise if and when fossil fuel supply constraints become stronger. On the other hand, technology learning may counteract in reducing these costs.

2.3.1 The ETS

So far, the ETS has not been working to full satisfaction. Following the (NO_x and SO_2) emissions trading schemes under the US Clean Air Act, the EU ETS directive is primarily targeted at a pre-set declining aggregate emissions cap by obligated participants. In the case of the ETS the tare is pre-set in principle up to 2050. Hence, the cap (the targeted total volume of emissions per period by all ETS participants) determines the supply of emissions allowances in a rather rigid way over quite a long period of time. The demand for allowances depends especially on macro-economic developments and effects of interacting policies. Fixed supply and fluctuating demand makes for a very volatile carbon price. Indeed, the overriding weakness in its current performance is the high volatility and the low level of the carbon (EUA) price for most of the time. The on-going weakness of the EU economy depresses the business of many ETS participants, reduces the volume of their output, their energy requirements and hence their GHG emissions. Moreover, policy intensification regarding, among others, renewables deployment and energy efficiency improvement negatively affects the demand for fossil fuels and consequential GHG emissions.

As a result the demand for EUA in the present (third) trading period is much less than expected and consequently the EUA price is rather weak, currently hovering around 5 euro per allowance. Many economists state that this is no problem as long as the quantitative emissions reduction target is met; the price mechanism is deemed by them to be the optimal allocation mechanism, ensuring that the environmental goal will be achieved at lowest costs. However, the question is to what extent EU ETS reduction targets in isolation contribute to the ultimate goal to prevent dangerous human-induced climate change. Under the present circumstances (oversupply of allowances), the ETS is unable to assume one of the key roles it was meant to play, i.e. to stimulate ETS obligated parties and other economic actors to undertake cost-effective investment in carbon reduction and low carbon technology. The low allowance price level to date is poised to lock in carbon-intensive technology and infrastructures. With inertia caused by investment cycles of often several decades duration this will render attainment of the envisaged low carbon economy by 2050 appreciably more difficult to achieve. Furthermore, under the present ETS design the carbon price is very volatile, implying uncertain cash flows for recovering initial investments in low carbon projects. This raises the cost of capital and thus the hurdle to scale for low carbon investments. Besides, a clear carbon price signal gives evidence on the credibility of the economy-wide effort the EU is making towards a low carbon Union. This can be quite supportive to the EU's external climate change policy.

The ETS is also prone to some implementation weaknesses. These include system liability to VAT fraud, irregularities with emissions monitoring, the fact that buyers instead of sellers are liable for the validity of international credits (Tol, 2013). Moreover, it is claimed that several Member States have engaged in protecting their respective industrial companies involved in the ETS (Clò and Vendramin, 2012). Pending structural reforms, after a tense and protracted debate a draft amendment of the EU ETS

Auctioning Regulation on back-loading has been politically agreed upon on 8 January 2014 to sup-port the carbon price in an ad hoc temporary fashion.[6]

Presuming the ETS is to be continued post-2020, a major issue will be what kind of structural reforms to implement to improve its functioning. For fostering investment in low carbon technology, a selection among the following structural measures might be considered[7]:

1. Increasing the EU reduction target to 30% in 2020.
2. Retiring a substantial amount of phase 3 allowances on a permanent basis.
3. Early revision of the annual linear reduction factor. To date, an annual reduction factor to the aggregate emissions cap applies of 1.74%, up to 2050 in principle. The EU ETS directive foresees a review of the linear factor applicable as from 2020. It could be considered to advance this review for earlier application.
4. Extending the scope of the EU ETS to other sectors.
5. Limit access to international credits. More stringent limitations to conversion of CER and ERU credits into EU ETS emissions allowances: see Section 2.4.1 below.
6. Discretionary price management mechanisms: ex post market interventions to maintain pre-set moving price floors and price ceilings in accordance with transparent pre-set rules.

Options for measures to be added to the ones listed by the Commission include:

7. Shortening trading periods to some 4 or 5 years. Compared to the current trading period lasting 8 years, this would enable more frequent updating of ex ante target setting in the light of actual economic conditions and developments in interacting policy areas.
8. Reducing/ phasing out the allocation of free allowances to energy-intensive industry to the extent that their competitiveness in the internal market will not be significantly adversely affected: see Section 2.4.2 below.

A full review of these options is beyond the scope of this report.[8] Yet it is in order to establish the most essential lesson to be learnt from the current performance of the ETS. With a view to the overarching consideration to prevent catastrophic climate change, ultimately global GHG emissions should be contained. This warrants a strong carbon price signal to producers, product and production process innovators and consumers world-wide to stimulate low-carbon production and consumption patterns. A credible carbon price signal within the EU is an essential initial step towards that end. This, in turn, will not only signal to actors within the EU territory to reduce GHG emissions. It will also enable improved effectiveness of the EU's external climate policy as will be discussed below. There is a need for flexibility and resilience to be able to adapt to different circumstances, such as macroeconomic shocks. These could take the form of provisions in a reformed ETS for supply-side flexibility (Marcu and Egenhofer, 2014).

6 *Back-loading* refers to interventions to delay (part of) the planned auctions earlier on in a trading period to later dates within the same trading period without altering the total volume of allowances issued during the trading period concerned. The agreed draft amendment implies in total 900,000 allowances less will be auctioned in 2014, 2015 and 2016 while the volumes in the years 2019 and 2020 go up so as to leave the total volume of allowances auctioned during 2013-2020 unchanged. Implementation of the backloading measure can raise the carbon price at least temporarily. A sustained firming of the carbon price to much higher levels than to date depends on implementation of structural ETS reforms.

7 See (European Commission, 2012d).

8 See e.g. (Verdonk et al, 2013).

Accepting that ex post interventions are needed to adjust the supply of EUA to ensure a credible carbon price signal, this could take the following form. In the preceding year, for each trading period the final yearly linear annual reduction factor and a gradually rising bandwidth for the EUA price will be determined. The European Commission or rather a new ETS authority with a more independent 'technocratic' mandate will be in charge of this task, based on stakeholder consultations and a thorough own impact assessment. Automatic price-based triggers will then enable ex post interventions to prevent the carbon price from moving outside a bandwidth of a pre-set price floor and price ceiling, both rising gradually and in tandem over time. The key parameter choices before each trading period will be the time trajectory of the middle bandwidth value and the maximum deviation therefrom before a market intervention is triggered. The maximum deviation could either be set as an absolute value or as a percentage value of the middle bandwidth value. The values would have to be determined after consultations informed by detailed modelling.

The reforms as outlined above would transform the ETS from a pure quantity-based instrument into a hybrid quantity-price instrument. According to Weitzman (1974), when the marginal costs of supplying a certain 'good' (e.g. GHG emission reduction) are uncertain, using a price instrument is more efficient than a quantity instrument provided that the marginal benefits of that good are relatively flat compared with the marginal costs and *vice versa*. Indeed the stock of GHG in the atmosphere might not be very sensitive in the short to medium term for variations in the ETS cap[9], which would indicate a fairly flat negative slope of marginal benefit. Conversely, delaying GHG reduction is poised to steeply raise the marginal costs of achieving a certain ambitious long-term GHG target, considered as necessary to deal with the overarching problem of climate change. These conditions suggest that a pure price instrument (a carbon tax) is better in principle. But a choice for emissions trading as second-best instrument can be justified for reasons of political feasibility. Even so, a hybrid quantity-price ETS instrument has the advantage to provide a clearer system-wide carbon price signal reducing the cost of capital of investing in low carbon technology. Contingent on the width of the price floor-price ceiling interval, it still offers room to ETS participants with high marginal reduction costs to reduce compliance costs through buying allowances from participants with low marginal reduction costs. The price ceiling acts like a safety valve relaxing the cap when the carbon price would otherwise "go through the roof"; the cap tightens when it would otherwise "sink through the floor". This flexibility in the cap may raise political feasibility. Moreover, the high uncertainties surrounding the determination of marginal GHG reduction costs and benefits as well as the optimal calibration of the cap provides an additional argument in favour of a hybrid ETS (Pizer, 1998).

A second lesson that can be drawn is that, given the uncertainty about the future functioning of the ETS, it is prudent to include strengthening/introducing other climate benign instruments in the EU climate policy strategy, while at the same time seeking to address current weaknesses of the ETS. This is second-best from a static efficiency perspective but key to render the effectiveness of GHG reduction policy more robust.

9 Presuming there is still quite some room for flexibility to choose reduction time profiles, before a 'tipping point' of irreversible climate change processes will be reached.

2.3.2 Taxation on carbon emissions

Introduction of an EU carbon tax is a climate policy instrument, often considered for partial or full replacement of the EU ETS. A key feature of an economy-wide uniform carbon tax is that it affects economic activities within the jurisdiction concerned in a neutral way with respect to their (potential) GHG emissions. As it is applied top-down, taxing producers and, in principle, importers as well, its impact trickles down through the whole economy. In other words, GHG emissions in all sectors are taxed at potentially the same per tCO¬2-eq. rate. Moreover, a uniform carbon tax could also cover activities producing and/or consuming non-energy industrial feedstocks.

In principle, an EU-wide carbon tax is an instrument that could fully allow for climate change externalities of production activities undertaken in the EU. In other words, it could for example fully replace the EU ETS. Note that a carbon tax is a price instrument, whereas the EU ETS is a quantity instrument.[10] The effectiveness of a carbon tax to limit GHG emissions depends on the overall sensitivity of the level of economy-wide economic activity to a carbon tax. From an administrative point of view, a carbon tax can be implemented at much lower deadweight compliance costs than e.g. the EU ETS. The main reason is that much less stakeholders are involved in its implementation[11], while the ones that are do not need to incur staff and trading hardware-cum-software cost for engaging in carbon trading risk management. Moreover, in principle a uniform carbon tax with inclusion of equivalent carbon border adjustments has a neutral economy-wide impact on emitters of carbon (Clò and Vendramin, 2012).[12]

It is important to realise that an EU-wide carbon tax does not necessarily have to replace the EU emissions trading scheme altogether. A moderate harmonised or at least minimum carbon tax in the Member States can be implemented in conjunction with a reasonably ambitious EU ETS. In the face of strong political opposition against a common (minimum) carbon tax, only a quite modest rate might be politically feasible in the short to medium term. Evidently, a combined implementation would imply that any targeted bandwidth for the price of allowances, if and when implemented, has to come down correspondingly lower. In the absence of a price bandwidth the cap on emissions by ETS obligated parties would have to be set lower.[13]

The theoretical arguments in favour of a uniform carbon tax instead of the EU-ETS are compelling. This under the proviso that at the same time adequate measures are taken to neutralise negative effects on the competitiveness of industrial producers within the EU, exposed to external competition, i.e. adequate carbon-related border tax adjustments (See Section 2.4.2 below).[14] A reality check learns that the political feasibility of a stringent uniform carbon tax is minimal. Member States are quite reluctant to relinquish subsidiarity in the realm of fiscal issues. Therefore, a second-best approach might be the best way forward in practice. Indeed, in tandem with proper

10 When after structural reform ex post market interventions are to become allowed to ensure the carbon price to remain within a pre-defined bandwidth, the ETS will turn into a mixed quantity-price instrument.

11 Although economy-wide even more stakeholders will be facing its impact.

12 Provided that industry-specific carbon reduction interventions in the EU will be removed at the same time.

13 The calibration of the latter measure is intrinsically more difficult than the former.

14 In their absence, differentiation of (EU-internal) carbon prices are warranted (See Sijm et al., 2013) rendering the introduction of a uniform (minimum) carbon tax more complex.

reform of the EU ETS the highest politically feasible minimum carbon tax rate will further raise the effectiveness of EU internal climate change policy.

