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Working Paper

Options for non-ETS target setting in 2030

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1. Introduction

In January 2014, the European Commission published a communication entitled 'A policy framework for climate and energy in the period from 2020 to 2030' (European Commission, 2014a), which outlined the following policy objectives for the EU:

- Greenhouse gas (GHG) target to reduce domestic GHG emissions by 40 % below 1990 levels in 2030;
- Renewable energy (RES) target of at least 27 % of energy consumption by 2030, with flexibility for Member States to set national objectives.
- Increasing energy efficiency. The ambition level is to be determined in the context of the review of the 2020 energy efficiency target (summer 2014).

The domestic GHG target for 2030 is split between the Emission Trading Scheme (ETS) and non-ETS sectors on the basis of cost efficiency (European Commission, 2014b). The ETS is expected to deliver a reduction of 43 % below 2005 emission levels in 2030 by increasing the annual linear reduction factor determining the ETS cap to 2.2 % from 2021 onwards. Whilst the non-ETS sector aims to achieve a 30 % reduction below 2005 emission levels in 2030 by setting non-ETS targets for Member States. However, at present there is no recommendation from the European Commission on how to allocate the non-ETS reductions amongst the Member States with the Impact Assessment (European Commission, 2014b) only providing a calculation of a cost efficient distribution.

The aim of this briefing paper is to explore options for 2030 non-ETS target setting, which may be accepted by all Member States. In order to build consensus on an approach to non-ETS effort sharing in 2030, it is necessary to have a common understanding of the current and projected situation in terms of per capita emissions (see Chapter 2) and an appreciation of the level of reductions required to remain on course for meeting longer term emission reductions in 2050 (see Chapter 3). It is unlikely that the current distribution of non-ETS targets for 2020 based upon GDP per capita can be applied to non-ETS reductions for 2030, as this would result into targets spread in a range of 60 % below 2005 emission levels and 60% above 2005 emission levels. In order to analyze whether growth targets are in line with overall reduction needs the current 2020 targets are compared with average per capita emissions in 2030 (see Chapter 3). Different options for 2030 non-ETS target setting are outlined in Chapter 4 followed by a discussion of their advantages and disadvantages in Chapter 5 along with concluding remarks on the way forward towards an agreement.

2. Current and projected non-ETS emissions up until 2020

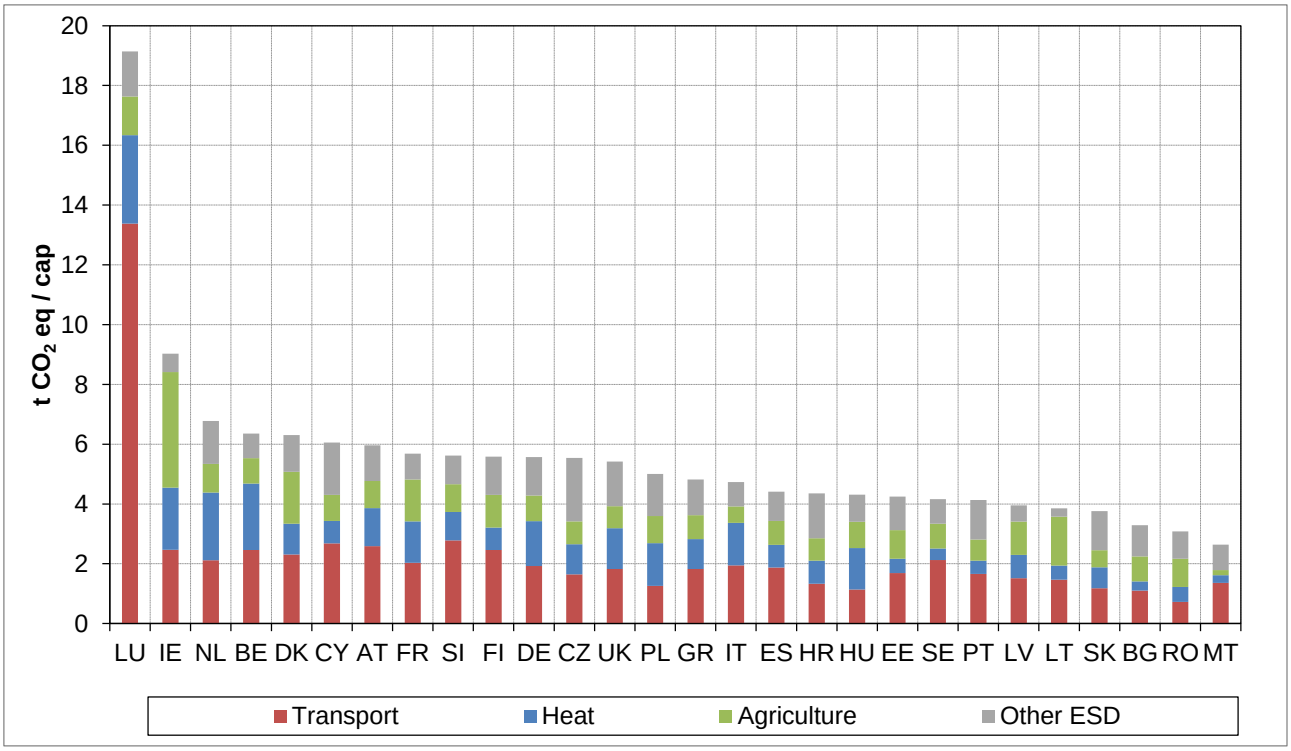
Currently non-ETS emissions in the EU are 5 t CO_2eq per capita on average in 2011. The picture varies across Member States. In most Member States per capita emissions in the non-ETS sectors in 2011 range from 3 t CO_2eq per capita to 7 t CO_2eq per capita (see Figure 2-1). Transport is the most important sector contributing to non-ETS emissions, followed by heating[1] and agriculture. Figure 2-1 also illustrates the different structure of the economies. Countries in southern Europe have a lower demand for heating due to milder temperatures;[2] other countries have high emissions

[1] The inventory category 1.A.4 (Other Sectors) including emissions from Commercial/Institutional and Residential sectors is used as q proxy for emissions from heating.

