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COMMISSION STAFF WORKING DOCUMENT

EXECUTIVE SUMMARY OF THE IMPACT ASSESSMENT

Accompanying the document

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions

A policy framework for climate and energy in the period from 2020 up to 2030

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1. LESSONS LEARNED AND PROBLEM DEFINITION

1. The EU is on track to meet and might exceed its -20% GHG target for 2020. However, 13 Member States need to make additional efforts to meet their respective national 2020 targets under the Effort Sharing Decision[1]. The economic recession and the accelerated inflow of international credits have created a surplus of around 2 billion allowances in the EU ETS[2]. If unaddressed, this will have a long lasting effect on the ability of the ETS to incentivise low carbon investments across the EU. There is an increasing risk for divergent national approaches to prevail, which would be detrimental for the internal market and cost-effectiveness. No evidence is found on carbon leakage so far. It seems tat existing measures have successfully prevented it, notably through the provision of free allocation of emission allowances, although the experience so far is not sufficient to draw decisive conclusions for 2020.
2. As regards renewable energy, the EU has met its interim targets but more efforts will be needed from Member States to reach the 20% target in 2020[3]. Many Member States also need to make additional efforts to meet their respective national targets under the Renewable Energy Directive, and recent evolutions such as for instance retroactive changes to support schemes is causing concern as to whether the overall EU target will be met. The increase of renewable energy sources has contributed to containing electricity wholesale prices on many markets but this has not yet been reflected in retail prices or translated into tangible benefits for consumers, in part as the cost for renewables support schemes (often passed on to final consumers) outweigh the reducing impact of renewables on wholesale prices on many markets. At the same time, decreasing wholesale prices in some markets puts pressure on conventional generation and generation adequacy. In addition, diverging Member State support schemes with focus on national production pose significant challenges to further integration of the internal energy market
3. As regards energy efficiency, the 2020 target of saving 20% of the EU's primary energy consumption compared to projections is not legally binding for Member States. Nevertheless, after years of growth, primary energy consumption peaked in 2005/2006 and has been slightly decreasing since 2007, in part due to impacts from the economic crisis, but also due to improved energy intensity. Despite the 20 % energy savings target not being legally binding on Member States, it has provided significant momentum to the

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[1] See Kyoto and 2020 target progress report 2013 (COM(2013) 698) for details.
[2] As outlined in the Commission's Carbon Market report, COM(2012) 652.
[3] See the Commission's "Renewable energy progress report", COM(2013) 175.

efforts to reduce energy consumption and intensity, and facilitated agreement on strong measures, in particular the Energy Efficiency Directive. Nevertheless, the EU is likely to miss the 2020 target under current policies.

4. While the gradual completion of the internal energy market has helped to keep EU wholesale electricity and gas prices in check, end-user prices for many businesses and households have increased significantly in both nominal and real terms over the last decade. The analysis suggests that this trend will continue also in the absence of new policies, underlining the need to make sure that potential adverse impacts from climate and energy policies are contained.
5. Developments in international markets and exploitation of unconventional hydrocarbons has led to an increasing divergence of prices, most notably for natural gas in the EU compared to the USA where shale gas is now an increasingly important energy source and is considered by to impact positively on the US economy's competitive position.
6. As foreseen already when the 2020 package was prepared and adopted, there is clearly an interaction between the headline targets. Measures to promote energy efficiency and renewable energy generally contribute e.g. to reductions in GHG emissions and are complementary to dedicated climate policies as they address different market failures. As far as electricity is targeted, also a downwards impact on ETS carbon prices can be expected, however the current surplus of allowances in the ETS is largely driven by other factors. Moreover, measures to reduce GHG emissions can in principle incentivise both renewables development and energy savings, but e.g. higher levels of the ETS price than those experienced over the last few years would be needed to have considerable impact. Finally, energy savings help to ensure progress towards higher shares of renewables, as the target in this regard is measured as a share of gross final energy consumption, and higher shares of efficient renewables reduce primary energy consumption at any given level of final energy consumption through lower transformation losses.
7. Present policies are not sufficient to reach the EU's long term climate objective in the context of necessary reductions by developed countries as a group to reduce GHG emissions by 80-95% in 2050 compared to 1990. In the context of international climate negotiations, the EU needs to come forward with a position, including its own ambition level ahead of the 2015 UNFCCC climate conference in Paris.
8. The EU's medium- to long-term security of energy supplies remains an issue by a persisting energy import dependence on sometimes politically instable regions and reliance on fossil fuel usage which in the long term will be incompatible with the EU's climate and energy objectives. Gradual depletion of the EU's conventional fossil fuel resources together with expectation of continued high and volatile fossil fuel import prices puts pressure on parts of EU industry.
9. The EU's energy system needs significant investments in energy infrastructure and electricity generation to ensure its medium to long term viability and sustainability. Infrastructure funded in the near term will still be in place in 2030 and beyond. There are other non-economic barriers and market failures e.g. with regard to renewables and energy efficiency. There is need urgently for a clear and coherent framework that creates predictability and reduced regulatory risk.
10. Current policies aiming at achieving a more sustainable economy and energy system, which may reduce costs and avoid damages in the longer run, are expected to contribute to short to medium term cost increases, which cause concerns about the affordability of energy for households and the competitiveness of EU energy prices. Future policies must limit these concerns.
11. There are no sufficiently clear EU climate and energy objectives for the period post 2020, and no comprehensive regulatory framework in place to ensure that the transformation towards a competitive, secure and sustainably energy system and economy is on par with

long term objectives. In absence of such objectives and regulatory framework, the energy markets and investment decisions made on a commercial basis are under current projections not expected to lead to the necessary transition.