In introducing an EU-wide minimum carbon tax it should be ensured that the industrial sectors exposed to external competition also get minimum tax signals to reduce GHG emissions. Upon implementation of adequate carbon-related border tax adjustments the special treatment of the exposed industries should be revoked. This will have to be implemented to level the playing field at least within the EU market–between in-land production of carbon-intensive products and competitive imports. As a result, compliance with WTO requirements is likely to be the case (see Section 2.4.2 below). At the same time, all goods produced and all goods consumed in the EU (included imported goods) will then be facing at least the minimum carbon tax, based on the volume of direct and embedded carbon content (expressed in e.g. tCO2) times the carbon tax (€/tCO2).[15]

2.4 External climate change policy

So far, the EU's external climate change policy has been less successful. The mainstay of EU external climate change policy has been to engage in international climate change negotiations under the auspices of the UNFCCC, aiming to engage negotiation counterparts to accept quantitative emission limits and implement effective policy measures towards such limits. On some scores small 'partial' results were achieved (Oberthur and Groen, 2014), using carrots, such as the CDM (Section 2.4.1) and commitments by the EU to make a large contribution towards the goal, agreed in Copenhagen in 2009, of $US 100 billion climate change related transfers to non-Annex I (developing) countries by 2020. So far, the EU has refrained from using bilateral sticks outside the soft UNFCCC negotiation process to engage crucial trade partners, notably China and the US, such as the introduction of a carbon import duty (See Section 2.4.2). A major pre-condition for exercising the option to use sticks is the presence within the EU of a credible carbon price signal.

2.4.1 Clean Development Mechanism

So far, the EU ETS has by far been the most important driver of the CDM. The key argument for the EU to grant generous incentives to non-Annex I trading partners is to lower the abatement costs for participants of the EU ETS. Moreover, by offering these partners additional revenue opportunities through GHG reducing activities it was hoped to foster more engagement towards a more globalised GHG emissions reduction process. From the EU perspective the CDM is presumed to be a transition instrument towards the establishment of a global GHG reduction regime. So far, evidence of this transition is scanty. Moreover, there are strong indications that a substantial part of the granted CDM credits (called certified emission reductions) have originated by free-

15 Or tCO_2-eq. instead of tCO_2.

riding stakeholders, such as operators of Chinese and Indian HFC-23 reduction projects.[16]

Limiting the access of CDM credits to the EU ETS is considered as one of the measures to improve the functioning of the EU ETS. A measure that could make a (modest) contribution towards that end is to limit the eligibility for converting CDM credits into EUAs. One way to do this would be to limit the origination of eligible CDM credits to countries that are signatory to the UNFCCC with GDP levels below a certain level and possibly also middle-income non-Annex I countries with credible climate change policies in place. Another way is to limit the scope of eligible activities, by e.g. excluding CDM credits from HFC-23, waste incineration and landfill gas projects, as credits to such projects could provide perverse incentives (see footnote 16). Furthermore, it could be considered to impose a more stringent cap on the total amount of CDM credits.

2.4.2 Trade regime instruments

So far, apart from mandatory product standards for energy-using equipment with respect to energy use, no dedicated policies are in place to limit GHG emissions "embodied" in EU imports of intermediate non-energy goods and final consumption goods. In other words, a very large amount of GHG emissions at global level are not accounted for in statistics of EU-induced emissions. Nor are these emissions factored into the prices of imported goods for intermediate use or final consumption in the EU area. The statistical underreporting of EU-induced GHG emissions results in a grossly underestimated carbon footprint of the EU society. What is more, the current discriminatory treatment of EU climate change measures – favouring competing imported commodities from trading partners with soft GHG reduction policies over commodities manufactured in the EU – forecloses a neutral incidence of the carbon reduction burden among apparent consumption of all goods and services in the EU.[17]

The EU has tried in vain to encourage major trade partners to assume meaningful GHG mitigation targets. The Union did so by offering to tighten its overall GHG reduction target for the year 2020 with respect to emissions in the year 1990 to 30% instead of 20%, if major trading partners would adopt meaningful emission limitation targets as well. The Copenhagen climate conference in 2009 resulted in a set of non-binding voluntary commitments by a number of trading partners. The most important one is the commitment by China to reduce the carbon intensity of its economy (tCO2eq. per unit of GDP) in 2020 by 40% to 45% relative to the level in the year 2005. As such, this pledge is a valuable initial sign of commitment by China to enable international climate negotiations making further progress. Yet, its fulfilment brings Chinese emissions hardly, if at all, below baseline emissions that would evolve in the absence of any additional action to comply with this non-binding commitment. Given a continued fast growth of the Chinese economy, even at a gradually decelerating rate, a scenario of a

16 See e.g. the press release of EIA on 18 November 2010: *Massive investment in fake HFC carbon credits spurs Italian sabotage of EU ETS reform*: http://www.eia-international.org/massive-investment-in-fake-hfc-carbon-credits-spurs-italian-sabotage-of-eu-ets-reform-2. Meanwhile such CDM projects have been banned from eligibility to conversion of certified emission rights (CDM credit) into EU allowances.

17 Apparent consumption of a commodity equals domestic production plus imports minus exports of the commodity concerned. Through free allocation of allowances obligated participants of the EU ETS do get partial compensation for the costs of their participation to the EU ETS. Note that the rules and regulations of the EU ETS stipulate a gradual phase-out of free allocations.

baseline emission trend for China would still have a dramatic effect on the world's average temperature.

Evidence on global GHG emissions trends suggests that setting a good example by stringent emission reductions by the EU itself is by far insufficient to achieve the EU's strategic objective of limiting the rise in global average temperature to not more than 2°Celsius above pre-industrial levels. It would seem that expanded use of trade regime instruments has to be considered in order to bring about stronger limitations to future global GHG emissions by targeted trading partners. These would encompass notably two type of measures: (i) more stringent mandatory standards for energy-using products, including imported ones, and (ii) carbon-related border tax adjustments. The second category warrants further explanation.

In principle, a carbon import duty could level the playing field in the internal market with regard to competing imports from countries with lower exposure of their respective industries to GHG reduction measures[18] than is the case with competing EU producers. A carbon import duty seeking to level the playing field in this regard would have to be well-documented before implementation. This is to show beforehand that these carbon-related border tax adjustments are no hidden measure to discriminate against competing imports. Evidently, this warrants the prior establishment of a clear carbon price within the EU. Before the introduction of border trade adjustments, EU producers exposed to external competition will have to be given carbon-related compensations such as free allocations.

A carbon import duty might be considered merely for goods from EU trading partners with a less stringent carbon mitigation regime. In principle, the import duty should be equal to the carbon price in the EU less the carbon price prevailing in the respective jurisdictions of the EU trading partners. Applying this principle is not straightforward. For EU carbon border adjustments to qualify as WTO-compliant the following conditions need to be met (Gros and Egenhofer, 2010 and 2011):

- Full auctioning of EU ETS allowances: no free allowances to participants from exposed industries.
- The embedded carbon content of imports from partners with a lower carbon price needs to be established unambiguously. This warrants the application a credible carbon footprint methodology to imports. Much progress has been made of late in developing such a methodology.[19]
- The implicit/explicit carbon price for each EU trade partners needs to be established. It is a major challenge to design a methodology that will be acceptable in terms of being widely considered to be non-discriminatory between countries. Especially the valuation in terms of implicit carbon pricing of GHG reduction measures, additional to baseline policies is a contentious issue.
- The carbon import duty should be revenue-neutral: tax revenues should be earmarked on world-wide mitigation of the global climate externality, i.e. degradation of a vital exhaustible resource: the capacity of the earth's atmosphere to keep human induced temperature rise within 2 degrees Celsius. In the allocation of the revenues both low carbon technology development/transfer and

[18] Allowing for possible carbon-related rebates when these overseas industries export to the EU.

[19] WTO-compatible measures could be considered to mitigate the negative effect of the internal EU carbon price on the competitiveness of EU carbon-intensive industry in overseas markets, e.g. in the field of RD&D support.

strengthening the capacity of low-income Non-Annex I countries to adopt low carbon development strategies that will be consistent with aspirations towards improving living standards of their respective populations.

- Although not completely clear from WTO regulations, the case to qualify for WTO compliance weakens when EU exporters would receive embedded carbon tax rebates. The reason is that such rebates would be inconsistent with a neutral focus on processes that reduce the pressure on the exhaustible climate resource. This inconsistency from the process-oriented perspective would imply a bias in favour of EU exporters. At the same time, this implies that a proposal in favour of a carbon import duty is set to meet stiff resistance from the conservative part of the EU business sector.

Let us consider the impact of an EU carbon import duty on global emissions. Direct GHG emissions effects result from reduced global demand for the goods directly affected by an EU carbon import duty. Under certain plausible assumptions the world's welfare stands to rise, when allowing for the climate externality (Gros and Egenhofer, 2010 and 2011). Indirect effects may result from induced changes in carbon mitigation regimes in affected exporting countries. It can be expected that, on the one hand, the EU's trading partners are poised to initiate complaint procedures at the World Trade Organisation against the EU for erecting illegal trade barriers and (initially) to strong retaliatory measures targeting selected EU exports. Yet with a proper implementation along directions outlined under the preceding five bullets, the introduction of carbon import duties will in all likelihood turn out to be WTO-compliant. Moreover, so far too little allowance tends to be made for the fact that well ahead of China and the US the EU forms the world's most important trade partner to date. The EU's trade position will slowly recede, but by 2030 the EU will still rank among the three most important trade blocks. This gives the EU significant leverage in trade disputes.

Upon facing an EU carbon import duty, exporters to the EU will be hard-pressed to adjust climate policies (public sector) and production processes (private sector). This way carbon-related tax transfers to the EU customs can be avoided, whilst carbon-reducing innovations are stimulated in the domestic industries of trade partners hit by carbon-related EU border trade adjustments. In a carbon-constrained world such innovation will bring significant comparative advantages, boosting the competitiveness of the domestic economy of EU trade partners in a future-proof way.[20] Moreover, significant co-benefits might be reaped in terms of reduced local air pollution and supply security. This applies notably but not only to China. Therefore, EU carbon-related border tax adjustments may well provide strong price signals to its targeted trading partners to foster low-carbon production technology innovations and to introduce (more and stronger) carbon reduction policy measures within their respective jurisdictions.

Recently atmospheric concentrations of CO_2 have passed the 400 ppm milestone. Given the seriousness of the climate change issue and the shrinking share of global GHG emissions emanating from the EU territory, carbon-related border tax adjustments

20 The argument put forward by China that export duties on, among others, energy-intensive commodities boil down to a relatively high implicit carbon price (Voituriez and Wang, 2011) cannot be taken for granted on two counts: the "pollution haven" argument as the Chinese internal economy still lacks a proper carbon price signal and trade distortions discriminating against importing countries which might even run counter to the WTO regulatory framework.

constitute perhaps the EU's most potent instrument to reduce global GHG emissions. As already stated, exposure of producers within the EU to a credible carbon price signal is a key pre-condition for introduction of carbon-related border tax adjustments.

China forms a case in point. To date, with the value of Chinese exports to the EU topping 300 billion US dollar per annum the EU is the most important destination of Chinese exports and therefore of key importance to the Chinese economy. China is already preparing its economy for de-carbonisation. Whilst still taking a tough stance against adopting GHG emission limitation commitments within the UN FCCC framework, it is on the verge of introducing seven regional emission trading schemes. These schemes are reported to heed lessons learned from the EU ETS experience by introducing carbon price floors and ceilings.[21] China is reported to be planning for the introduction of a national CO_2 reduction scheme before 2020, based on the experience to be gained with seven pilot schemes. Introduction of carbon-related border tax adjustments by the EU might therefore help to speed up China's plans to embrace more robust decarbonisation pathways. And if this proves to be the case indeed, then strategic national reasons of strengthening the Chinese economy rather than mitigating the climate change issue is set to be the main consideration for the Chinese government to do so. Furthermore, the co-benefits for China in terms of local air pollution mitigation and supply security improvement are huge. Moreover, adoption of an acceptable climate change regime from the EU perspective would stop the potentially large carbon import tax transfers from Chinese exporters to the EU. This would be another driver for China towards accepting legally binding carbon mitigation commitments within the UNFCCC negotiation process rather than 'intended nationally determined contributions'.