[2] The attribution of heating emissions to the ETS and non-ETS sector may vary across Member States depending on whether district heating is common (large CHP plants are covered under the ETS while domestic boilers are not).

from agriculture (Ireland). Per capita emissions are highest in Luxembourg, which is mainly due to the fact that fuel taxes are very low in Luxembourg. Thus a major share of the fuel sold in Luxembourg is used abroad by foreign vehicles.

Figure 2-1: Non-ETS emissions per capita by sector in 2011



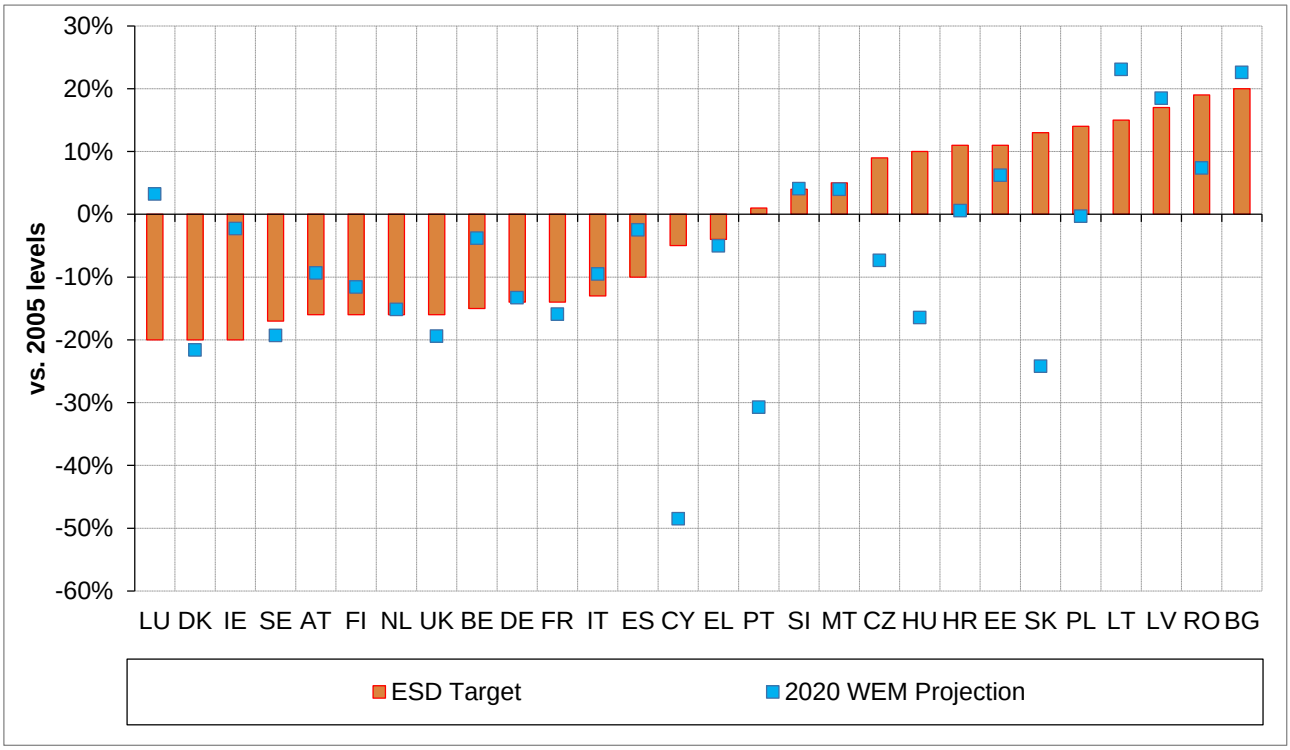
Source: EEA (2013a), EEA (2013b), Own Calculation (2014)

Given the heterogeneity of the EU, the Effort Sharing Decision (ESD) allocated 2020 non-ETS targets to Member States within a range of + 20 % to -20%, relative to 2005 emission levels, depending upon their GDP per capita compared to the EU average (EU, 2009).

Bulgaria is associated with a relatively low GDP per capita and is therefore allowed to increase non-ETS emissions in 2020 by 20 % above 2005 levels (increase to 3.7 t CO_2eq per capita in 2020). In contrast, Luxembourg is associated with a relatively high level of GDP per capita and therefore is required to reduce non-ETS emissions in 2020 by 20 % below 2005 levels (reduce to 15.4 t CO_2eq per capita in 2020). The range of targets under the ESD collectively achieves a non-ETS reduction of around 10 % below 2005 emission levels for the EU and will require the majority of Member States to reach between 4 and 6 t CO_2eq per capita by 2020.

The ESD target for each Member State relative to 2005 levels is illustrated in Figure 2-2 by the orange bars whilst the blue squares represent the expected non-ETS emissions of each Member State in 2020 based upon their own projections taking into account policies and measures already implemented (EEA, 2013; Table 7.3). Progress towards ESD targets varies with Member States such as Denmark, Sweden and the United Kingdom projecting to exceed their non-ETS targets – while other Member States are less optimistic based on current measures. Given that the majority of Member States (15) expect to either meet or exceed their ESD target, the non-ETS emission targets for 2020 outlined by the ESD should be considered as a conservative baseline for future discussions on 2030 non-ETS target setting.