12. Therefore, the problem this specific initiative aims to address is the lack of objectives or definite policy framework in place to steer climate and energy policies in a 2030 perspective.

2. SUBSIDIARITY

13. As regards climate change, it is a trans-boundary problem. Coordination of climate action is necessary both at global and European level. Articles 191 to 193 of the TFEU confirm and further specify EU competencies in the area of climate change. Policies often have an internal market dimension and the required infrastructure often has an European dimension.
14. As regards energy, Member States are increasingly interdependent to ensure secure, sustainable and competitive access to energy. Moreover, the cost of the transition of the energy system will be lower if Member States cooperate. Moreover Article 194 TFEU specifies the EU's right to act in the energy domain. Of course, the role of Member State action within this framework will remain crucial and the responsibility for continued progress up to 2030 is shared, as demonstrated e.g. in the climate and energy package for 2020. All future EU action in this regard will respect Art. 191 to 194 of the TFEU.

3. SCOPE AND OBJECTIVES

15. The policy initiative underpinned by this Impact Assessment is only the first step to a comprehensive and detailed solution to energy and climate challenges in a 2030 perspective. As such, the policy initiative focuses on the broad objectives of the 2030 Framework and some key implementation aspects; in particular the issue of climate and energy targets in a 2030 perspective and how they interact while proposing the general direction of policy development within this framework. On this basis, the policy options evaluated in this Impact Assessment focus on the target setting as such, and to a lesser extent on other means of ensuring progress towards meeting the abovementioned challenges.
16. The operational objectives for a 2030 climate and energy policy framework are to:

- Propose coherent headline target(s) for climate and energy at the EU level to steer climate and energy policy in a 2030 perspective.
- Propose key indicators for the competitiveness of the energy system and security of energy supply, as appropriate associated with aspirational objectives, to keep track of progress over time and get a clear basis for policy response.
- Propose the general direction of the appropriate design of future concrete policies needed to meet 2030 objectives.

4. DESCRIPTION OF POLICY OPTIONS AND METHODOLOGY

Regarding policy options for headline targets and measures

17. The starting point for the analysis is the newly established Reference Scenario. It assumes full implementation of already adopted policies, including the achievement of the renewable energy and GHG reduction targets for 2020 and implementation of the Energy Efficiency Directive, which will deliver strong savings by 2020 and continues to provide savings beyond, however with gradually decreasing effect post 2020. The existing linear reduction of the cap in the ETS is unchanged and continues beyond 2020. For 2030, the

new reference scenario results in a GHG reduction in the EU of 32% below 1990 levels; a renewable energy share of 24% of final energy consumption; and primary energy savings compared to the baseline for 2030 (as projected by PRIMES 2007 baseline) of 21%.

18. The reference scenario shows that full implementation of the Community's existing climate and energy targets and policies is effective in leading to a decrease of GHG-emissions and contributes to improve security of supply, impacting energy system costs and electricity prices. On the other hand the analysis shows that developments under the reference scenario would already result in increased ETS prices, energy system costs and electricity prices.
19. In the reference scenario, over the period 2011-2030, electricity prices increase by 31% and energy system costs by 34% in real terms. Expressed as a ratio between energy system costs and GDP, this increases by 2 percentage points in the period 2011-2020 but is limited to a 1.3 percentage points increase over the entire period 2011-2030. Important drivers are the impact of rising energy import prices of all fossil fuels by 40%, the need for strong infrastructure investment to replace obsolete capacity and extend the grids, as well as agreed policies to achieve the energy and climate objectives of the package. Increased investment needs explain around 60% of the total energy system cost increases until 2020 with increasing fuel costs as the other important contributor to increasing system costs.
20. The main options for combining headline targets considered are:

    1. A sole GHG target, including elements of supporting renewables and energy efficiency policies:

    2. A GHG target combined with explicit (additional to the reference scenario) energy efficiency measures and elements of supporting renewables policies:

    3. A GHG target combined with a pre-set renewables target and explicit additional energy efficiency measures:

For each of these, sub-options are considered where applicable:

A. GHG targets of between 35 and 45 % (reductions compared to 1990 GHG emissions levels).

B. Pre-set RES targets of 30 and 35% (or no pre-set target) as a share of gross final energy consumption.

C. Different level of ambition (moderate, ambitious and very ambitious) for energy efficiency policies (additional to those already present in the Reference scenario).

21. In order to assess these options, a large number of scenarios combining targets and ambition levels have been analysed, out of which 7 have been retained for more detailed assessment, shown in Table 1 below.
22. Scenarios are modelled either with the same conditions as in the reference scenario (referred to as reference scenario conditions or '®') or with *enabling conditions*. This latter relates to assumptions on e.g. energy infrastructure development, R&D and innovation, decarbonisation (and notably electrification) of transport and public acceptance (eg for CCS), for which timely market coordination of certain technologies will be prerequisites and which are necessary to meet this long term transformation towards a low carbon economy. While these enabling conditions are particularly affecting energy system changes after 2030, they do start to have some effect before 2030, and some investments, e.g. related to infrastructure, need to be started before 2030 for these enabling conditions

to materialise. All scenarios achieving 40% GHG reductions or more imply a tightening of the annual reduction factor of in the ETS post 2020.