In assessing the relative performance of climate change policies undertaken by distinct trading partners, due weight is to be given to the marginal GHG abatement costs and additional climate policy measures. For instance, compared to other large trading partners, GHG abatement costs in China have been indicated to be appreciably higher than in OECD countries (Carrero and Massetti, 2012). The assumed cost burden of climate policy measures implemented by a trading partner should be properly acknowledged in determining the implicit carbon price prevailing in the jurisdiction of the trade partner concerned. To date, for China these are appreciably higher than is the case with the US. Also the carbon-reduction measures already taken by China are impressive, although their additionality is not an entirely trivial matter. Such measures include the stimulation of enhanced energy efficiency and low carbon sources of energy (wind, solar, nuclear). All in all, with an EU allowance price hovering around 5 €/tCO2-eq. the current carbon price signal emitted within the EU economy be needs to be substantially enhanced to credibly justify a carbon import tax to be levied on Chinese goods entering the EU.

21 *EurActiv*, 23 July 2012: "*China keen to avoid EU's CO_2 market problems.*"

2.5 Conclusions

Post-2020 EU internal climate policy:

- Given uncertainty about the future functioning of the EU ETS it is prudent to include strengthening/introducing of other climate benign instruments in the EU climate policy strategy, while at the same time seeking to address current weaknesses of the EU ETS through fundamental reform.
- The governance structure of the EU ETS needs to be revamped to enable automatic ex post interventions under strict, ex ante defined rules. One approach to do so could be to prevent the carbon price from moving outside a dynamic bandwidth between a pre-set price floor and price ceiling for EU allowances, gradually rising over time. This will enhance (re-instil the currently shaken) confidence of investors in low carbon technology, improve the resilience of the ETS to macroeconomic shocks, and keep negative interactions with other climate and energy policies and measures in check.
- A carbon tax could be implemented in conjunction with appropriate structural reforms to the EU ETS. This will further increase the credibility of the carbon price signal to producers and consumers alike of goods consumed within the EU. To further improve the effectiveness of internal climate change policy, it is recommended to go for the highest level of EU-wide minimum carbon taxation of fossil fuels that is politically feasible.

Post-2020 EU external climate policy:

- In order to improve the effectiveness of the EU ETS and to reduce free riding, it is recommended to limit the eligibility of the clean development mechanism (CDM).
- Given the seriousness of the climate change issue, the shrinking share of GHG emissions emanating from the EU territory in global GHG emissions and the prominence of the EU in world trade, EU policymakers need to seriously consider the introduction of a more assertive external climate policy. A carbon import tax is poised to constitute a quite potent EU GHG reduction instrument needed to prod crucial trade partners, especially China and the US, to accept legally binding GHG mitigation targets.
- Before introducing this ‘stick’ Europe needs to make its own house in order by way of fundamental reform to establish a credible, predictable carbon price signal. This will, at the same time, substantially reduce the support funding needed to close the cost gap for low carbon technology, deemed eligible to dedicated deployment support.

3

On 2030 EU targets for energy policy domains

3.1 Introduction

Apart from direct climate policy measures to limit GHG emissions, the Commission recommends strong policy efforts by the Member States in the strongly related areas of energy efficiency, renewable energy, and resource efficiency stimulation. This chapter is concerned with possible post-2020 targets regarding the latter policy domains.

Section 3.2 on innovation policy for energy technology sets the stage for the main topic of this chapter. Subsequently Sections 3.3, 3.4 discuss the (de-)merits of possible 2030 EU targets respectively related to the use of renewable sources of energy and energy efficiency. Section 3.5 summarises the main findings of this chapter.

3.2 Innovation policy for energy technology: some key concerns

Energy plays an important role in rendering Europe (i) more cost competitive, (ii) more sustainable, and (iii) more macro-economically robust to energy supply vulnerabilities. Energy innovation policy is to effectively foster the development in Europe and global diffusion of cutting-edge energy technology that makes distinctive contributions towards those three ends. Let us reflect from a socio-economic perspective on what kind of new energy technology is needed and what major avenues are open to foster innovation.

Climate change is a long-term policy issue. Moreover, the future energy technology mix does not change substantially overnight due to long capital turnover periods and path-dependencies. Accordingly, cost competitiveness needs to be considered forward-looking over a longer time frame, at least 40 years ahead, and from a dynamic perspective. From a public perspective, externalities such as environmental impacts, resource scarcities to the extent not (adequately) factored in by market players and supply flexibility characteristics of distinct energy techniques are to be included into the cost equations. The latter is especially relevant with regard to fluctuating renewables as against controllable generation techniques in the power sector (Joskow, 2011). Moreover, the diversification of a distinct generating technique and its value to reducing fuel price risk of a generating portfolio may imply significant externalities (Roques et al, 2008).

Sustainability of energy supply depends on the volume development of energy supply and the footprint of the technology mix. The most sustainable energy techniques have, when applied, the smallest environmental footprint per unit of output energy generated. A unit of output energy saved is to be considered as a negative unit of output energy generated. This can be assessed by estimating the marginal impacts on GHG emissions, polluting emissions, bio diversity and the use of a variety of physical natural resources including fossil fuels, biomass, rare earths, water and land.[22] Goedkoop et al (2009) have developed a single score LCA (life cycle assessment) indicator that goes a long way in this direction. Broadly speaking, energy savings techniques tend to have the most favourable overall environmental footprint while renewable energy techniques also tend to have relatively good overall environmental footprints. However, this needs to be establish on a technique by technique basis. Certain renewable energy techniques may have high marginal requirements of specific natural resources in competition with alternative uses for these resources. For example, wind power generators require rare earths such as neodymium whilst the quality of marginal wind resources tends to diminish along with higher penetration rates (Mortiary and Honnary, 2011).

The socio-economic perspective of cost-reducing innovation is not purely positive science; it also has normative loadings in framing the Public Cause. In this respect, recent work of Geoffrey Hammond and colleagues is worth mentioning (inter alia Hammond et al, 2013). They have undertaken scenario studies on UK “more electric” pathways towards 2050, based on the framing of possible pathways for development of a more sustainable electricity supply to occur within the ‘action space’ defined by the ‘logics’ of government actors, market actors and civil society actors. This approach allows for the analysis of governance interactions between these three types of actors as they seek to ‘enrol’ the others into their own logic. In this characterisation, the market rules logic argues that high-level policy objectives are best achieved with minimal possible interference in market arrangements and vertically-integrated energy companies being the dominant market players. The central coordination logic argues for a dominant role for the direct co-ordination of energy systems by national government actors to deliver energy policy goals, e.g. by allocating dedicated tranches through feed-in policy to specific technologies. The civil society logic (also called ‘thousand flowers logic’) argues that energy systems should meet the needs of citizens, who would in

22 See (Jansen, 2013) for a brief introduction to ‘resource efficiency’, including the categorisation of ‘resources’, and further references.

accordance with this logic take a leading role in the decisions relating to how the energy system operates an evolves. The civil society logic envisions a major role for decentralised generators and flexibly participating power consumers, also the small-scale ones such as notably households. Technological needs and hence technology-specific features in innovation policy design and implementation[23] depend very much on the framing of future technology pathways.

Regarding the design of innovation policy for energy conversion and using technology, some considerations will now be presented that are quite relevant for the subsequent analysis of climate and energy targets (in this chapter) and renewable energy policy (in the next chapter).

- The techno-economic maturity of promising technology is quite relevant. For promising low carbon technology with still appreciable technology risk and a high cost gap to bridge towards commercial maturity the emphasis of public support is to be put on RD&D. Yet even for less mature promising technology, limited[24] stimulation of market deployment is an essential complement to gain feedback from the market by innovating technology providers in steering their innovation efforts on user needs, cost reduction as well as features improving market and system integration.
- Apart from urgent regulatory reform, for improving the integration of fluctuating renewables (wind, solar PV) and supply security at short timescales, accelerated development of innovations in the areas of energy storage and smart grids is essential.
- It would seem less appropriate to apply a common innovation and market deployment approach to all low carbon technology. Nuclear and CCS applied to fossil generation each have their key idiosyncratic drawbacks compared to EE and RES, i.e. residual catastrophic risk (foremost nuclear; to a much lesser extent CO_2 transport and storage) and negative impact on resource efficiency on account of the high energy penalty (CCS). In MS accepting nuclear, nuclear already benefits from the socialisation of damage cost exceeding legally defined levels per catastrophic event. Both nuclear and CCS will benefit from a reformed EU ETS with a credible carbon price signal. Moreover, given its current maturity status CCS needs additional RD&D support without crowding out RD&D funding for promising but immature RES and EE technologies.
- For long-term supply security and geopolitical risk reduction, innovation of technology that substitutes for or reduces the needs for exhaustible resources, notably fossil fuels, is essential. This goes especially for resource-poor regions and countries such as the EU region (Jansen and Seebregts, 2009). The next paragraph provides some more background.

Reducing the fossil fuel import bill, i.e. cost-effective energy efficiency or fuel-substitution, can be an important component of innovation policy. **Table 1** below shows the evolution of the EU's rising fossil fuel import bill. Eurostat figures put the value of EU-27 energy import bill in the year 2012 at €545 billion[25], i.e. 4.3 % of the EU's GDP

[23] E.g in defining the eligibility criteria in RD&D tenders.

[24] In order to control support costs.

[25] See European Commission (forthcoming: p.112). The EU trade deficit in energy products for year 2012 is €421 billion (3.3%). Yet from the perspective of geopolitical risk the import bill and notably the resource rent component of it is more relevant.

(€12,927 billion in 2012) or approximately €1090 per EU-27 inhabitant per year. Of the €545 billion worth of EU energy imports in 2012, *inter alia* € 420 billion is accounted for by oil (and oil products), € 65 billion by natural gas, € 21 billion by solid fuels and € 20 billion by electricity.[26] The shares of Russia and the MENA region in the value of EU energy imports were 30% and 25% respectively. A rough calculation indicates that of the strongly unemployment-raising out-flow of EU domestic financial resources associated with the EU energy imports, in 2012 at least € 286 billion or 52% consists of pure resource rents. [27]

Reduced imports of fossil fuels will mitigate the exposure of the EU to both fuel price risk and geopolitical risk. The large resource rent transfers (international financial flows of resource rents on top of pure fuel extraction, processing and transport costs) are a prime driver of geopolitical tensions. High inflows of resource rent transfers enable a number of countries well-endowed with fossil fuels to tighten destabilising resource nationalism practices and terrorist groups receiving trickling-down funding to step up their activity levels. This observation does not negate the key importance for the EU to aim for good political and trade relations with fossil fuel exporting countries. There is a win-win in assisting oil-and-gas-rich trade partners, should they wish to restructure their economies towards robustness in an increasingly carbon constrained world.

Table 1: The value of EU-27 external energy trade

(€ billions)

Trade value item 1)	2000	2005	2006	2007	2008	2009	2010	2011	2012
Value of EU-27 energy imports	161,1	272,6	339,6	336,4	458,0	298,4	383,5	491,8	545,1
Value of EU-27 energy exports	29,1	45,9	59,0	66,7	85,2	58,9	79,2	101,1	123,7
EU-27 fossil fuel trade balance	-132,0	-226,7	-280,5	-269,7	-372,8	-239,6	-304,3	-390,7	-421,4
1) All items below concern SITC 0.6.									
Source: EUROSTAT									

3.3 Energy efficiency

Raising energy efficiency across energy supply, transmission and distribution, conversion and end-use sectors in a socioeconomically sound way is the foremost point of departure for designing a robust climate and energy package. Performing given levels of activity with less energy at acceptable socio-economic cost can reduce apart from GHG emissions:

- Energy cost for households and businesses.
- The societal exposure to volatile energy prices and geopolitical risk.
- Local air pollutants and effluents.