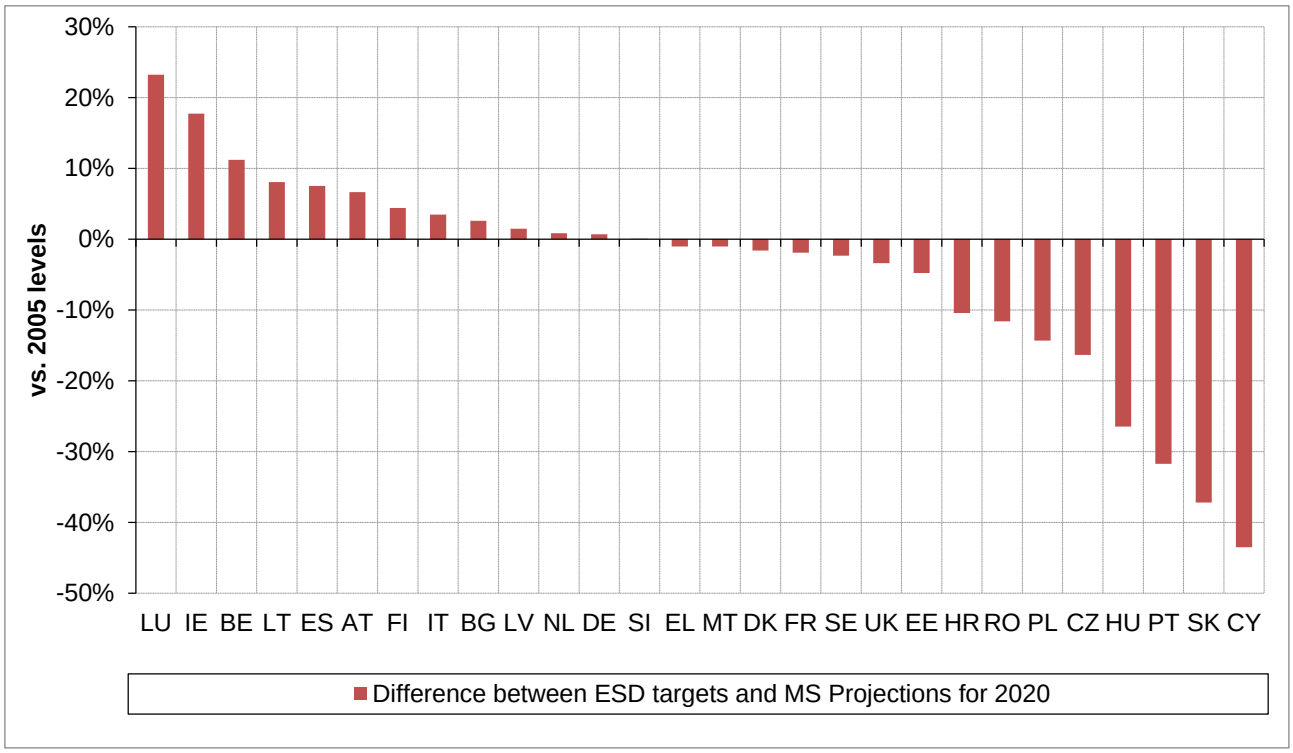
Figure 2-2: Comparison of Member State projections (with existing measures) for non-ETS emissions in 2020 with the ESD targets



Source: (EU, 2009), EEA (2013) Trends and Projections Report: Table 7.3

The difference between the ESD target for each Member State and their projected non-ETS emissions in 2020 is illustrated further in Figure 2-3. This figure presents the deviation of projected emissions (with existing measures) in 2020 from 2020 ESD targets, expressed in percentage points of 2005 levels. Using this metric gives a more realistic idea of the effort required between 2020 and 2030 than using the 2020 targets. Based upon Member State projections it is expected that Luxembourg, Ireland and Belgium will be considerably short of AEAs in 2020 whilst Portugal, Slovakia and Cyprus will all have a surplus of Annual Emission Allowances (AEAs) in 2020. It is therefore likely that the trading of AEAs will be required in order for all countries to fully comply with the ESD. The continuation of such a flexible mechanism in the non-ETS sector is expected to be necessary in the 2030 Framework to ensure that a fairer distribution of non-ETS targets can also be reasonably cost efficient.