Table 1: Scenarios to assess main policy options with respect to targets

Scenario	*GHG 2030 vs 1990*	*RES 2030 (% final En. Cons.)*	*EE 2030 (change vs 2030 proj.[4])*
Reference Scenario	*-32.4%*	*24.4%*	*-21.0%*
Reference scenario conditions			
GHG35/EE®	-35%	No pre-set target (25.5%)	No pre-set target (-24.4%)
GHG37®	-37%	No pre-set target (24.7%)	No pre-set target (-22.9%)
GHG40®	-40%	No pre-set target (25.5%)	No pre-set target (-24.4%)
Enabling conditions			
GHG40	-40%	No pre-set target (26.5%)	No pre-set target (-25.1%)
GHG40/EE	-40%	No pre-set target (26.4%)	No pre-set target (-29.3%)
GHG40/ EE/RES30	-40%	30%	No pre-set target (-30.1%)
GHG45/EE/RES35	-45%	35%	No pre-set target (-33.7%)

Regarding other targets and indicators

23. The responses to the public consultation make clear that many stakeholders consider that targets and objectives for GHG reductions, RES shares and EE may be sufficient for ensuring progress towards an environmentally sustainable energy system, but not for progress with regard to the competitiveness of the EU energy system and security of energy supplies and that other targets or indicators relating to these areas therefore should be established.

24. Three main options can be envisaged in this regard:

- No such targets or indicators are set.
- Other 2030 targets for other aspects of competitiveness and security of supply are set, and treated in an equal manner as potential targets for GHG, RES and EE.
- No other such targets are set, but relevant indicators are defined to keep track of progress over time and to provide a knowledge basis for policy action; potentially associated with aspirational objectives in a 2030 perspective.

Regarding interaction with international climate policies

25. A number of policy options have been analysed reflecting how the 2030 framework would integrate developments relating to an international agreement, notably on:

- The continuation of measures relating to carbon leakage
- The potential adoption of a higher target in case of an international agreement (two options have been considered: one step up from 35% to 45%, and one from 40% to 50%)
- The role of international credits in the overall framework

Regarding structural measures for the ETS

26. Regarding structural measures for the ETS, two policy options have been considered in this impact assessment for the period post 2020: (1) a revision of the annual reduction

[4] Same metric as used for the 2020 energy savings target.

factor, and (2) access to international credits. A qualitative assessment regarding the extension of the scope of the ETS is also included as an annex. All policy scenarios analysed in full detail implying GHG reductions in 2030 at 40% or above include a tightening of the annual linear reduction factor in the ETS. An additional impact assessment was prepared in relation to the option to create a market stability reserve or the permanent retirement of some allowances.

Regarding Land Use, Land Use Change and Forestry

27. Emissions and absorptions from this sector are not included in the reduction targets in the current Effort Sharing Decision regulating the sectors outside of the ETS, nor in the ETS. In the context of a 2030 framework it needs to be assessed how to integrate this sector.

Regarding implementation of potential renewable energy and energy efficiency targets

28. Pending agreement on a target as such, the main options for a general approach to meeting a renewables target are evaluated in a more horizontal manner. Such options include:

    - Continuation of Member State specific targets and support schemes;
    - Continuation of Member State specific targets and support schemes, but with non-discriminatory treatment of renewables coming from other Member States in the national support schemes or strong coordination between Member States, possibly under the condition that there is sufficient transmission capacity between the Member States involved, and
    - Gradual Europeanization of the approach to ensure progress towards a 2030 objective.

29. Pending the 2014 review of the approach to energy efficiency/savings in a 2020 perspective, this Impact Assessment does not define or evaluate in detail potential implementation approaches. However, the various options assessed include specific energy efficiency measures, integrating their contribution and impacts within the overall framework.

5. ASSESSMENT OF IMPACTS

5.1. Impacts relating to options for targets and measures

30. All values in section 5 relate to 2030, if not otherwise stated (the full IA includes more information on impacts in a 2050 perspective; see also the Roadmap for moving towards a low carbon economy in 2050 and the Energy Roadmap 2050).

Environmental impacts

31. Compared to 2005, emissions in the ETS sectors continue to decrease more than emissions in the Non ETS sectors, with emissions reducing in 2030 in the ETS between 37 and 49% and in the Non ETS sectors between 26% and 35% compared to 2005. Compared to the Reference, with higher reductions in the ETS, the Non ETS sectors reduce more.
32. The power sector (including district heating and CHP) is projected, with around 48% to 66% reductions compared to 2005, to experience the largest GHG reductions, which reflects the cost-efficient mitigation potential in that sector. Transport and non-CO_2 emission in the agriculture sector see emissions reduce the least compared to 2005, with transport reducing between 12 and 20% compared to 2005 and non-CO_2 emissions from agriculture reducing between 13 and 28%. In developing the 2030 framework, further work will be needed to assess the potential of mitigation options and the practical implementation in policy terms.