Especially in the non-ETS buildings and transportation sectors the socio-economic potential for energy savings is high.

26 These figures are based on data extracted from EUROSTAT's data base.

27 Based on the assumption that the resource rent shares as % of the 2012 EU import bill are as follows: oil imports from MENA countries: 75%; oil imports from non-MENA countries; 30%; gas imports: 10%; solid fuel imports 2%, electricity 0%.

One of the three targets featuring in the 2009 climate and energy package is the indicative (non-mandatory) '20% energy efficiency' target. The Commission interprets the EU-wide indicative target as follows. A certain baseline scenario was developed at the request of the Commission in 2007 with year 2005 as base year, making use of the PRIMES model. In this exercise baseline gross domestic energy consumption, exclusive of non-energy industrial uses of fossil fuels and products, has been projected to attain a level of 1842 Mtoe[28] in the year 2020. This is illustrated in a slide produced by the Commission, reproduced in Figure 3.1 below. Additional energy efficiency measures should bring down the corresponding actual value by 20% to 1474 Mtoe. Mid-2011, the Commission presented an updated analysis projecting that without any further energy policy initiatives from that point onwards the corresponding energy level in 2020 would be 1678 Mtoe. This lower level than projected in the earlier baseline scenario can be explained by a combination of higher fossil fuel prices than foreseen earlier, the on-going economic recession and intervening policy measures up to mid-2011. However, this still leaves a 'policy gap' of 204 Mtoe.

This policy gap formed the backdrop against which the Commission made an impact assessment of its draft Energy Efficiency Directive (EED). The Danish presidency of the European Council in the first six months of 2012 made the adoption of the (amended) EED the centrepiece of its efforts. Indeed, in June 2012 a final political agreement could be reached on the adoption of a compromise version. A key component of the adopted EED is the obligation placed on retail suppliers to ensure, on aggregate, 1.5 % energy savings annually among their customers. Retail suppliers are offered certain options to achieve the obligation placed on them in an alternative fashion. Remarkably, retailers of automotive fuels have been exempted from this EED obligation. Other components of the EED include the obligation on central government bodies to refurbish at least 3% of their building stock annually. In the draft EED this obligation was stipulated to rest on the whole public sector. Furthermore, MS can choose an alternative approach for the public sector that delivers the same amount of savings as the 3% refurbishment target.

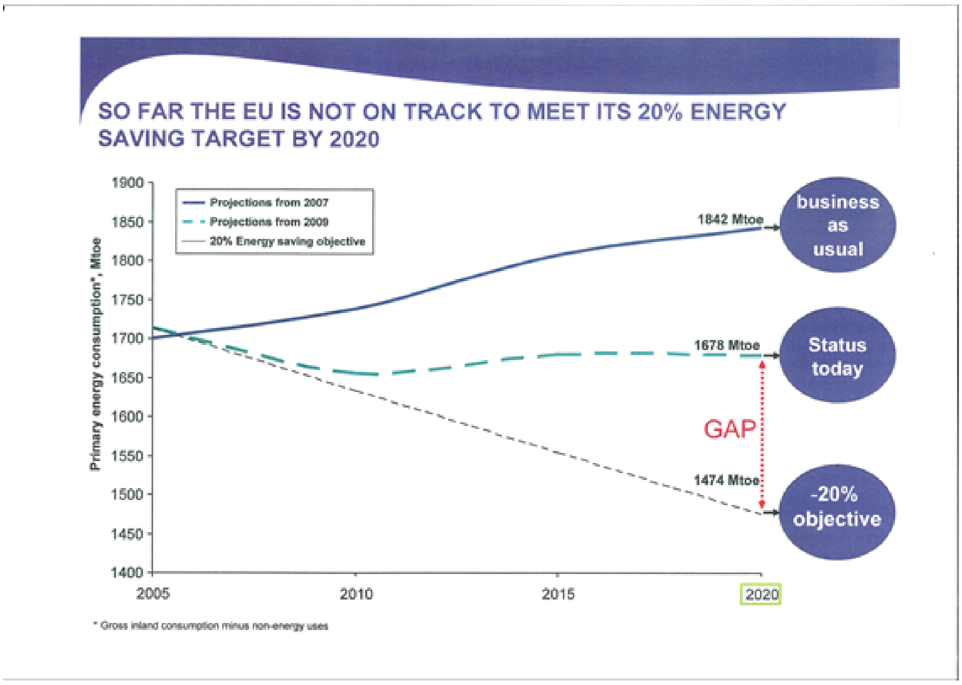
The EU's largest economy and energy consuming Member State, Germany, has adopted very ambitious national energy efficiency targets for the year 2050 and interim reference years in the form of energy consumption targets (Bundesregierung, 2010). The politically agreed German national goals are to reduce domestic gross energy consumption by 50% and domestic electricity consumption by 25% in year 2050 with respect to corresponding levels in year 2008.[29] The pioneering German sustainable energy policies are drawing attention from analysts world-wide. Evidently, the social and economic feasibility of the ambitious German policy goals needs to be proven.[30]

[28] Mtoe stands for million tonnes of oil equivalent. According to Système International it is a non-standard energy unit, proposed by the oil and gas industry. So far, it is also being used by international bodies such as IEA and World Bank as well as, surprisingly, the European Commission.

[29] The corresponding targets for year 2020 are reductions by 20% and 10% respectively.

[30] See *inter alia* (Jansen, 2011a).

Figure 1: Analysis by the European Commission mid-2011 of the 20% energy saving target for target year 2020



Source:http://ec.europa.eu/energy/efficiency/eed/doc/2011_directive/20110622_energy_efficiency_directive_slides_presentation_en.pdf

Cost-effectiveness of saving measures is the most important argument in favour of energy savings. In general there is still a large cost-effective potential but account should be taken of the diversity in circumstances when applying saving measures. It proves that sometimes part of the savings potential is not cost-effectives while on average it does (see Tigchelaar et al, 2011). Therefore, cost-effective savings policy should not always target on 100% penetration of measures but rather be flexible in scope.

From a socioeconomic perspective, the merits for the EU gained by adopting ambitious but realistic, affordable post-2020 indicative energy consumption targets are significant. Curbing energy consumption through a well-designed package of socioeconomically feasible policy measures will yield strongly benign net macro-economic and environmental effects:

- Energy efficiency improvement measures (and, to a lesser extent, renewable energy deployment) are activities with broadly a high domestic resource content. Compared to e.g. fossil fuel refining and distribution, their direct employment multiplier is high. To the extent that EE (and RES) activities substitute fossil fuel related activities and require no or moderate amounts of subsidy, their total employment impact as well as their impact on GDP tend to be quite significant as well. Indeed, the Commission's impact assessment of the implementing the Commission-proposed draft energy efficiency directive indicates for the EU-27 an increased GDP of € 34 billion and an increased net employment of 400,000 person-years in 2020 (European Commission, 2012e and 2011c).

- Their negative impact on the imports of fossil fuels will mitigate the exposure of the EU to both fuel price risk and geopolitical risk. The Commission's impact assessment (European Commission, 2012e and 2011c) indicates a reduction in fuel expenditure per annum in 2020 of about € 38 billion, to which reduced expenditure on imported fuels contribute a large part.
- The increased costs for investment in energy efficiency (on average € 38 billion annually) are partly offset by reduced investment cost in energy generation and distribution (on average € 6 billion annually) (European Commission, 2012e and 2011c).
- Absolute energy consumption targets, set at ambitious but realistic levels, are anti-cyclic in the sense that the marginal costs of such targets are low (high) at economic downturns (booms). Such targets send transparent messages to society that it pays off to monitor energy use and to implement energy-saving innovations whenever financially feasible. They are more transparent than energy efficiency improvement targets against a counterfactual baseline. Denmark has already such policy in place and Germany has formulated such policy for the future. For well-circumscribed highly cyclical industrial branches, e.g. within the basic chemicals and metals industries, or trends beyond national influence (e.g. air transport to/from Malta), a correction mechanism can be added to the absolute national target. For the highly cyclical branches concerned, this could e.g. take the form of branch-specific energy intensity targets.
- Last but not least, among the main effects, both global and local pollutant emissions will be substantially lower. This translates into an appreciably lower contribution by the EU's inhabitants to the unfolding degradation of the earth's atmosphere; consequently, the rise in world-wide average annual temperatures will be lower and many avoided years of life lost as a result of less exposure to pollutant local emissions.

The benign socio-economic effects of a well-designed package of policy measures to achieve a realistically ambitious, indicative energy consumption (energy efficiency) targets are clear. In adopting such targets - when backed up by strong mandatory measures in the framework of related directives, such as the ones on Eco-design, on energy labelling and on energy-efficient CHP - the public sector gives a clear signal to private investors of the objectives of the public sector. Yet certain unforeseen economic circumstances, such as a strong economic recovery or higher than expected population growth (e.g. because of net immigration into the EU) may render mandatory energy consumption targets too inflexible, i.e. only reachable at inhibitive economic welfare loss. Furthermore, the effectiveness of energy-saving measures is often highly contingent on location-specific circumstances. Even in the absence of a mandatory energy efficiency target, regulatory measures such as gradually raising energy efficiency standards - e.g. by way of the eco-design, labelling, buildings, energy services and CHP directives - can make large contributions to raising energy efficiency. Moreover, energy efficiency is fostered by an ambitious mandatory renewables target. When companies wishing to show their corporate social responsibility or local public authorities set renewable targets for their respective domains of responsibility (municipalities, companies), energy-saving measures often rank among the most cost-effective ones to raise the share of renewables in energy demand.

3.4 The market uptake of renewable sources of energy

A key issue in the design of the post-2020 portfolio of EU energy and environmental policies is whether or not dedicated policy to stimulate the uptake of renewable energy in the form of binding RES targets should be continued. Stated more specifically, should there be a 2030 target for the share of RES in the EU energy mix? Several MS governments argue that the EU ETS is best-placed to do the job in meeting Europe's energy and environment agenda regarding a competitive, secure, socially inclusive and low carbon Europe. Their view is strongly supported by some trade associations of large integrated energy companies, energy-intensive and fossil fuels industries, and energy traders. These stakeholders see their prevailing business models jeopardised by the merit order effect exerted by power from fluctuating renewables as well as rising market shares in gross power demand filled by distributed generators, among which retail-level prosumers.

But from a European social perspective, compelling arguments in favour of a realistically ambitious binding RES target obtain, also in the next decade towards target milestone year 2030. Main arguments in favour of including a dedicated RES target in the 2030 climate and energy package under negotiation include:

- Technological dynamics trends. Quite some highly environmentally-compatible energy technologies tend to exhibit faster technological learning by technology providers than most conventional energy technologies. For instance, expert judgments to date on learning rates for Onshore Wind, Offshore Wind, Utility-scale PV, Rooftop PV, and CSP are around 7%, 9%, 18%, 18% and 10% respectively against almost naught for competing conventional generating technology.[31] Hence faster gains in dynamic economic efficiency might be reaped from dedicated policy efforts covering the whole innovation cycle, including the bridging of the cost gap with reference to well-established conventional energy technologies. In other words, Europe will strengthen its dynamic competitiveness compared to its largest external trading partners, when it effectively engages in a robust RD&D and roll-out strategy regarding highly environmentally compatible energy technology.
- A realistically ambitious 2030 RES target[32] is a major component of such a strategy; it will help:
  - To provide an important signal to investors in RES technology towards a predictable RES investment climate beyond 2020. Especially but not only for large-scale RES technology, such as offshore wind, such a credible 2030 RES target will boost confidence among technology providers and project developers. The latter will be stimulated to build up a project pipeline, permitting them to profit from learning by doing in subsequent projects. Especially in offshore wind this is essential to bring down the still high O&M costs.