Figure 2-3: Difference between ESD target and MS Projections for 2020

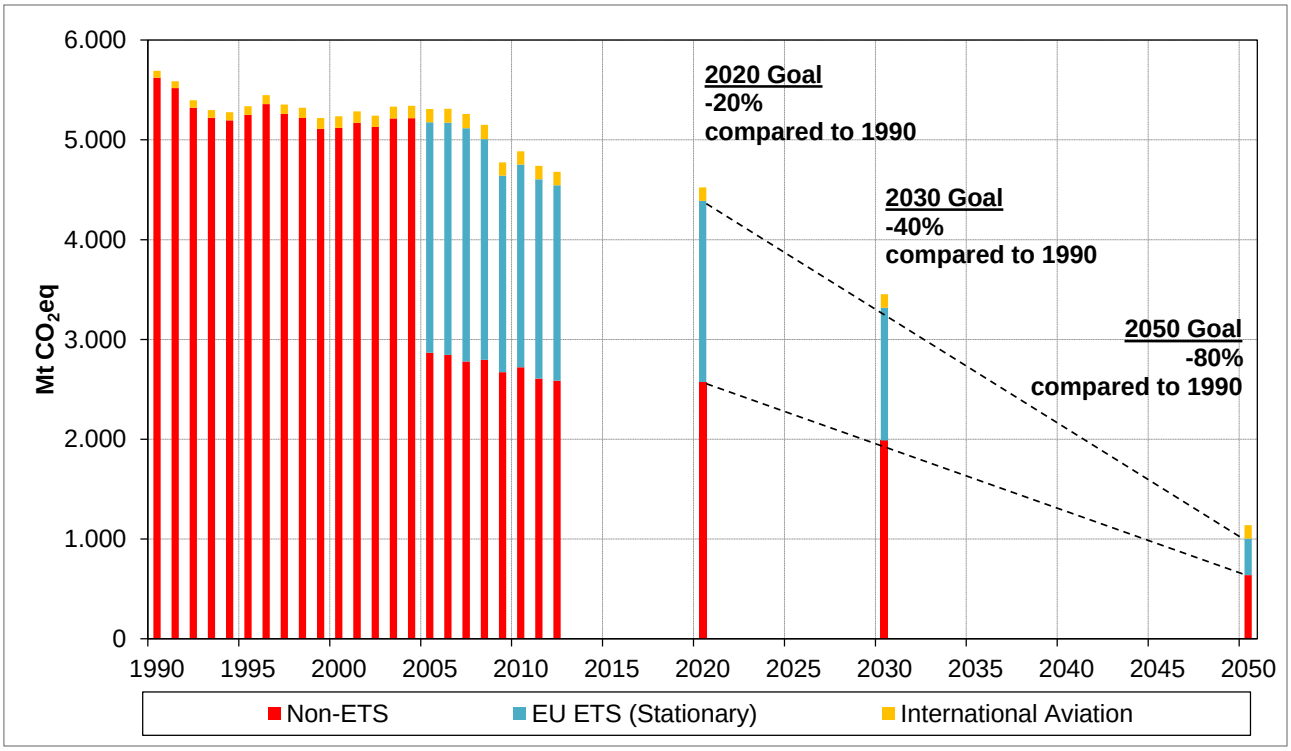


Source: (EU, 2009), EEA (2013) Trends and Projections Report: Table 7.3

3. Long term reduction needs in the non-ETS sector

Beyond 2030, the European Commission has formulated the target to reduce emissions to 80 % below 1990 levels through domestic reductions alone until 2050. This long-term target, as well as a cost-effective pathway for achieving such deep emission cuts, is set out in the 'roadmap for moving to a competitive low-carbon economy in 2050' (European Commission, 2011). Figure 3-1 illustrates the effort required by the EU to achieve an emissions reduction of 80 % below 1990 levels by 2050. Assuming that the EU ETS cap is strengthened by implementing a linear reduction factor of 2.2 % from 2021 onwards, the non-ETS sectors would need to reduce emissions to a level of around 600 $MtCO_2eq$ in 2050.[3] Given that the EU-28 had a population of 508 Million in 2012 this translates into average emissions of 1.3 t CO_2eq per capita in 2050. For simplicity it was assumed that the population remains constant in each country.[4] This means that in 2050 there will be very limited room to take different circumstances of Member States into account. A long-term convergence of emissions is also in line with the declared objective of the European Union to facilitate the convergence of living conditions in all Member States.[5]

Figure 3-1: Long term reduction needs until 2050 under a 80% reduction scenario



Source: EEA (2013a), EEA (2013b), (EU, 2009), (European Commission, 2011), (European Commission, 2014b)

In order to evaluate whether or not the 2030 target for non-ETS emissions proposed by the European Commission (30 % below 2005 emission levels) is consistent with the long term

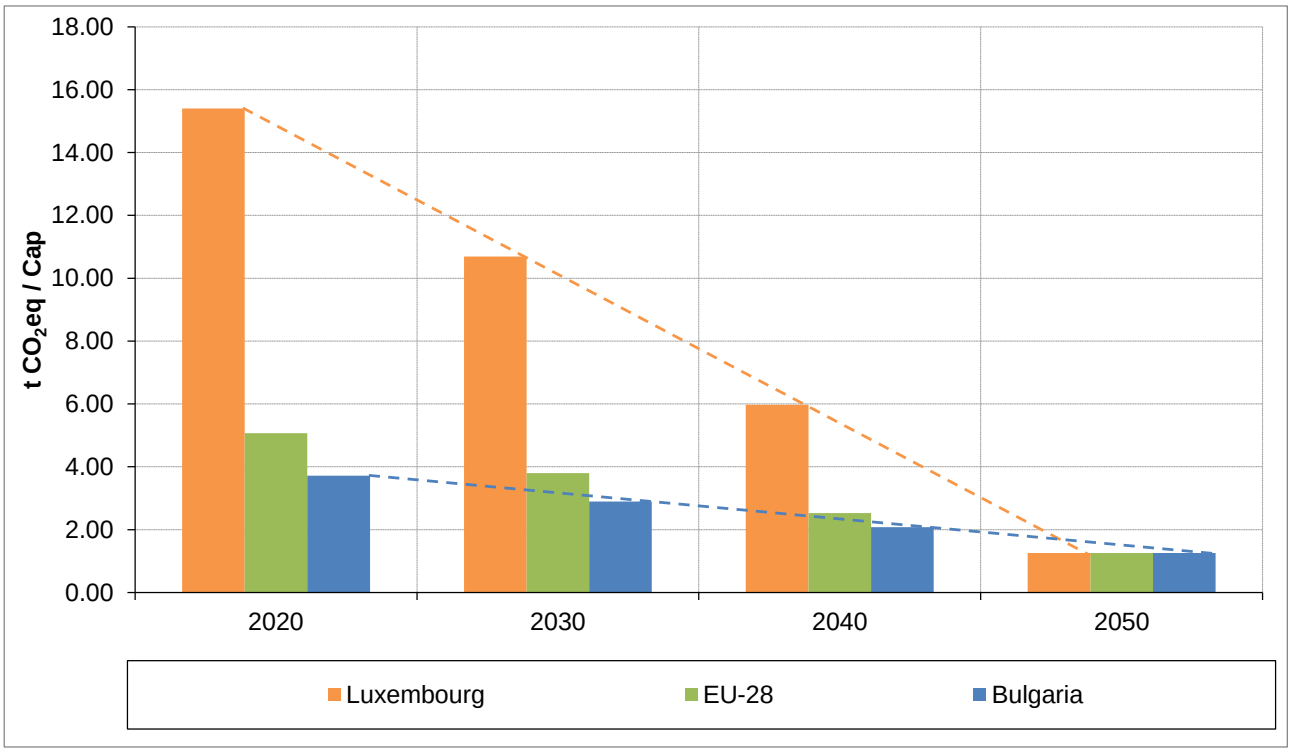
[3] In this study it is assumed that aviation emissions will remain stable at 2012 levels.