33. Focussing relatively more on energy efficiency policies for any given level of GHG reductions reduces emissions in the non-ETS more and less in the ETS. A high level of renewable energy to the contrary increases reductions more in the ETS, and less in the non-ETS.
34. For the non-CO2 emission reductions, highest reduction potential by 2030 is in the non-agricultural sectors, with a significant part of these reductions already achieved in the Reference scenario.
35. Emissions and absorptions from Land Use, Land Use Change and Forestry (LULUCF) are at present a net sink, but one that is gradually decreasing. Overall, the impacts of increased production and consumption of renewable energy (and thus increased bio-energy demand) on this sink is limited if increased demand for bio-energy is met largely through increased use of perenial energy crops, but this would imply a significant expansion of cropland used for bio-energy, with some 10% compared to 2005. If increased demand is rather met through increased imports, or through higher rates of harvest removals of forest wood, the negative impact on the sink, be it directly or indirectly through Indirect Land Use Changes, might be higher. The eventual impact on GHG emissions would depend in part also on crops used and farming practices, as well as land use changes outside Europe, and will need further analysis.
36. Reduction in fossil fuel use results in significant air pollution reductions. The reduction in mortality can also be valued economically, with estimated reductions in health damage due to reduced air pollution of €2.9 to 35.5 billion depending on the scenario and the 'value of life year lost' assumed. Because of the changed energy mix and lower emissions in terms of air pollution, costs to control them are lower as well, between €-0,9 billion and €7 billion per year. Scenarios with ambitious energy efficiency measures and renewables targets imply much higher positive environmental and health impacts, most notably for reductions of particulate matter and nitrogen oxides.

Impacts in the energy system (including economic impacts)

37. For a domestic 40% reduction of GHG emissions, the additional energy system costs compared to the reference scenario of adapting the energy system would be contained to 0.15–0.54% compared to GDP[5] in 2030, compared to the reference scenario. These costs are not a reduction of GDP compared to what would otherwise be the case, but reflect the increased costs for all final consumers (industry, consumers, transport users) arising from changed investment patterns and related fuel savings to receive the required energy services. Additional costs are lower for scenarios resulting in 35 or 37% GHG reductions in 2030, (0.03% to 0.13%) and higher for a scenario that combines a 45% GHG reduction with 35% RES and strong EE policies (0.84%). Depending on the specific scenario, these cost projections are to various extents based on EU-wide cost-effective approaches for GHG emission reductions, renewable energy deployment and energy efficiency improvements, thereby underestimating costs if in reality such cost efficiency would not be achieved.
38. Cost impacts are least pronounced in scenarios that do not have energy efficiency policies and renewables targets going beyond what is achieved in scenarios with a single GHG target only.
39. This said, scenarios based on concrete EE measures aim to reflect the need for concrete policies that remove barriers to EE due to market failures, split incentives and imperfect information among market actors. On this basis, the use of carbon, renewables and energy

[5] Range reflecting different scenarios for 40% GHG target, with or without enabling conditions, with or without additional RES targets, ambitious efficiency policies; excluding disutility and auctioning costs.

efficiency values rather than specific policies may underestimate the cost of reaching set objectives unless the theoretical cost-optimisation can be achieved in reality.

40. In terms of investments and fuel cost savings, all scenarios reflect increased capital investments (in addition to the reference scenario, with between 17 and 93 billion € annually on average between 2011 and 2030) as well as increasing energy purchase savings (compared to reference, with between 8 and 34 billion € on average between 2011 and 2030). The increased investments in more efficient and low carbon technologies are noticeable in all sectors, and are most pronounced in the buildings sector. Additional investment needs are highest in the scenarios with ambitious energy efficiency policies and renewables targets. Fuel savings are highest in the scenarios with ambitious energy efficiency policies.
41. In all policy options, the EU's energy efficiency would improve substantially bringing also energy security benefits linked in particular to lower fossil fuel use and imports. All scenarios give beneficial impacts for key indicators relating to energy security, such as total primary consumption (between -2 and -15%), final energy and net energy imports (between -2 and -19%) in a 2030 perspective. Positive impacts are more pronounced in scenarios with ambitious energy efficiency policies and renewables targets.
42. Average electricity price changes in 2030 ranges from -1.1% to + 11.3 % compared to the reference scenario, with the lowest prices projected in the scenario combining a 40% GHG target with ambitious energy efficiency measures. All scenarios resulting in 40% GHG emissions result in relatively small electricity price increases compared to the Reference Scenario.
43. In all scenarios, ETS prices remain very low until 2020 at least, reflecting the presence of a large surplus of allowances in the market as well as continued emission reductions being driven by policies such as the RES directive and the EE Directive. Contrary to electricity prices, differences between policy scenarios are very pronounced with regard to the ETS price, projected at between 11 and 53 € per allowance in 2030 depending on the scenario, with scenarios with ambitious energy efficiency policies and RES targets resulting in the lowest ETS price and the scenario driven by a GHG target and carbon values the highest ETS price.

Macro-economic and social impacts (GDP, employment, affordability of energy)

44. The impact on GDP in 2030 has been assessed, focussing on the GHG40 reduction scenario and where available and appropriate also on scenarios with explicit EE policies and RES targets. This assessment assumes that third countries do not take measures beyond the pledges they made at present in the context of the UNFCCC.
45. One modelling tool, GEM E3, projects negative impact on GDP from 40% GHG reductions driven by a GHG target and carbon pricing, ranging from -0.10 to -0.45% in 2030 compared to the reference scenario. Both E3MG and E3ME project positive contributions of up to 0.55% in the scenario including ambitious energy efficiency policies, taking into account the positive impact of energy efficiency investments on GDP. Scenarios resulting in lower GHG reductions are expected to have relatively lower impacts on GDP compared to the reference scenario. The modeling suggests that more positive GDP effects can be achieved if ETS allowances are auctioned and if CO2 taxes are applied in the non ETS sectors, with revenues being recycled for the reduction of labour costs (revenue neutral from a governmental perspective). This confirms previous assessments[6] suggesting that carbon pricing can achieve more positive macro-economic

[6] See for instance the Impact Assessment accompanying A Roadmap for moving to a competitive low carbon economy in 2050, SEC(2011) 288 final.

outcomes, if revenues from these carbon pricing tools are recycled back into the economy and used in a manner beneficial for the entire economy. Also higher levels of energy efficiency and renewable energy, requiring higher level of investments could result in more positive GDP impacts.