31 See e.g. (IEA, 2012: p. 374, Table 11.1)

32 Not over-ambitious, i.e. somewhere in between 25 and 30% at EU level in year 2030, subject to detailed scenario modelling informing policymakers to reach a sensible political compromise. Furthermore, enhanced EU-wide cost-effectiveness in reaching the target and improved market and system integration of renewable electricity will have to be key policy ingredients underpinning RES target realisation. Future RES policy design will be addressed in more detail in the next chapter.

- To keep average costs per unit of energy in check in the medium and long term, as the portfolio of commercially mature RES technologies broadens. This feature is supported by faster technological learning than competing non-RES technology. Moreover, except for biomass-based technology fuel price risk is absent.
- To develop low-cost climate change mitigation options at low cost. Climate change is a long-term issue. When considering mitigation costs per tCO2eq. a long-term forward-looking rather than a static efficiency perspective on policy cost is most appropriate. Technological dynamics are poised to render the additional costs of appropriate dedicated RES support policy[33] increasingly lower per tCO2eq. over time. Conversely, on longer term it will be increasingly difficult to match EU demand for fossil fuels with (dwindling) internal supply and imports. Consequently, the long-term trend of cost of competing fossil-fuel technology as well as the volatility thereof is set to rise.
- To strengthen the EU's competitive advantage in the world-wide fast expanding RES-related industries. A strong home base will stimulate EU companies, active in RES-related industries, to retain or even strengthen competitive advantages in high-tech activities of the RES supply chains.

- Overdependence on one single policy instrument increases the risks of under-achieving set climate and energy policy goals. Several Member State governments and industry associations state that policy coherence is necessary and the ETS is to act as the single climate change policy flagship instrument to foster a carbon neutral European electricity sector by 2050 in a technology-neutral fashion. The attractiveness of the ETS as the single GHG mitigation instrument is static economic efficiency: the market will decide which technologies are the most cost-effective. However, this advantage needs to be weighed against several overriding disadvantages. First, there are serious worries about the functioning of the ETS (European Commission, 2012d). Second, the current slide and volatility of the carbon price detracts from the strength of the carbon price signal. Third, economy-wide not all economic activities are affected by the ETS in a neutral way. Last but not least, policy coherence does not necessarily imply that GHG reduction at the lowest cost from a static efficiency point of view is the only criterion. Societal resilience to increasing resource scarcities for a range of resources (defined in a broad fashion) would certainly rank high among other policy considerations.
- The precautionary motive. Even under the prevailing harsh macro-economic conditions, Europe needs to boost its resilience to withstand the expectedly growing impacts of climate change and resource scarcities at local and global levels. This necessitates the availability of a broad portfolio of affordable, resource-efficient, low-carbon energy technologies. Such a broad portfolio cannot be made available overnight; it warrants major RD&D efforts. For technologies in the last phases of the innovation cycle, the emphasis with respect to effective public RD&D interventions will have to be on market stimulation as well as on market and network integration. By adopting ambitious but realistic mandatory RES targets, a stable supportive environment can be offered to investors and early adopters of emerging low-carbon energy technology.
- A mandatory target for renewables in the energy mix fosters additional energy efficiency measures. Reduced energy consumption as a result of additional energy efficiency measures reduces the renewable energy volume needed to reach the

[33] RES support policy will be considered in Chapter 4 below.

mandated renewables share. For economic actors (companies, municipalities, etc.) adopting renewable targets, energy efficiency measures will be among the ones considered for implementation.

- A trade-off exists in allocating RD&D cost to the technological and market development of highly environmentally compatible energy technology and short-term benefits forgone on material consumption per capita. Any 2030 binding RES target should duly allow for this trade-off. Again, it should be ambitious but not overly ambitious.

3.5 Conclusions

Adopting for year 2030 – on top of an GHG emissions reduction target – an affordable indicative target for the level of energy consumption (EE) target backed up by strong and compulsory implementing measures as well as an affordable mandatory target for the share of renewables (RES) in the EU energy mix will generate substantial net socioeconomic benefits. In doing so, a clear, transparent message will be sent to European economic actors that the public sector is committed to foster (investments in) energy savings and energy efficiency improvements as well as renewable energy generation over a long time period ahead. The targets concerned should be ambitious, going beyond what would be achieved without them, but not ill-affordably over-ambitious.

Both enhanced energy efficiency as increased deployment of non-overly-subsidised renewable energy generate a series of significant co-benefits. Compared to competing conventional energy technologies, many nascent RES and EE technologies are reported to have appreciably higher technological learning rates. Hence, presuming cost-efficient support policies, both RES and EE contribute to more affordable energy and GHG reduction costs, if not already to date then at least as from the short to medium term future. Given their relatively high local content of EE- and RES-related activities compared to conventional energy supply, investment in both EE and (not more than moderately subsidised) RES boost macro-economic growth and employment.

Both RES and EE reduce long-term energy supply vulnerabilities and geopolitical risks, associated with the consumption of energy carriers from fossil fuels. With the possible exception of certain biomass-based energy carriers, both RES and EE reduce emissions of local air pollutants.

Target levels should be ambitious in that they imply genuinely additional efforts as compared to baseline levels, but realistic in terms of affordable additional up-front costs. The precautionary motive suggests that, even under the prevailing harsh macro-economic conditions, Europe needs to boost its resilience in facing the impacts of climate change and resource scarcities at local and global levels.

4

Observations on post-2020 European RES policy options

4.1 Introduction

Apart from the possible introduction of a 2030 EU RES target with or without distinct MS RES targets the compatibility of national support schemes with the Internal Energy Market and the State Aid Guidelines is an issue of increasing importance along with rising RES shares. Also, non-support arrangements of relevance for the competitiveness of RES with conventional sources of energy is a policy area warranting increased attention. This chapter focuses on RES policy options for the power sector. Renewable heat raises less competition issues because of its predominantly local character. Furthermore, renewable electricity might evolve into an important source of energy for renewable heat (heat pumps) and low duty vehicles.

Section 4.2 presents the main policy options as distinguished by the Commission. These options are reviewed in Section 4.3. Some key aspects of non-support arrangements relevant for the integration and competitiveness of RES are discussed in Section 4.4. Section 4.5 concludes.

4.2 RES policy options

On 6 June 2012 the Commission published its communication on inter alia its appraisal of options for medium- and long-term European renewable energy policy (European Commission, 2012a). The long-term energy vision document of the Commission (European Commission, 2011f) already indicated that in the absence of a support framework, growth of renewable energy will drop after 2020 to some 1% per annum. According to submitted national renewable energy action plans, EU-broad renewable energy volumes will grow up to 2020 by 6.3% per annum. Indeed, early clarity on the post-2020 renewable energy policy regime will generate real benefits for investors in RES industry and associated infrastructure. However, not earlier than March 2007 RES targets for 2020 were politically agreed upon. Indeed, as large interests of both the public and the private sector (industry and households) are at stake, a thorough and well-balanced process is in order to determine the post-2020 regime. Directive 2009/28/EC requires the Commission to present a post-2020 renewable energy roadmap by 2018.

The Commission posits that "...certain cost effective and well-targeted support schemes may still be necessary beyond 2020...for newer, less mature technologies" (European Commission, 2012a). Furthermore: "...diverging national support schemes, based on differing incentives may create barriers to entry and prevent market operators from deploying cross-border business models, possibly hindering business development...".

Renewable energy policy interventions beyond 2020 should contribute to security and diversity of energy supply, competitiveness, environment – including climate – protection, economic growth, employment creation, regional development and innovation in the EU. The Commission proposes the following specific objectives:

i) Reduce uncertainty for investors and the business community.
ii) Improve viability and cost-effectiveness of support schemes.
iii) Facilitate consistency with market arrangements.
iv) Provide adequate energy infrastructure.
v) Foster technology innovation and development.
vi) Ensure wider public acceptance and address sustainability.

Inter alia these considerations and renewable energy policy objectives led the Commission to undertake an impact assessment study, considering the following post-2020 options (European Commission, 2012b):

- No new EU policies (baseline). Renewables will continue to benefit from the current ETS legislation.
- Decarbonisation without renewable energy targets, relying on the carbon market and a revised ETS with strengthened GHG reduction targets and/or policies fully compatible with long-term EU decarbonisation goals.
- The continuation of the current regime, with binding national renewable energy targets, as well as binding emissions reductions and energy efficiency targets. The 2008 Climate and Energy package will be updated, leading inter alia to the setting of mandatory national renewable energy targets, to begin with for the year 2030.
- An EU-wide renewable energy target, to start with for the year 2030, backed-up by a harmonised support scheme and electricity system management.

The Commission's impact assessment explores how effective the different options are at addressing the multiple objectives. The key table presenting the results of this assessment is reproduced below.

Table 2: Results of the impact assessment by the European Commission of three policy options against the baseline

Criteria	Options	1: No new EU action	2: GHG targets/no RES target	3: Post-2020 national RES targets	4: EU RES target and harmonised measures
Effectiveness	Policy certainty	=	+	++	++
	Support viability	=	++	+	+
	Infrastructure adequacy	=	++	++	+
	Internal market	=	++	+	++
	Technology innovation	=	+	++	+
	Sust./public acceptance	=	+	+	+
Efficiency	System costs	=	=	=	=
Coherence	with other EU policies	=	+	+	+

Legend: = equivalent; + improvement; – deterioration

Source: European Commission (2012b: 38, table 4)

The Commission envisages improvements across-the-board when considering the impacts of the distinct options on the criteria effectiveness and coherence with other EU policies in the energy and environment domain. Energy system costs would *grosso modo* remain at the same level as under the baseline. The third option might promote decentralisation of electricity generation which, in turn, would decrease overall network and system vulnerability to climate-related disasters. Moreover, option 3 might lead to lower impacts regarding construction of overhead power lines than options 2 and 4. For the latter options more of those investments would be needed to connect the best sites with consumption centres. In addition, under option 3 the Commission envisions the highest dynamic efficiency improvements. Options 3 and 4 may result in higher energy import savings with associated increasing energy security as well as new industries, jobs and economic growth. On the other hand, the latter options may raise the costs for power consumers although the merit order effect reducing wholesale electricity prices would at least partially compensate mandatory surcharges for renewable energy support on the electricity bill. The Commission deems that post-2020 national RES targets would make a positive contribution to the internal market, whilst for options 2 and 4 this positive contribution would be even larger.

The Commission states that “analysis shows that in practice option 4 could have a lower efficiency than theoretically expected”. This option is likely to promote a more concentrated renewable energy deployment, which “could risk raising support scheme and infrastructure costs”. Yet the Commission refrains from reflecting this finding in the impact assessment summary table. Ultimately, the Commission does not come up with a clear recommendation and leaves it up to European policy makers which option to take.

4.3 Policy options review

In Section 3.4 we have presented overriding arguments in favour of dedicated 2030 RES targets. If the very worrisome human-induced climate change trends will continue to be reconfirmed, the case for option 1 is very weak indeed. This case is further weakened by considerations of supply security in the medium and longer term. The previous chapter also presented a broad variety of arguments that it is indeed less prudent to bet on the ETS as single instrument to achieve the decarbonisation in the ETS sectors, consistent with the indicative EU GHG reduction targets for 2050 of 80-95% compared to 1990 levels. This leaves options 3 and 4 for a more detailed review.

It is hard to summarise the complex real world into just a few options for future policy action. The Commission chose to present just two options for the setting of renewable energy targets. Option 3 is the option with national targets but also with coordinated support. In its scenario writing the Commission presumes option 3 to lead to convergence of national support schemes and greater research and development of innovative technologies. The script for option 4 is a single EU-wide target and a harmonised EU-wide support scheme, enhancing concentrated development of RES potentials. Although the documents on renewable energy policy in the EU published by the Commission on 6 June 2012 seems to convey a certain preference for a FiP (feed-in premium scheme) over a certificates-backed renewable quota scheme, the script does not clearly indicate whether the harmonised support scheme would be a FiP or a renewable quota scheme.