[4] In a future analysis it would be possible to use population projections. In case population in one country would decrease by 5% this would result in a reduced emission target of 5% for this country. The higher the reduction effort, the lower the impact of a changed population on the target.

[5] Art. 121 III of the Treaty on the Functioning of the European Union (TFEU)

trajectory, the linear reduction path of emission reductions necessary between 2020[6] and 2050 was calculated and then compared to 2030.[7] The current proposal for a 2030 non-ETS target for the EU-28 is only slightly higher (3.9 CO_2eq/capita) than the necessary 2030 non-ETS target for the EU-28 calculated in this study (3.8 CO_2eq/capita), which is illustrated in Figure 3-2 by the green bar. The pace at which Member States should reduce their non-ETS emissions in order to be consistent with the long term trajectory for 2050 depends upon their starting point in 2020. For example, Luxembourg (orange bar) would need to reduce at a faster rate over time than Bulgaria (blue bar) due to the fact that their emissions per capita are higher in 2020 (Figure 3-2).

Figure 3-2: Long term convergence approach for non-ETS target setting in 2030



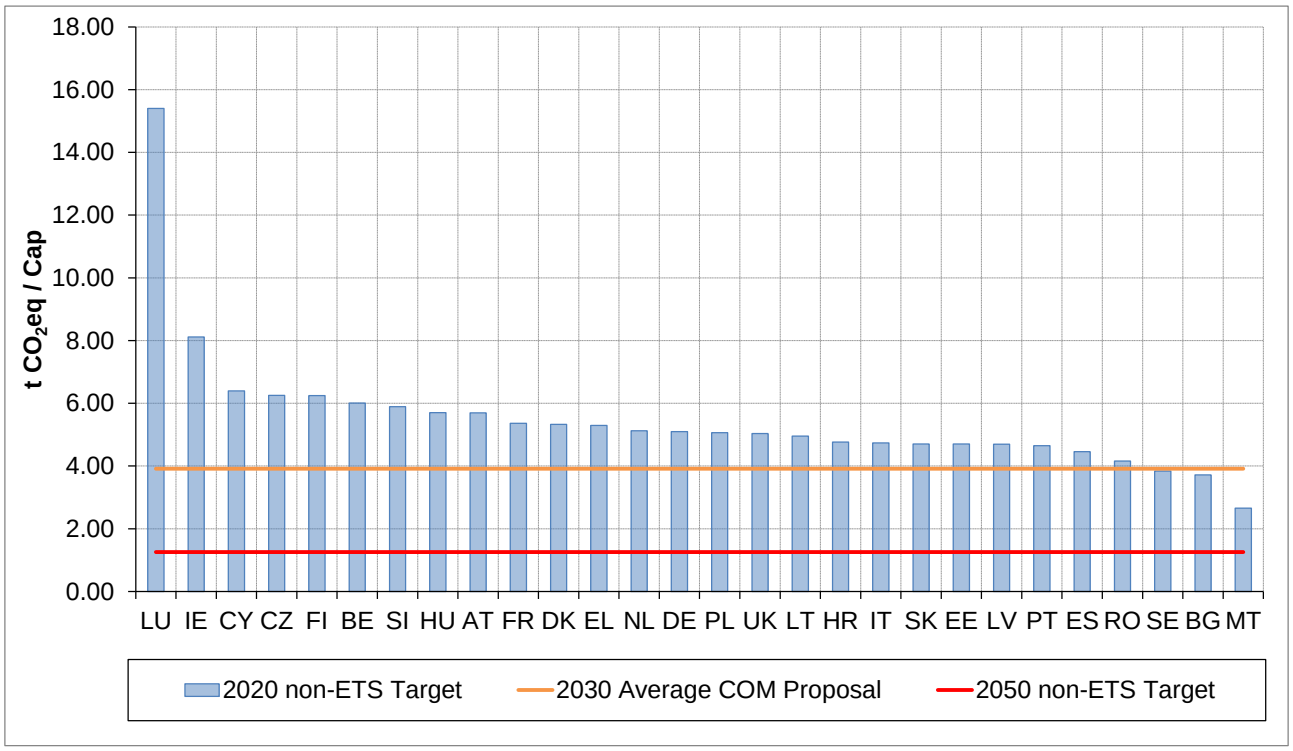
Source: EEA (2013a), EEA (2013b), (EU, 2009), (European Commission, 2011), Eurostat (2014a)

Figure 3-3 compares per capita targets in 2020 with the necessary emission reductions proposed by the European Commission in 2030 (3.9 t CO_2eq/capita) and 2050 (1.3 t CO_2eq/capita). When comparing the 2020 targets (illustrated by the blue bars) with the average 2030 target (illustrated by the orange line) it becomes clear that all Member States (with the exemption of Sweden, Bulgaria and Malta) need to reduce emissions further. Sweden, Bulgaria and Malta have the lowest per capita targets in 2020, with which these countries would already reach the average 2030 target of 3.9 t CO_2eq per capita. Actually with non-ETS emissions in 2011 these three countries together with Slovakia and Lithuania have already 3.9 t CO_2eq per capita or lower as shown in Figure 3-3.