46. In terms of employment, the underlying structural changes are expected to have a relatively small positive or negative impact on the overall employment level depending on the methodology used for the assessment, but significant shifts in employment among or within sectors are expected. Such impacts will require that adequate labour market policies are implemented. More detailed, sectoral analysis shows that engineering, basic manufacturing, transport equipment, construction sector and business services gain the most in terms of employment levels, whereas the fossil fuel extraction sectors loose most. Scenarios with ambitious energy effciency policies are typically positive for total net employment.
47. Fossil fuel prices are projected to increase irrespectively of the EU's approach to 2030 targets, and electricity prices are projected to increase significantly under the Reference Scenario. putting pressure on the affordability of energy. The share of energy-related costs (operational and capital costs) in households' expenditure increases in the Reference scenario up to 2030 and the additional increases in policy scenarios are relatively small. The balance is expected to shift from operational costs to capital costs. Household electricity prices and consumption levels would be positively impacted by ambitious energy efficiency policies, reducing energy costs, while at the same time increasing capital cost stemming from the investments necessary to achive the consumption reduction.

Competitiveness of energy-intensive sectors and carbon leakage

48. Macro-economic models were also used to assess impacts of a 2030 target of 40% GHG reductions on the production of energy intensive industrial sectors exposed to international competition. Furthermore the role of free allocation or auctioning is assessed. Again, it is assumed that third countries do not take measures beyond the pledges they made at present in the context of the UNFCCC.
49. The results indicate that the carbon price differential between the EU and other main world regions increases if the EU commits to -40% GHG if others are not increasing their efforts too.
50. Compared to the reference scenario overall production losses compared to the Reference Scenario can be limited for industrial sectors with a GHG reduction of 40%.
51. The analysis confirms the benefits which energy intensive sectors would draw from effective international climate action, leading potentially to increased production compared to a scenario of EU unilateral action, in particular at high levels of ambition.
52. Overall, the analysis confirms that in the case of not sufficiently strong global action, a system of continued of free allocation, with periodic review of the factors determining this free allocation, gives a significantly higher level of protection for energy intensive industries exposed to the risk of carbon leakage, compared with a situation where these sectors would have to purchase allowances. Notably, free allocation works in particular for sectors that are not including the opportunity cost of free allocation in the price of their products. But if sectors (can) include the opportunity cost of free allocation in their price setting, there is less difference of impacts between free allocation and auctioning.
53. Regarding the risk for "investment leakage", it would be beneficial if the allocation system gave more long term clarity on free allocation (as long as third country action are not on par), and if it encouraged production maximisation. In this context, it needs to be noted that rules relating to closure, new entrants, capacity extensions/reductions (which

already exist) and periodic updating of reference years, encourage production maximisation in comparison with a situation of grandfathering of free allowances.

54. Improving the system of free allocation post 2020 requires updating the benchmarks, to define the maximum amount of free allocation, and to assess which criteria best would reflect the actual risk of carbon leakage. Auction revenue or other forms of ETS related revenues (such as what is currently done with the so called NER 300) could also be used in a more targeted manner to promote demonstration of new technologies, including for the energy intensive industries. A dedicated EU programme could be more efficient.
55. Scenarios with ambitious energy efficiency and renewable policies demonstrate lower ETS prices, and scenarios with energy efficiency policies reduce energy consumption, electricity prices and fuel costs. At the same time, such policies result in higher capital costs.
56. Indirect impacts from carbon prices on electricity prices can be compensated through state aid, but it needs to be considered if improvements are needed to avoid distortion of intra-EU competition.
57. In case of strong global action, the continuation of these measures should be reviewed.

5.2. Impacts of other targets or indicators

58. The main disadvantage of *not setting other targets or indicators* for e.g. price competitiveness and security of energy supplies is that it would significantly remove visibility of and importance given to other aspects of security of supply and competitiveness than those addressed by RES and EE targets and policies, and that it would not be compatible with the strong emphasis by the European Parliament and the European Council on the importance of these other objectives.
59. A major disadvantage of setting *targets rather than indicators* is that it would add complexity to the framework as such and would significantly complicate interactions and coherence between various energy and climate areas. It would be particularly difficult to ensure that progress towards a broader set of targets is made at the same time due to complex interactions, and difficult policy decisions would arise if progress towards meeting one target works against another. Moreover, targets should only be set for areas where concrete policies to achieve them are conceivable, and if it is feasible to capture complex objectives in one or a limited set of targets. Simple but comprehensive targets at the EU level for competitiveness and security of supply, the progress to which could be ensured through concrete EU policies are not easily conceivable.
60. The main advantage of setting indicators (potentially associated with aspirational objectives) is that it would recognise the importance of other aspects of competitiveness and security of supply than those addressed by RES and EE targets and policies without setting binding targets that could be difficult to implement and fully integrate with other binding measures. Moreover, by following the development of such indicators over time, policy makers would get a good basis for development and / or adaption of policy direction if need be. In order to ensure that the such policy action is taken on the basis of real developments, aspirational objectives in a given time perspective could be defined with respect to these indicators. The Commission's report on energy costs and prices provides useful information in this regard to build further on.

5.3. Structural measures for the ETS post 2020

Adjustment of the linear reduction factor

61. The analysis demonstrates that in case of a 35% overall domestic GHG reduction, the ETS contribution could be achieved through the continuation of the linear factor of 1.74%, as foreseen in the current legislation (around 38% reductions in 2030 compared to 2005).