It is a big question mark as to whether option 3 and option 4 alone provide a realistic menu of future support coordination options. As for option 3, the Commission seems to take it too easily for granted that national support schemes will converge. The power of the Commission to coordinate support in an option 3 setting should not be overstated. So far, with the major exception of the Swedish-Norwegian joint support scheme, the application of the cooperation mechanisms, meant to improve cost effectiveness on a voluntary bilateral basis, has been disappointingly less than expected or hoped for by the Commission. The key challenge here is to scale the huge transaction cost barriers to private project developers – including red tape costs – to realise project-based cross-border cooperation in such a way that cost-efficiency benefits will indeed be realised. This proves far from easy in practice. Indeed, the only cooperation mechanism under option 3 with high potential for realising cost-efficiency benefits appears to be joint support schemes.[34]

As such, fragmented national support schemes are not only at odds with the internal market, but also affect cost-effectiveness of renewable energy support in a strongly negative way. The Commission negates the cost-reducing innovation push from competition between technologies. Furthermore, the Commission presumes that under option 3 a more distributed pattern of RES development will occur, closer to consumption centres. Yet, given similar cumulative EU targets, under both option 3 and option 4 a very large role will be played by variable renewables beyond 2020 anyhow.

[34] Including technology-specific joint support schemes, e.g. a regional joint support scheme for offshore wind projects.

Hence, also under option 3 very large investments are needed in infrastructure to evacuate production peaks in solar and/or wind power to more remote load centres and in flexible back-up capacity and/or expensive storage devices. Furthermore, non-support arrangements with respect to level the playing field for distributed energy resources have a far greater effect on distributed versus concentrated RES than national RES targets as such. These considerations raise doubts about the full validity of the Commission's assessment results for option 3 with regard to the criteria: effectiveness/internal market and efficiency.

Political agreement on a EU-wide harmonised support scheme is still far off. On the other hand, along with the fast market penetration and resulting mainstreaming of RES, national support schemes do seem to be increasingly harder compatible with the Internal Energy Market concept. Challenges to the compatibility of national support schemes with EU law are mounting.[35] Moreover, under the current financial crisis the inefficiencies of market fragmentation through national support schemes are challenged in the national political arena of several MS.[36]

It is noteworthy as well that the Commission, DG Competition, has published new draft guidelines on environmental and energy aid for application up to 2020. (European Commission, 2013h) The final guidelines are to specify the conditions under which state aid measures may be declared compatible with the internal energy market. The draft guidelines require direct marketing of the renewable power fed into the grid as well as standard balancing responsibility for renewable generators where competitive intra-day balancing markets exist.[37] Small installations and less deployed technologies are exempted. Hence only the latter categories might be supported by feed-in tariffs; the former by feed-in premiums or a renewable quota scheme with tradable green certificates. DG Competition classifies a technology with a share of less than 1-3% of EU gross electricity consumption as a less deployed technology for the purpose of the draft guidelines. Under this criterion offshore wind and a myriad of biomass technologies would classify as less deployed, whereas onshore wind and solar PV would only be eligible for aid by way of feed-in premium or renewable quota schemes. Furthermore, the draft guidelines call upon the member states with a feed-in premium scheme to organise technology-neutral auctions as the allocation mechanism for granting feed-in premium support. Member states with a renewable quota scheme should not fix the value of the associated tradable green certificates nor should they apply technology-specific renewable quota systems (technology banding).

The aforementioned draft guidelines are currently undergoing a consultations procedure and are subject to changes. But should they be adopted in their present form, their impact will become notable. They will foster greater coordination and improve market integration of renewable electricity. For better or for worse, adoption of the draft guidelines will have implications for the renewable energy mix as well. For instance, under present cost conditions this is due to raise the share of wind onshore to

[35] To date, at least two cases having been referred to the European Court of Justice by the respective national courts are awaiting judgment of the EJC, i.e. Essent Belgium NV versus VREG and Alands Vindkraft AB versus Energimyndigheten. In the first case, the Advocate-General has already reached an Opinion on 8 May 2013 and in the second case on 28 January 2014. The EJC judgments regarding these two cases is expected within a few months.

[36] See e.g. (Monopol Kommission, 2013).

[37] (European Commission, 2013h: p.36, paragraph (121))

the detriment of PV systems of at least 1 MW_p ; whilst the share in total new installed PV capacity of small residential and business-sector PV systems is poised to rise.

To date, the renewable energy ambitions of the 28 Member States are widely diverging, given differential capacities to raise support money, different renewable energy resource abundances and different industrial policy ambitions. Moreover, a harmonised purely market-based scheme – i.e. a uniform renewable quota scheme – in isolation may give rise to inordinate windfall profits, other undesired distributional effects between MS and within MS between stakeholders, as well as slowing down technological diversity. For example, MS abundantly endowed with fluctuating RES resources will see their renewable generation capacity expanding. This will be welcomed by renewable sector stakeholders and consumers (because of the downward pressure on wholesale power prices) in these MS. But it will be despised by their conventional generators having to face stronger low-marginal-cost competition and their network operators, who need to invest more in network reinforcement, ICT technology, and in adapting their operational philosophy from passive to active network management. For resource-poor MS more or less the opposite holds.

A less one-size-fits-all harmonisation option than option 4 of the Commission's impact assessment – one that gives due allowance to MS-specific considerations - warrants further consideration. This option is a hybrid approach, coupling a fairly ambitious EU-wide harmonised renewable quota scheme to national FiT schemes directed only at high-cost promising technologies. Because of supplementary (conditional) technology-specific infant industry treatment of promising but currently high-cost renewables, this approach engenders dynamic efficiency gains by way of EU-scale markets and market competition between technologies. Moreover it might strike a good balance between internal market considerations and country-specific conditions. Member States with less capacity to raise support money and/or with less industrial policy ambitions can limit their renewable energy commitment to participation in the harmonised renewable quota scheme, whilst Member States opting to do more can operate in parallel to a national FiT scheme that caters to their particular needs. Furthermore, distributional effects can be checked (reduced) to a certain extent when after approval by the other participating MS resource-poor MS provide supplementary support to their inlands marginal RES-E technologies. This would boost the inlands generation from these technologies and consequently lessen the demand for certificates originated abroad. Note that the costs of running a national FiT are substantially less when participating in an EU-wide renewable quota scheme than without such participation.[38]

In the documents on the internal energy market published by the Commission on 5 November 2013, the Commission further emphasises the need to raise the cost-effectiveness of support to renewables deployment (European Commission 2013d, 2013e, 2013f). The Commission hopes that the co-operation mechanisms defined in the renewables directive (European Union, 2009) will help a great deal in fostering efficient deployment of renewable energy. Given quite high transaction costs faced by projects development to qualify for 'projects between Member States' and even higher ones for 'projects between Member States and third countries', expectations might turn out to

[38] See (Jansen, 2011b) for further background on a hybrid renewable quota/ feed-in premium scheme. Evidently, its compatibility with the guidelines on environmental and energy aid, once finalised, would need further investigation.

be too high. On the other hand, the high design and introduction costs of 'joint support schemes' might well be justified by potentially quite high benefits in terms of efficiency gains and improved market functioning. Regional joint support schemes might facilitate market deployment of a bundle of eligible technologies, but also be applied to a single technology. For instance, it may be of great significance for boosting the volume and efficiency of offshore wind deployment. A regionally harmonised approach, encompassing e.g. the countries being member of the NSCOGI initiative would greatly help in enabling this technology, requiring high upfront capital investments.

4.4 Market and system integration

The integration of fast increasing volumes of power from variable renewables (wind, PV) calls for a very flexible electricity system and further harmonisation of grid codes. Resources that might be used to match power demand and supply at different timescales are (e.g: IEA, 2011):

1. Dispatching flexible conventional power plants.
2. Pumped hydro for large-scale electricity storage.
3. Interconnections to neighbouring power markets.
4. Flexible demand from large industrial users (e.g. under interruptible load contracts).
5. Flexible distributed resources (flexible generation, storage provision, demand side response by actors connected to distribution networks).

All these flexibility drivers are needed to make the electricity system more flexible. Market arrangements need to be reformed so that the value of flexibility is reflected in market prices. This will improve the currently poor competitiveness of *inter alia* flexible gas-fired power plants. Granted a trend noticeable in several MS towards a higher share for both renewables-based generation and decentralised generation, the flexibilisation of distributed resources deserves special attention. This requires inter alia regulatory reform to ensure their access to power markets and exposure to market-based price signals. The playing field needs to be levelled for competing generation and demand-side resources on differentiated power markets according to several timescales intra-day, along with day ahead, as well as on the (emerging) markets for balancing, reserves and ancillary services. Apart from enhancing the integration of variable renewables into power (sub-) systems and markets, this also has a benign effect on among others market functioning, supply security, the empowerment of consumers and prosumers (ACER, 2013; ACER and CEER, 2013). Moreover, it can help curbing the growth in investment requirements in distribution and transmission networks. In principle, distributed energy resources can provide a range of system services. Also variable renewables may be able to deliver both active and reactive power support services (REserviceS, 2013; Ela et al, 2014).

New approaches are needed to incentivise the availability of generating capacity at distinct levels of flexibility. This would have to address the "the missing money problem" for both conventional and non-subsidised RES technology to recover up-front costs. Finon and Roques (2013) provide a review of some alternative approaches. Coordination at EU level is essential for the functioning of the internal energy market.

A point to restate is that the draft guidelines on environmental and energy aid stipulate with certain exceptions direct marketing and balancing responsibility requirements for medium and large renewable generation plants (European Commission, 2013h). Adoption of these requirements are helpful for market and system integration of power generated by the renewable plants concerned. Also the guidance document for the design of renewables support schemes (European Commission, 2013e: 14-16) proposes clearly defined balancing responsibilities. The guidance document suggests that this is to go in tandem with other market reform such as larger balancing zones with sufficient internal transmission capacity, availability of the option for small producers to use the services of aggregators, liquid intra-day markets, synchronisation of gate closure times, etc. Remarkably, the guideline document does not propose to reconsider priority dispatching and the interdiction of significant curtailment of renewable energy contained in Renewables Directive 2009/28/EC.

A further integration-enhancing support rule for medium and large plants meriting further consideration, is to cap ex post for each trading period (e.g. hour) of the wholesale power market the level of support benefits per kWh generated at the benchmark wholesale electricity price level. In case of negative electricity prices, the support level concerned would be reduced to naught.

4.5 Conclusions

In order to raise the cost-effectiveness of renewables support and their integration in the emerging Internal Energy Market, there is a need for fast convergence and at least partial harmonisation of MS renewable energy support schemes. Joint support schemes is the co-operation mechanism with the most potential for contributing to EU-wide cost-effectiveness of RES-E support. A hybrid renewable quota scheme applied by willing MS at regional level might substantially reduce deployment support costs, whilst at the same time allowing for technology-specific and country-specific characteristics and concerns. Offshore wind might present an interesting opportunity for a technology-specific joint support scheme.

Deployment of renewable electricity will be greatly helped by proper regulatory reforms of power market design and network arrangements, levelling the playing field in power, balancing and ancillary markets for all generators, storage providers and electricity consumers. This holds in particular for distributed (decentralised) resources.

5

The Commission proposal for the 2030 package

5.1 Introduction

The European Commission launched her proposal for the 2030 climate and energy package on 22 January, 2014. This chapter provides an overview of the Commission proposal and some key points of the Commission's impact assessment on headline targets. Moreover, a preliminary assessment is made of the Commission proposal focusing on the headline targets.

An overview of the proposed package by the Commission is given in Section 5.2. Section 5.3 recaps some highlights from the Commission's impact assessment. The chapter concludes with a preliminary and succinct review of the Commission package.