6 It was assumed that the ESD target (European Commission, 2013a), (European Commission, 2013b) for the EU-28 was achieved in 2020

7 This involved calculating an annual emissions per capita reduction rate for the EU-28 by subtracting non-ETS emissions per capita in 2020 (assuming the ESD target was achieved) from non-ETS emissions per capita in 2050 and then dividing this result by the time period (30 years). Population remains constant at 2012 levels.

Figure 3-3: 2020 non-ETS targets in comparison to average EU-28 reduction needs in 2030 and 2050



Source: EEA (2013a), EEA (2013b), (EU, 2009), (European Commission, 2011), (European Commission, 2014b) , Eurostat (2014a)

It is important to acknowledge that Figure 3-3 demonstrates that there is no room for any Member State to increase their emissions above their non-ETS 2020 target as the non-ETS reduction target in 2050 (illustrated by the red line) shows that all Member States will be required to reduce their per capita emissions in the long term.

4. Options for allocating 2030 non-ETS targets

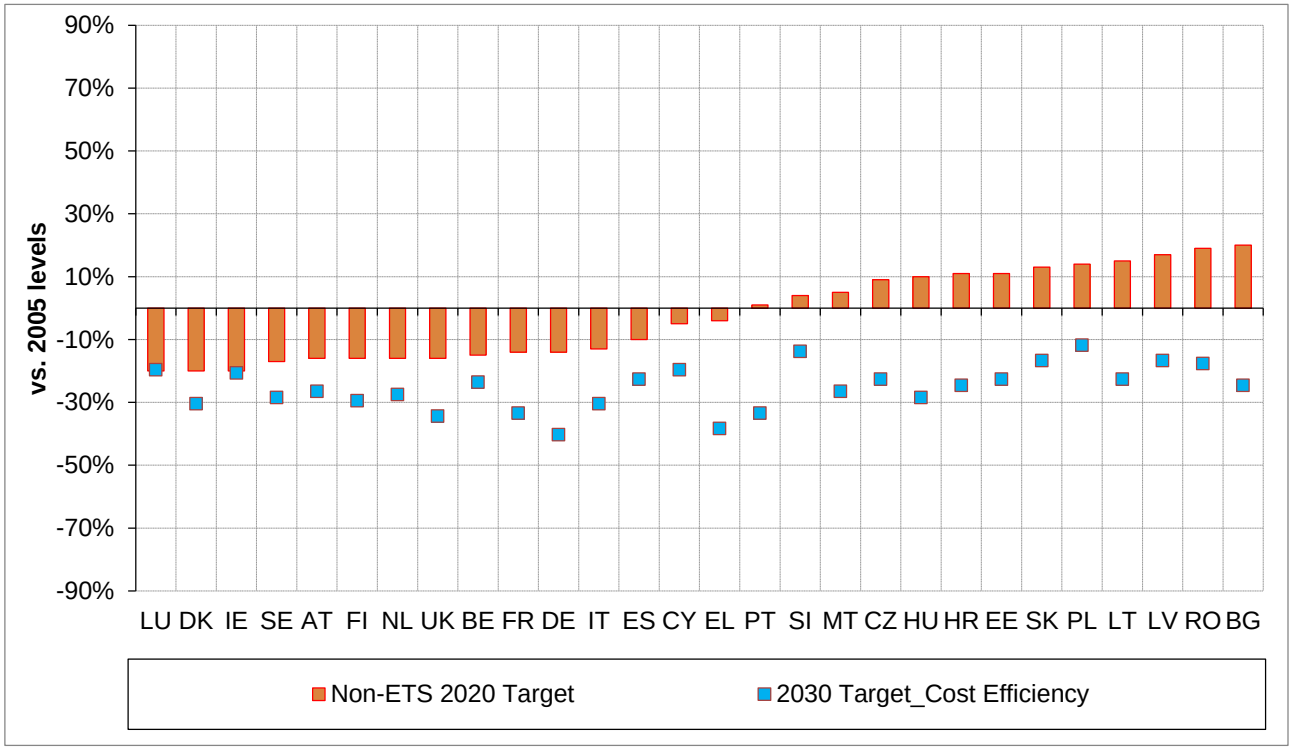
All of the effort sharing approaches considered in this section deliver a non-ETS reduction of 30 % below 2005 emission levels in 2030, which is in accordance with the Communication published by the European Commission entitled ‘A policy framework for climate and energy in the period from 2020 to 2030’ (European Commission, 2014a). The different distributional outcomes for 2030 non-ETS target setting reflects the selection of effort sharing approaches based on different criteria (cost efficiency, reduction effort, per capita emissions and economic capacity), which will be explained and discussed in the following sub-sections.

4.1. Cost efficiency approach

The distribution of reduction effort among the ETS sector and the non-ETS sectors proposed by the European Commission was based on a cost efficiency assessment. The modelling in the Impact Assessment accompanying the 2030 Framework assumes that 'EU-wide targets are met in a cost optimal way, while reflecting existing policies of the Member States already included in the Reference Scenario' (European Commission, 2014b, pg. 121). The Impact Assessment does not quantitatively assess a range of different approaches for distributing the 2030 non-ETS target amongst the Member States, instead opting to provide a calculation of how the additional emission reductions beyond a 2030 reference scenario are achieved in a cost efficient way under a range of policy scenarios.

Given the recent publication of a communication from the European Commission (European Commission, 2014a) expressing support for a 40 % GHG reduction target below 1990 levels and a RES target of at least 27 % share in final gross energy consumption in 2030; the cost efficient distribution under the scenario entitled 'minimum for GHG -40 %' from the Impact Assessment accompanying the 2030 Framework[8] is a starting point to compare potential effort sharing approaches in this study.[9] The resulting targets are shown by the blue squares in Figure 4-1 for each Member State and compared with their existing non-ETS targets for 2020 (orange bars).