62. While 40% GHG reductions could be achieved in 2030 without changing the annual linear reduction factor in the ETS through very ambitious other policies, a change would be required in order to ensure adequate levels of cost-efficiency and maintain the relevance of the ETS in a 2030 perspective. Achieving an overall 40% GHG reduction by 2030 compared to 1990 cost efficiently would see emissions reduce by 43% in 2030 in the ETS compared to 2005. Setting the ETS cap in 2030 at this level would require a change in the linear reduction factor to 2.2% from 2021 onwards. With a 35% GHG target, the linear reduction factor would not have to be changed.
63. But the ETS is expected to remain characterised by large surpluses in the ETS market that are only gradually decreasing after 2020, with remaining surpluses of around 2 billion or more allowances remaining by 2030 also under the policy scenarios achieving higher GHG reductions. It should be noted that this still represents a situation where the market would have to continue to operate with large surpluses, strongly driven by longer term considerations regarding scarcity and costs. If long term considerations are not sufficient to create market certainty, ETS prices may actually be lower and emissions higher than the cap in 2030. The cumulative ETS cap would however still be respected.
64. A change of the linear factor would only gradually start having a meaningful impact in terms of creating more scarcity. This is reflected in the carbon price patterns of these scenarios with very low carbon prices, but potentially increasing quite rapidly post 2020, unless much stronger RES and EE policies are implemented. Such low prices in the short to mid-term increase the risk that the investments required are not fully implemented, potentially leading to a lock-in in more carbon intensive infrastructure.
65. On this basis, an adjustment of the linear reduction factor provides no short term solution for improved functioning of the ETS in the coming decade. In the short term the Commission has proposed to delay auctioning 900 million allowances and backload it to the later part of phase 2.
66. In addition, the Commission also made a specific assessment of more direct structural measures that would improve the market functioning through for instance the creation of a market stability reserve or the permanent retirement of some allowances. For more information regarding this assessment, see the Impact Assessment as regards the establishment of a Structural measure to strengthen the EU Emissions Trading System.

Use of international credits

67. The Clean Development Mechanisms (CDM) and Joint Implementation (JI) are the instruments through which credits are currently generated. They are associated with several difficulties and are often contested by stakeholders, for instance regarding baselines, additionality, excessive rents and perverse incentives. With CDM there is no requirement of an own contribution to mitigate by the seller. The EU banned credits from afforestation and reforestation projects and later restricted certain industrial gas projects as a first step to address these problems.
68. In the reference scenario projections, there is no demand for international credits in the EU ETS after 2020, given that it would only add to the already large surplus of allowances (and credits as allowed up to 2020 in the ETS). This remains true even where a 2030 target is set to deliver a 40% GHG reduction. If overall emissions are to be reduced by 40% by 2030 compared to 1990, then even with a 43% reduction target in the EU ETS compared to 2005, there could still be a surplus in the EU ETS amounting to around 2 billion allowances by 2030. This is reflected in the default situation, whereby no further credits are used for compliance after 2020. Hence limiting the access to international credits appears a necessary but insufficient option to address the ETS surplus. A 2030 framework with an unconditional target not allowing for additional large inflows of international credits and a higher ambition allowing a large share of additional efforts

being met through international credits, could create more certainty on reductions that are really necessary domestically. Allowing that a large share of the additional effort to meet a conditional target comes from international credits, may incentivise further development of a genuine international carbon market that captures own appropriate action by all parties.

5.4. EU action in the context of increased international action

69. The impact of a higher conditional GHG target for the EU, with at the same time sufficient global action to limit global warming to below 2°C, has been assessed. This would clearly require action by all parties, comparable reduction targets by countries with similar responsibilities and capabilities as the EU, and considerable emission reduction efforts by emerging economies to enable their emissions to peak before 2030.
70. In order to simulate impacts of a conditional (higher) target, and without prejudice to any eventual position on what a potential unilateral and a potential conditional target may be, two examples were assessed based on a 35% and a 40% unilateral target and a 45% and a 50% conditional GHG target. In case of the conditional targets, it is assumed that globally action is taken consistent with 2°C.
71. This analysis confirms that the GDP impact in the EU of higher conditional targets is negative but with access to international credits reducing the impacts. In the latter case negative GDP impacts from the higher targets are limited to 0.5% and 1.2% respectively in 2030. However, global GDP impacts are larger than those for the EU.
72. In addition, the results indicate that most EU energy intensive industries would significantly benefit from global action, for instance through a binding international agreement, with potentially increasing production in the EU in some sectors, thereby confirming that global action is beneficial for the competitive situation of most EU energy intensive industries.

5.5. Policy options for the land sector

73. Approaches for policies addressing CO_2 emissions and absorptions of the land sector could continue to treat this sector separately, or address it together with the other emissions from the agricultural sector. Considering the strong linkages between land management and agricultural activity this latter option seems to have advantages. The practical implementation could include the CO_2 emissions and absorptions of the land sector in the potential future Effort Sharing Decision (governing the non-ETS sectors) or rather do the opposite, and take the agricultural Non-CO2 emissions out of the potential future Effort Sharing Decision and integrate it together with the CO_2 emissions and absorptions of the land sector into one new pillar of the EU's climate policy. This would allow for broader incentives for climate friendly and smart agriculture than today within a post-2020 Common Agricultural Policy.