5.2 The proposed package

A binding EU target for GHG emissions reduction of 40%. The Commission hopes that the Council and the European Parliament will agree by the end of 2014 that the EU should pledge the 40% reduction (relative to the 1990 level) in early 2015 in the run-up to the UNFCCC Conference of the Parties in Paris at the end of 2015. The 40% reduction would have to be achieved by domestic measures alone. The ETS-sectors have to achieve approximately 43% emissions reduction, whilst the non-ETS sectors need to realise approximately 30% below their respective 2005 level. A draft effort sharing decision to equitably share among MS the reduction requirement in the non-ETS sector for consideration by the MS, will have to be prepared later.

Reform measures to improve the functioning of the ETS. A surplus of some 2 million allowances is currently hanging over the ETS allowance market. This overhang is further expanded by additional supply of 900,000 allowances towards the end of Phase 3 of the ETS. This allowances volume is to be back-loaded from auctions in the period 2014-2016 (reduced by 900,000 allowances, compared to the pre-set total volume) into auctions in 2019 and 2020 (correspondingly increased in total volume by the same amount). The overly large surplus depresses the carbon price signal and prevents the ETS from giving enough confidence to potential investors in low carbon technology. To improve this situation the design of the ETS is in need of major reform. Therefore the Commission proposes some key changes.[39] *Firstly*, with effect of year 2021, the linear annual reduction factor of the ETS emissions cap is proposed to be increased from 1.74% to 2.2%. *Secondly*, the Commission proposes the establishment of a market stability reserve mechanism. By way of this mechanism ex post interventions can take place each year as from 2021, contingent on the occurrence of certain conditions in the allowance market. Interventions are to be automatic, based on pre-defined rules. If in any last year (the first 'last year' being 2020) 12% of the number of allowances in circulation[40] was more than 100 million, this number (corresponding with the 12% share) is proposed to be transferred to the market stability reserve and the amount of allowances to be auctioned in the current year would then be correspondingly less.[41] The reserve mechanism is proposed to release 100,000 allowances[42] for additional auctioning in a certain year when either one two possible conditions apply: (i) the total number of allowances in circulation in a given year is below 400,000, (ii) if for more than six consecutive months the carbon price is more than three times the average carbon price during the two previous years. Allowances in the market stability reserve at the end of a trading period (e.g. phase 4) will be carried forward into the next trading period. *Thirdly*, permanent retirement is proposed of a number of allowances in the phase 3 trading period, i.e. 2013-2020. The Commission suggests that the second and third measure might be taken either in a mutually exclusive way or in combination. Furthermore, the Commission proposes an ETS review by the end of 2026.

A binding target for renewables at Union level of 27%. Renewables-deployment measures at MS-level to reach this EU target for the RES share in gross final energy consumption are left to subsidiarity.

Measures on energy efficiency to be proposed through the upcoming EED review. The Energy Efficiency Directive, Articles 3(2) and 24(7) stipulate that the Commission will consider the potential need for amendments to the directive once the review has been completed. Coverage of the MS' national energy plans (see next component) will have to include energy efficiency.

A new governance system for energy and climate policies based on MS plans for competitive, secure and sustainable energy. The Commission proposes that the MS shall prepare 'national plans for competitive, secure and sustainable energy' under a

[39] (European Commission, 2014d)

[40] Total amount of allowances in circulation in year x = (total number of allowances issued + total number of credits used, each from 2008 to year x) - (total emissions from 2008 to year x + total number of allowances in the market stability reserve in year x).

[41] The maximum number of allowances in circulation not resulting in a transfer of 12% thereof to the reseserve is 833 million allowances (833 million * 12% = 100 million). The minimum number of allowances in circulation that does not result in a release of allowances from the reserve is 400,000 million.

[42] If less than 100,000 allowances are in the market stability reserve, the release of allowances will be correspondingly less.

common approach based on upcoming guidance by the Commission. The plans are set to ensure stronger investor certainty and greater transparency, and to enhance coherence, EU coordination and surveillance. An interactive process between the Commission and the MS will have to ensure that the plans are sufficiently ambitious, as well as their consistency and compliance over time.

Supplementary components. Supplementary components are: (i) systematic monitoring of key variables including energy prices and costs, and (ii) a set of minimum principles to be complied with by undertakings in shale gas exploration and development. As for the first auxiliary component, the key variables still to be specified in detail relate to energy price and cost developments for distinct end-users, security of energy supplies, deployment of interconnections and smart grids, intra-EU coupling of energy markets, competition and market concentration of energy markets, and technological innovation.

5.3 The Commission's impact assessment

The Commission's impact assessment is based on scenario modelling exercises, based on PRIMES as the central modelling tool, linked with a selection of other models for better coverage of specific issues. The modelling exercises are based on realisation of assumed headline targets, e.g. 40% GHG emissions reduction or 30% RES in gross final energy consumption, based on cost optimisation under e.g. economy-wide uniform carbon values. Yet the real world is characterised by imperfect foresight by economic actors, deviations from economically rational behaviour to some extent and imperfect coherencies between MS policies. Hence, the model outcomes on target achievement costs should be interpreted as lower bound projections of actual target realisation costs. The Commission's impact assessment was conducted before its proposed 2030 package presented on 22 January 2014 was finalised. Hereafter the main results are reproduced of those scenarios that would seem to be most relevant with regard to the headline target values in year 2030 proposed by the Commission.[43]

The reference scenario. This scenario sets the baseline against which the effects of other scenarios are gauged. It informs about the projected outcome from implementing agreed policies of the adopted 2020 package including the achievement in 2020 of the renewable energy and GHG reduction targets (for the ETS and for the non-ETS sectors) for that year and implementation of the Energy Efficiency Directive. RES and EE policies will be phased out after 2020, but a non-reformed ETS will be continued with continuation of the annual linear reduction factor of the ETS cap of 1.74%. In their GHG abatement policies, the EU's main trading partners will not go beyond what has been pledged in the UNFCCC's Conference of the Parties at Copenhagen in 2009. Including the lean years so far in the current decade, the EU economy is projected to grow during the period 2010-2030 by 1.5% pa, whilst from 2015 to 2030 this annual average growth rate would be 1.6%. Stated in $US2010 per boe, the oil import price is set to rise from $80 in 2010 to $121 in 2030. For gas corresponding figures would be $38 and $65, as well as $16 and $24 for coal. RES subsidies decline post 2020 to zero by 2050 for most

[43] See European Commission (2014b and 2014c) for more details.

technologies. In 2030 the EU energy demand is projected to decline by 9% compared to 2010, whilst the energy intensity (energy consumption related to GDP) would decline by 33% in 2030.

The 40 GHG R and 40 GHG scenarios. These scenarios assume the adoption of a 40% GHG emissions reduction target as the only headline target based on domestic efforts only.[44] The R stands for 'reference conditions' as distinct from 'enabling conditions', which hold under non-reference scenarios denoted without R. 'Enabling conditions' would imply *inter alia* that energy infrastructure will be developed according to the latest 10-year development plans by the EU transmission system operators, strong R&D and innovation funding, high generation-side and demand-side flexibility enabled by smart grids and smart regulation, decarbonisation (and notably decarbonisation) of transport and successful public acceptance efforts (transmission grid extensions which is already tacitly assumed by the 10-year development plans, wind power development, CCS). In the absence of 'enabling conditions' less costs on infrastructure are being projected. But apart from infrastructure costs, target achievement costs will be higher. The latter will be less so before 2030, but the more so on longer term when less new low carbon technologies will enter the market, on account of less R&D effort, more stringently binding infrastructure constraints with lock-in of carbon-intensive energy and transport infrastructure, energy installations and buildings.

The 40 GHG/EE scenario. This scenario also assumes adoption of a 40% GHG emissions reduction target and enabling conditions. It also assumes adoption of very ambitious energy efficiency going beyond the 'standard' enabling energy efficiency measures. This scenario focuses on enhanced removal of market barriers to allow greater penetration of energy efficient practices such as:

- Speeding up the buildings renovation rate.
- Energy management systems in all new construction as from 2015.
- Extended and more ambitious energy efficiency obligations.
- More ambitiously tightening of energy efficiency standards driven by Ecodesign Regulations.
- Measures leading to more rigorous penetration of best available technology in industry.
- Wider deployment of high-efficiency CHP and district heating/cooling.
- A range of more ambitious measures in transportation, e.g. stronger CO_2 standards for passenger cars.

The 40 GHG EE/RES30 scenario. This scenario assumes, additional to the 40 GHG/EE scenario, the adoption of a 30% RES target. This target regards the share of RES in gross final energy consumption.

A selection of key modelling results, taken from (European Commission, 2014b) are shown in **Table 3** below. An essential aspect is the projected carbon price in 2030 resulting from the modelling optimisations (see bottom line). Note that the ETS design has been assumed unchanged in all scenarios. As a result, the impact assessment projects quite strong negative interactions between the carbon price and ambitious dedicated energy efficiency and RES policies.

44 Hence no use of carbon credits obtained outside the EU.

Comparing the projected results under the GHG40 R scenario with those under the GHG40 scenario (in the third and fourth column respectively), the RES share rises from 24.4% in the Reference scenario to 25.5% (GHG40 R scenario) and 26.5% (GHG40 scenario) respectively. Hence, enabling conditions would jack up the RES share by 1%. The net fossil fuel import bill is influenced in a negative direction. [45] Compared to the share of renewables in transportation, the share of RES-E plus RES-H/C is projected more sensitive to enabling conditions. Apparently PRIMES and interlinked models used project relatively moderate penetration of electricity as a fuel for passenger cars (moderate substitution of oil by electricity including RES-E). The projected rise in average annual system costs[46] of a 40% GHG emissions reduction target is moderate (+0,20%) under 'reference conditions' and even less under (more cost-efficient) 'enabling conditions', i.e. +0,15%.

Comparing the projected results under the GHG40/EE scenario with those under the GHG40 scenario (in the fifth and fourth column respectively), the RES share rises to 26.4% (GHG40/EE scenario) and 26.5% (GHG40 scenario) respectively. Most projected impact of more stringent energy efficiency measures appears to be in the transport and buildings sectors, as compared to the electricity sector. The net fossil fuel import bill is influenced in a remarkably negative direction. [47] Compared to the share of renewables in transportation, the share of RES-E plus RES-H/C is projected more sensitive to enabling conditions. Apparently PRIMES projects rising penetration of electricity as a fuel for passenger cars at a relatively moderate speed (moderate substitution of oil by electricity including RES-E). The projected rise in average annual energy system costs as a result of a 40% GHG emissions reduction target plus quite ambitious energy efficiency measures beyond for the remainder enabling conditions' is significant (+0,54%). A boost in (annualised) investment expenditure is the key underlying factor, less than completely offset by a projected lower fuel and electricity bill. It should be noted that the pay-off of the high investments in higher energy efficiency is projected to occur notably in the decades beyond 2030. Deeper decarbonisation onto 2050 can then be realised at much lower additional costs.

Adding a 30% RES headline target to the GHG40/EE scenario has the most projected impact in the electricity sector and in heating/cooling (the buildings sector) with higher RES shares. Total system costs are projected to be the same, when compared to those under the GHG40/EE scenario (average annual costs during the period 2011-2030: 2,089 billion euros[48]). The projected fossil fuel net import bill goes down by an additional 2 billion euros, mainly on account of lower imports of natural gas in the electricity sector.

45 A major undercurrent, not shown in **Table 3** below, is the dominant impact of more enabling conditions upon the projected (remarkably higher) substitution of natural gas by renewables in the electricity sector.

46 During the period 2011-2030

47 A major undercurrent, not shown in **Table 3** below, appears to be the dominant impact of stronger energy efficiency measures upon the projected savings of oil in the transport sector, whilst the (higher) substitution of natural gas by renewables in the electricity sector also plays a significant but less dominant role in bringing down the projected net fossil lfuel import bill.