Figure 4-1: Comparison of 2020 and 2030 non-ETS targets (based on cost efficient distribution from the minimum values for GHG -40% scenario)



Source: EEA (2013a), EEA (2013b), (EU, 2009), (European Commission, 2014b), Own Calculation (2014)

[8] The minimum for GHG -40 % scenario was selected as it was the only policy scenario that delivered a 30% reduction in non-ETS emissions below 2005 levels in 2030 (i.e. comparable with the European Commission proposal).

[9] The non-ETS targets under this approach have been scaled to ensure that the average reduction for the EU-28 is 30 % below 2005 emission levels in 2030 and is comparable with the other distribution options considered in this study.

Under the cost efficient approach, Germany (DE) is expected to accept the highest reduction target in 2030 relative to their non-ETS emissions in 2005 (- 40 %).[10] However if the non-ETS target in 2020 is considered to be the starting point for target setting (rather than 2005 emission levels) then the reduction effort for Germany declines to 26 percentage points of 2005 emissions below the 2020 target and Bulgaria (BG) actually receives the most ambitious target with a reduction of 45 percentage points of 2005 emissions below the 2020 target.[11] In contrast, Poland (PL) is allocated the least ambitious non-ETS reduction target relative to 2005 emissions under the cost efficient approach (- 12%). Although if the non-ETS emission target level in 2020 is considered to be the starting point for target setting then the reduction effort for Poland increases to 26 percentage points of 2005 emission levels below the 2020 target and Luxembourg (LU) receives the least ambitious target and is only required to stabilise non-ETS emissions at 2020 levels.

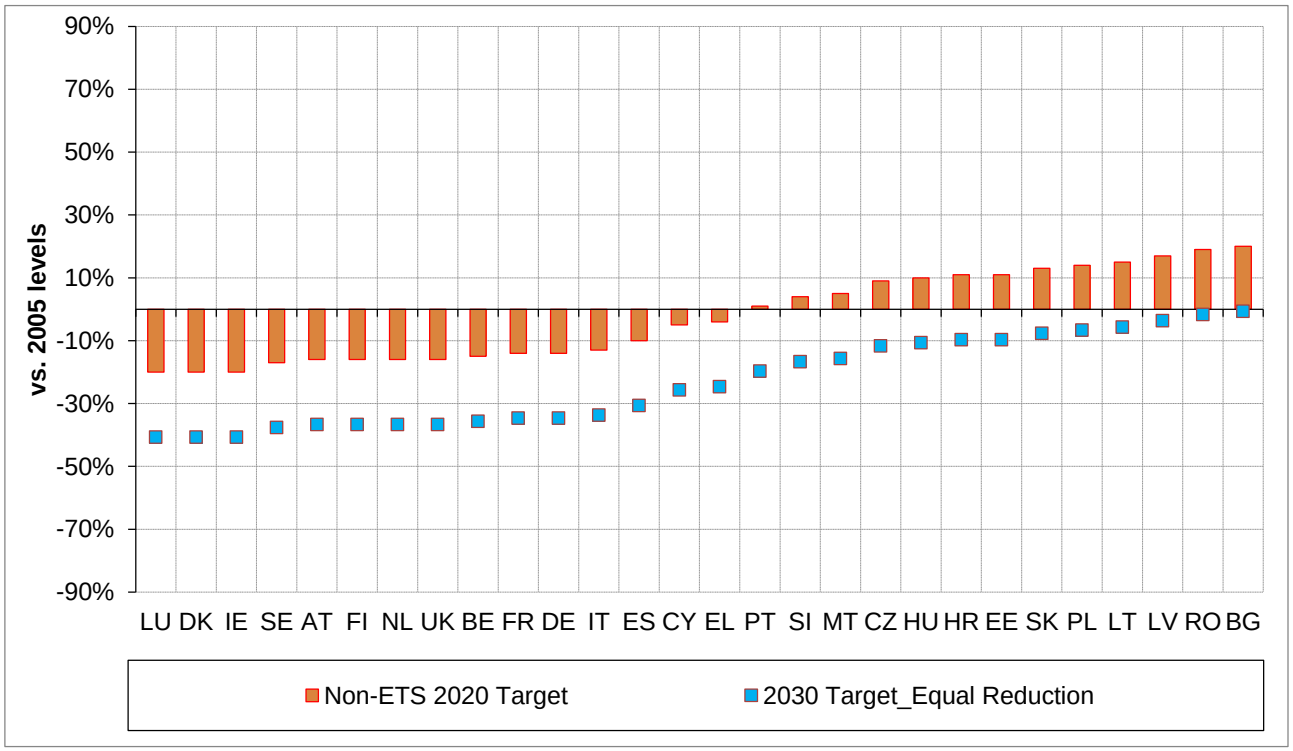
[10] The ambitious reduction target for German in 2030 under this approach is actually more of a reflection of the existing measures that are included within the 2030 reference scenario in the Impact Assessment accompanying the 2030 Framework rather than cost efficient abatement potential.

[11] To calculate the non-ETS reduction from a 2020 starting point relative to 2005 levels simply calculate the difference between the non-ETS target for 2020 and the proposed non-ETS target for 2030.

4.2. Equal reduction effort approach

The equal reduction effort approach requires all Member States to undertake the same reduction effort. The existing non-ETS targets for 2020 are used as the starting point and each Member State has to reduce 21 percentage points[12] of 2005 emissions below 2020 targets. The resulting targets are shown by the blue squares in Figure 4-2 for each Member State and compared with their existing non-ETS targets for 2020 (orange bars).