5.6. Implementing a potential RES target

74. Implementing approaches to meeting a renewables target for 2030 would have to be assessed in detail in a future Impact Assessment if there is agreement on the target as such. If the 2030 framework were not to include an explicit RES target, other supporting measures relating to e.g. infrastructure, planning and permitting, grid access, targeted funding etc. would become even more important. Some general considerations can be made:
75. First, an EU-level target could avoid setting national targets. This potentially could lead to development of renewables where the resources are most abundant, and thereby in theory improving EU wide cost-efficiency. At the same time, if Member States do not have specific targets, they would have less incentive to mitigate administrative barriers and

facilitate uptake through grid developments and necessary licensing. Moreover, Member State targets could better ensure a balanced development of renewables across the EU economy and society.

76. Second, meeting an EU target without national support schemes but with schemes at the EU level would be less distortive to competition and market integration, but would at the same time reduce Member State flexibility to adapt to specific circumstances and decide themselves how finance / support RES developments.
77. Third, technology neutrality and equal treatment of all renewable options without sector specific targets or support schemes would improve short to medium term cost-efficiency, at least in theory. On the other hand, truly technology neutral approaches would typically lead to excess profits for producers of more cost-competitive renewables, and would not ensure development, deployment and cost-reductions that could be necessary for cost-efficiency in the longer term, in particular if the EU were to agree on more ambitious renewables objectives post 2030. Moreover, the development of innovative, currently more costly RES technologies might be hampered, impacting thereby on longer term industrial leadership of EU companies.

5.7. Implementing a potential energy efficiency / savings target

78. Energy efficiency is fundamental to achieve long term GHG reduction objectives and energy efficiency policies will be necessary even in absence of a explicit target to address market failures and imperfections, and thereby ensuring that reductions of both energy consumption and GHG emission are achieved in practice. All scenarios analysed but the ones driven by a sole GHG target include explicit assumptions to varying degrees on the type of energy efficiency policies implemented, but the purpose of this impact assessment is not to evaluate in detail the various means of meeting a potential energy efficiency target/objective for 2030.
79. Such assessment will be part of the 2014 review of the approach to energy savings in a 2020 perspective. This 2014 review should also consider if energy intensity rather than absolute energy savings could be a more suitable basis for post 2020 objectives in sectors of the economy where energy consumption is strongly correlated with economic activity; provided that implicit or explicit sectoral targets would be considered appropriate and cost-effective. A combination of the two approached could also be considered.
80. Irrespective of any potential 2030 targets in this regard, and without prejudice to the 2014 review, it will be important also in a 2030 perspective to continue policies at the EU level ensuring a high level of energy efficiency, especially in areas such as buildings, energy consuming appliances, vehicles etc. to ensure a level playing field and safeguard the internal market for related products. There will be a need to foster governance and the capacity of market actors and policymakers to introduce energy efficiency measures and to improve the financeability and risk profile of energy efficiency investments.

5.8. Differential impacts across Member States

81. The analysis indicates that assuming cost-effective approaches for GHG targets, RES targets and EE policies, efforts in lower income Member States are relatively larger than for higher income countries, with relatively higher increases in investments and system costs compared to GDP, but also relatively higher benefits in terms of fuel savings and air quality. For options achieving 40% EU wide GHG reductions it is estimated that for the group of Member States with 2010 GDP/capita below 90% of EU average the additional energy system costs increases over and above the EU average costs increases are annually between 1.7 and 4.6 billion€ over the period 2021-2030.
82. Several distributional mechanisms are conceivable to allow for more equitable outcomes, such as the differentiation of targets, the distribution of auctioning revenues and the use of

smart financial instruments, structural funds etc. It would be important to ensure that such options do not unduly decrease overall cost-effectiveness of the policy framework by building in sufficient flexibilities. Such options should be analysed in more detail when preparing legislative proposals.

6. COMPARING THE OPTIONS FOR HEADLINE TARGETS AND INTERACTIONS

83. The assessment of headline targets and policies for 2030 has focused on mutually coherent policy options. Relevant impacts of the different options for headline targets are compared in the following table. The analysis shows that there are different ways of ensuring progress towards a sustainable, competitive and secure energy system and economy in a 2030 perspective.
84. Enabling conditions e.g. on R&D, infrastructure and public acceptance are important to achieve the long term transition towards a competitive and secure low-carbon economy, and such conditions show already some limited benefits in 2030.
85. A single GHG target would in principle treat options for GHG reductions in a non-discriminatory and technology neutral way. However, higher efforts geared towards energy efficiency and renewable energy beyond what is needed to achieve a GHG target would result in higher benefits relating to e.g., improvements in fuel efficiency, security of supply, reduction of the negative trade balance for fossil fuels, environmental impacts and health. A single GHG target is also expected to result in lower GDP and employment compared to a framework based on more ambitious targets for also renewables and energy efficiency, while macro-economic benefits associated with the recycling of auctioning revenues into lower labour costs would increase.
86. A single GHG target would result in lower energy related cost increases and necessary investments if met in an optimal way as represented by the use of carbon values in the modelling approach compared to a situation with three targets if renewable and energy efficiency targets would be set at a level above their cost-effective potential to meet the GHG target.
87. The containing impact on the ETS price is substantial from a Framework that would include specified ambition levels or strong policies for also renewables and energy efficiency. At the same time, renewables and energy efficiency investment going beyond what is needed to achieve cost-effectively a certain GHG target, would come with additional capital costs and lower operational costs only in the medium to long term, which overall would result in higher energy system costs.
88. A *40%* GHG target would ensure that the EU is on the Low-Carbon Economy Roadmap's cost-effective track towards meeting the EU's 2050 GHG objective to reduce GHG emissions by 80-95 percent in 2050 compared to 1990, in the context of necessary reductions by developed countries as a group. While that 2050 target could in principle be reached also with a *35*% GHG target for 2030, the Commission's current analysis suggests that it would come with additional costs over the entire time period up to 2050, while having lower costs in a 2030 perspective.
89. The 2020 target implies a 20 percent reduction over three decades and a 40 percent target in 2030 would imply the same reductions in one decade, strictly looking at the targets. On the other hand, so far we have achieved 18% reduction in 22 years (1990-2012), and going to a 40% target would mean a further 22% reduction in 18 years (2013-2030).
90. A 40% target would give a strong message to the international community in the process leading up to the international climate conference in 2015. At the same time, keeping in mind that the EU's agreed 2050 GHG objective can only be met through international climate action it leaves the question open if the EU's initial contribution to an international agreement should be lower