48 All euro amounts mentioned in this section are at constant prices of year 2010 (euros with spending power of the magnitude of the ones in year 2010).

Table 3: Commission's impact assessment: selected key scenario modelling results

	Ref.	GHG40 R	GHG40	GHG40/ EE	GHG40/ EE/RES30
	Main scenario features				
Reference or enabling conditions	Ref.	Ref.	Enabling	Enabling	Enabling
GHG reductions vs 1990	-32.4%	-40.4%	-40.6%	-40.3%	-40.7%
Renewables share[1], overall	24.4%	25.5%	26.5%	26.4%	30.3%
Renewables share in E and H&C subsectors	31.0%	32.9%	34.2%	34.1%	39.7%
Energy savings[2]	-21%	-24.4%	-25.1%	-29.3%	-30.1%
	Economic and social impacts				
Total system cost, avg annual 2011-30 (bn €)	2,067	2,074	2,069	2,089	2,089
Total system cost as % of GDP increase compared to Reference in 2030 in % points		+0.20%	+0.15%	+0.54%	+0.54%
Investment expenditure[3] in Reference and changes compared to Reference (avg 2011-30, bn €)	816	+30	+38	+59	+63
Energy purchases in Reference and changes compared to Reference (avg 2011-30, bn €)	1,454	-8	-18	-34	-31
Fossil fuel net imports in Reference and changes compared to Reference (avg 2011-30, bn €)	461	-4	-9	-20	-22
Avg price of electricity[4] (€/MWh)	176	181	179	174	178
ETS allowance price (€/tCO_2)	35	53	40	22	11

1) Share of RES in gross final energy consumption according to 2009 RES Directive
2) Energy savings evaluated against the 2007 Baseline projections for 2030
3) Investment expenditure includes total purchases of transport equipment for households and businesses (including road and non-road transport), but not transport infrastructure costs.
4) Average price of electricity in final demand sectors (€/MWh); in constant 2010 Euros. For the Reference Scenario, the corresponding value was 134 (€/MWh) in 2010.

Source: extracted from European Commission (2014b: 136-139, Table 40)

5.4 Discussion

The general conditions under which any EU 2030 climate and energy package are to be adopted call for some difficult trade-offs. First of all it is far from sure that the EU's most important trading partners will adopt climate policies of comparable stringency, allowing for capacity and responsibility. If they don't, negative effects on the competitiveness of the Union's energy-intensive industries warrant due compensation. Furthermore, the deep impact of the ongoing financial crisis and the subdued macroeconomic development prospects reduce the capacity of households and the business sector to sustain substantial engendered short- to medium-term increased costs. Especially the capacity of lower income MS and/or the peripheral MS hit hardest by the current crisis, to bear extra costs of climate and energy policy intensification is limited. Hence, distributive mechanisms to enable implementation of the 2030 package deserve special attention. Even so, also in higher income countries like Germany and the UK affordability for low-income groups is an issue, with the number of households with arrears in paying their energy bills mounting. All these conditions need to be balanced with the urgency of climate change and other pressing issues, including security of energy supplies, the public health effects of (avoided) air pollution and enhancing the Union's *dynamic* competitiveness.

The Commission's impact assessment indicates first of all that, under all scenarios, the EU energy system cost in the period 2010-2030 as a percentage of GDP are projected to rise markedly towards 2030 and to decline beyond 2030. Compared to the actual rate, 12.8% in year 2010, this core figure is projected to rise under the (least ambitious) Reference Scenario to 14% in year 2030. Again under this scenario it is projected to decrease thereafter to 12.3% in 2050.[49] Some major underlying factors accounting for the projected rise to 14% in 2030 are:

- Projected rising energy import prices; especially those for oil and gas would affect the future energy import bill in upward direction.
- The need to replace ageing energy infrastructure and the extension and enhancement of energy infrastructures and other investment costs associated with already agreed policies.

The benefits of the high energy system investments in the period 2011-2030, even if only considered in terms of less spending on fuels[50], are projected to occur to a substantial extent beyond 2030.

The most ambitious scenarios in terms of energy system costs described in Section 5.3 above, i.e. GHG40/EE and GHG40/EE/RES30, would lead to significantly higher system costs.[51] It is noted that these scenarios assume 'enabling conditions'. Due allowance should be made for the fact that real world conditions will be less enabling than assumed under these scenarios. *Inter alia,* the assumption of a uniform carbon value will hold in a rather imperfect way in the non-ETS sectors; MS policies will be less than perfectly coherent; and public acceptance of large-scale infrastructure expansion projects and wind power projects is hard to come to grips with. As a result, the actual additional energy system cost are likely to be higher than projected by these scenarios.

The projected strong negative interactions between the ETS carbon price and ambitious dedicated RES and EE policies (see **Table 3** above) gives food for thought. The main policy message to derive from these outcomes is that the ETS design is in for drastic reform. In order to make for more enabling conditions, design reforms for

49 European Commission (2014b: p.73)

50 Except for events such as direct exposed to fast rising energy bills and even more so to outright physical supply disruptions or to deseases related to less clean air, the ancillary benefits of such investments are less tangible. These externalities constitute important market failures.

51 As % of GDP + 0,54% on an average annual basis (period 2011-2030).

implementation not later than in 2021 of *inter alia* the following key design features would seem warranted:

1. The most urgent reform needed is to duly allow for automatic ex post interventions, when needed, in the supply of EU ETS allowances to ensure the allowance price to fluctuate within a predictable bandwidth, gradually rising over time. The market stability reserve mechanism, proposed by the Commission, is a step in the right direction. However, the carbon price time trajectory that adoption of this reserve mechanism would entail seems prone to rather high volatility and too little *ex ante* transparency. It is a matter of further scrutiny to determine whether or not the proposed mechanism will provide adequate predictability to investors in low carbon technology and associated RD&D. In this regard, the substantiation of the choice by the Commission to propose the introduction of quantity-based triggers instead of price-based triggers is in for improvement. In (European Commission, 2014e: 21-22) it is argued that: "One of the main implications of the decision for a quantity-based instrument over a price-based one is that the carbon price signal is not fixed by policy-makers but revealed by the market. In the EU ETS, the carbon price reflects the quantity of allowances and their relative scarcity and not the other way around." Yet, the question is whether the market alone is capable of factoring in the climate change externality in the carbon price or, alternatively, that policy-makers have to play a leading role using extensive and transparent consultations in the decision process. Furthermore, there is no a priori reason why the EU ETS should be a quantity-based instrument and not a hybrid quantity-price instrument. Also, the Commission states to favour market logic: "…a mechanism prescribing a certain price corridor runs counter to market logic and even substitutes it, by distorting the carbon price level that would otherwise be revealed by the market." Again, this reasoning does not make adequate allowance for the societal need to more properly internalise the climate change externality. A third argument raised by the Commission is: "Price-based triggers also suffer from the drawback of being more at risk of manipulation and gaming." This argument is not further clarified nor is it substantiated. In Section 2.3.1 above, compelling arguments were presented in favour of price triggers.
2. Expansion of the ETS sectors to cover retail energy demand is desirable in principle. The cost-efficiency benefits of widening the uniform ETS carbon price signal so as to include more, currently non-ETS sector can be large, provided the deadweight administrative costs of expansion to energy retail suppliers can be contained. Whether the latter is feasible and, if so, the way how to do this should be the focus of detailed follow-up investigation.

Whether the (projected) negative interactions between the ETS carbon price signal and ambitious dedicated EE and RES policies should be a reason to discontinue with dedicated, ambitious EE and RES policies is not an easy question. As stated already, in our view there are strong reasons to continue such policies for two major reasons:

- The risk that even a reformed ETS will function less well than envisaged beforehand. Ambitious supplementary measures that are supportive to long-term decarbonisation may be less efficient from a static efficiency point of view. Yet these might be desirable from at least the perspective of robustness of the package. This is the principal argument to implement well-designed supplementary measures. But also from a dynamic efficiency perspective ("faster learning by doing") certain ambitious supplementary policies (dedicated RES and EE deployment policies) are

desirable. RD&D policy might not be enough for a good coverage of the whole innovation cycle to render new low carbon technology commercially mature in time.
- RES and EE render major contributions to other policy objectives. In Chapter 3 above more details are presented on this point. It is not correct to consider RES and EE deployment instruments simply and only as sub-sets of GHG emission reduction instruments.

Dedicated RES and EE deployment policy needs to include technology-specific elements, considering *inter alia* the gap to commercial maturity and production scale. In principle, the approach adopted in (European Commission, 2013h) to differentiate between medium and large scale deployed technologies on the one hand and less deployed and small-scale technologies on the other is an interesting classification in this respect.

The Commission proposes an ambition level of 40% GHG target based entirely on domestic efforts. With a view to the difficult prevailing economic circumstances and the prospects for structurally lower growth of the EU economy, this ambition level seems both reasonable and affordable. The Impact Assessment has provided plausible evidence that the medium term additional costs of adopting this measure are acceptably low, when weighing these cost against the societal benefits over a longer 2010-2050 period and beyond.

The Commission can be credited for postponing to propose specific dedicated energy efficiency measures until the results are known of her imminent progress review of implementing the Energy Efficiency Directive by the MS. It would create a difficult situation when the Commission would have made a decision on ambitious energy efficiency measures, when the subsequent detailed review of current energy efficiency trends were to indicate that the form or the calibration of the former measures is sub-optimal. The Commission has made clear statements that dedicated energy efficiency measures are indispensable (European Commission, 2014a).

Also the choice by the Commission to propose an ambitious mandatory RES target at the EU level, the implementation of which in and by the MS is subject to co-ordinated subsidiarity, appears well-conceived. Also in the present report compelling arguments have been presented in favour of a dedicated RES target (See Chapter 3 above). The choice to leave – contingent on institutional innovation (see next paragraph) - the implementation at MS level to subsidiarity is understandable. To date, the Commission is not in a position to mandate MS-level renewables targets. Cases in point are: (i) the resistance by several MS, such as the UK and Poland, against adoption of a national renewables-target, and (ii) the extraordinarily dismal economic situation in a number of Eastern and Southern MS whose households and companies can ill-afford substantial additional support costs.

Pending further details, the Commission's proposal for new governance system for energy and climate policies based on MS plans for competitive, secure and sustainable energy is worth serious consideration. Apparently, the Commission sees this proposed, institutional innovation as a vehicle to ensure that the targets/ambitions at EU level on climate and energy are met in an equitable way at MS level with more European coordination of climate and energy policies in a clear time-framed process. Within this coordination process, a balance needs to be struck in MS effort sharing regarding the trade-off between equalisation of effort and the different capacities among MS to finance the effort. Moreover, the process may greatly improve implementation synergies through better horizontal coordination between MS.

The Commission's Impact Assessment would seem to provide insufficient information on the calibration of the mandatory RES target. The Commission proposes 27%. The information reproduced in **Table 3** above would suggest that a significantly higher target might be unaffordable for the EU at large. However, the Commission deems as well that the ETS needs fundamental reform to improve its functioning. Even when the reserve mechanism as proposed by the Commission would be adopted without amendments, the carbon price is poised to firm to appreciably higher levels than the € 11 per allowance in combination with ambitious RES and EE policy.[52] Hence adopting the Commission proposed reform, and even more so when the ETS coverage would be expanded to retail energy supply, a 27% headline target for RES might be achieved without any additional effort. It would also much stronger stimulate energy efficiency improvement than under the scenarios used in (European Commission, 2014b). Hence, publication of further Impact Assessment modelling related to the ETS is recommended, investigating scenarios incorporating successively a small selection of alternative key ETS design changes. This will enable external observers to better assess the 27% level for the RES headline target as well as the proposed ETS reforms themselves.

52 This allowance price in 2030 results from the modelling exercise with the GHG40/EE/RES30 scenario. See the bottom entry in the last column of **Table 3** above. The information provided in (European Commission, 2014e) does not deliver the recommended information.

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