91. As regards renewables, it is clear that a high level of ambition would come with significant benefits in terms of greater reliance on indigenous energy sources and the associated positive impacts on energy trade balance (to the extent that renewables no not replace other domestic energy sources). At the same time, the level of ambition must be coherent with the overall level of ambition for GHG reductions and not result in unwarranted impacts to continue with other low-carbon energy sources incentivised by the ETS or result in unwarranted restrictions of Member State flexibility to achieve GHG reductions outside the ETS.

92. As regards energy efficiency, the trade-offs between different levels of ambition is similar to that of renewables in the sense that a high level of ambition could lead to short to medium term cost increases that pay off only in the medium to long run. At the same time, a high level of ambition has the potential to better contain the operational energy cost impact of higher energy prices. Moreover, given a certain GHG target to be achieved, health benefits and impacts on the energy trade balance are larger with a higher level of ambition regarding energy efficiency, which is also expected to lead to more positive GDP and employment impacts. Again, this has to be weighed against potential impacts on short to medium term cost increases.

Table 1: Overview table with the key results for the IA for the different scenario projections

	Ref.	GHG35/ EE ®	GHG37 ®	GHG40 ®	GHG40	GHG40/ EE	GHG40/ EE/RES30	GHG45/ EE/RES35
	Main features scenarios							
Reference or enabling conditions	Ref.	Ref.	Ref.	Ref.	Enabling	Enabling	Enabling	Enabling
GHG reductions vs 1990	-32.4%	-35.4%	-37.0%	-40.4%	-40.6%	-40.3%	-40.7%	-45.1%
Renewables share[7] - Overall	24.4%	25.5%	24.7%	25.5%	26.5%	26.4%	30.3%	35.4%
Energy savings[8]	-21.0%	-24.4%	-22.9%	-24.4%	-25.1%	-29.3%	-30.1%	-33.7%
	Environmental impact indicators							
GHG emissions reduction in ETS Sectors vs 2005	-36%	-37%	-38%	-42%	-43%	-38%	-41%	-49%
GHG emissions reduction in non-ETS Sectors vs 2005	-20%	-26%	-28%	-31%	-30%	-35%	-33%	-34%
Reduced pollution control & health damage costs (€bn/yr)[9]		3.8 - 7.6	4.2-8.8	8.6 - 17.1	7.2 - 13.5	17.4 - 34.8	16.7 - 33.2	21.9 - 41.5
	Energy system impacts indicators							
Net Energy Imports (2010=100)	96	90	94	92	89	83	81	78
Energy Intensity[10] (2010=100)	67	64	66	65	64	60	60	57
Renewables share[11] in electricity, heating & cooling	31.0%	32.6%	31.6%	32.9%	34.2%	34.1%	39.7%	47.3%

7 Share of RES in gross final energy consumption according to 2009 RES Directive.

8 Energy Savings evaluated against the 2007 Baseline projections for 2030.

9 Reduction of health damage costs due to reduced air pollution compared to the reference (€bn/yr). Valuation uses value of life year lost used for the Thematic Strategy on Air Pollution, ranging €57000 to €133000 per life year lost.

10 Primary energy to GDP.

11 Contribution of RES in gross final energy consumption of electricity and heating & cooling, based on the individual calculations of the RES according to 2009 RES Directive.

	Ref.	GHG35/ EE ®	GHG37 ®	GHG40 ®	GHG40	GHG40/ EE	GHG40/ EE/RES30	GHG45/ EE/RES35
	Economic and social impacts							
Total System Costs, avg annual 2011-30 (bn €)	2,067	2,064	2,073	2,074	2,069	2,089	2,089	2,102
Total System Cost as % of GDP increase compared to Reference in 2030 in % points	+0.0%	+0.03%	+0.13%	+0.20%	+0.15%	+0.54%	+0.54%	+0.84%
Investment Expenditure[12] in reference and changes compared to reference (avg 2011-30, bn €)	816	+17	+19	+30	+38	+59	+63	+93
Energy Purchases in reference and changes compared to reference (avg 2011-30, bn €)	1,454	-26	-8	-8	-18	-34	-31	-23
Fossil Fuel Net Imports in reference and changes compared to ref.(avg 2011-30, bn €)	461	-10	-2	-4	-9	-20	-22	-27
Average price of electricity[13] (€/MWh)	176	174	176	181	179	174	178	196
ETS price (€/t of CO2)	35	27	35	53	40	22	11	14

[12] Investment expenditure includes total purchases of transport equipment for households and businesses (including road and non-road transport), but not transport infrastructure costs.

[13] Average Price of Electricity in Final demand sectors (€/MWh) constant 2010 Euros. For reference scenario, corresponding value was 134 €/MWh in 2010.