Figure 4-2: Comparison of 2020 and 2030 non-ETS targets (based on equal reduction effort)



Source: EEA (2013a), EEA (2013b), (EU, 2009), Own Calculation (2014)

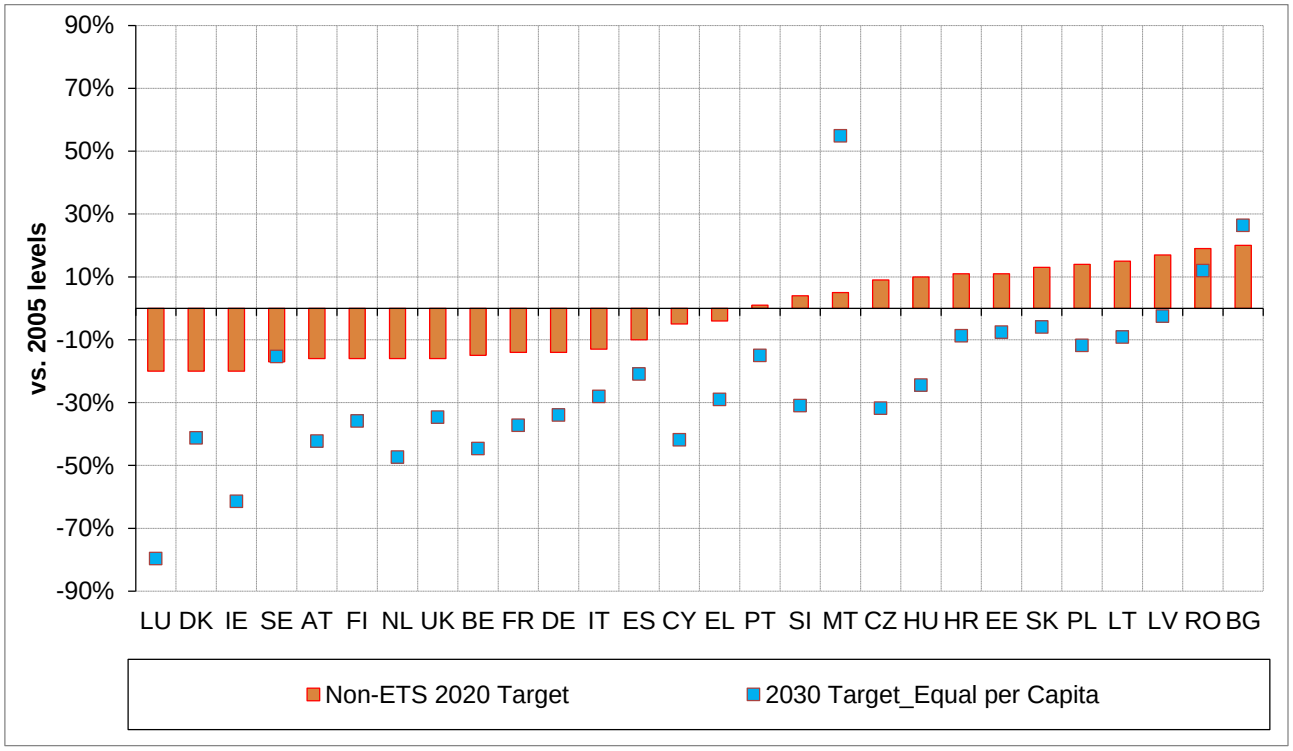
Under the equal reduction effort approach, Luxembourg (LU) is expected to accept the highest non-ETS reduction target in 2030 relative to 2005 levels (- 41 %) whilst Bulgaria (BG) is required to reduce non-ETS emissions by 1 % below 2005 levels in 2030. The equal reduction effort approach results in a range of non-ETS targets for 2030, which is considerably lower than alternative proposals based on either equal per capita emissions or economic capacity.

[12] The additional non-ETS reduction effort is calcuated by subtracting the non-ETS target in 2020 for the EU (around 10% below 2005 levels) from the non-ETS target in 2030 for the EU (30 % below 2005 levels).

4.3. Equal per capita emissions approach

The current non-ETS emission reduction in 2030 proposed by the European Commission for the EU-28 results in average per capita emissions of 3.9 t CO_2eq.[13] A simple approach to distributing non-ETS targets in 2030 would be to allocate equal per capita emissions to all Member States. The resulting targets are shown by the blue squares in Figure 4-3 for each Member State and compared with their existing non-ETS targets for 2020 (orange bars).

Figure 4-3: Comparison of 2020 and 2030 non-ETS targets (based on equal per capita emissions)



Source: EEA (2013a), EEA (2013b), (EU, 2009), Eurostat (2014a), Own Calculation (2014)

Under the equal per capita approach, the majority of Member States (especially those from Western Europe) have reduction targets of 30 % to 50 % below 2005 levels. For example, France (FR) is allocated a non-ETS target of 37 % below 2005 emission levels in 2030. However if 2020 is considered the starting point for target setting then the non-ETS target for France in 2030 declines to 23 percentage points of 2005 emission levels below the 2020 target. On average the EU-15 needs to reduce non-ETS emissions by 34 % below 2005 levels.

The majority of Member States from Eastern Europe have rather modest non-ETS reduction targets under this approach as they are characterised by lower non-ETS emissions per capita. For example, Romania (RO) is allocated a non-ETS emission limit of 12 % above 2005 emission levels in 2030, which corresponds to a non-ETS emission reduction of 7 percentage points of 2005 emissions below the 2020 target. On average the EU-13 needs to reduce non-ETS emissions by 10 % below 2005 levels.

[13] The per capita value of 3.9 t CO_2eq is calculated by dividing the non-ETS emission level in 2030 for the EU-28 (assuming a 30 % reduction below 2005 levels) by the EU-28 population in 2012 (assuming a constant population).

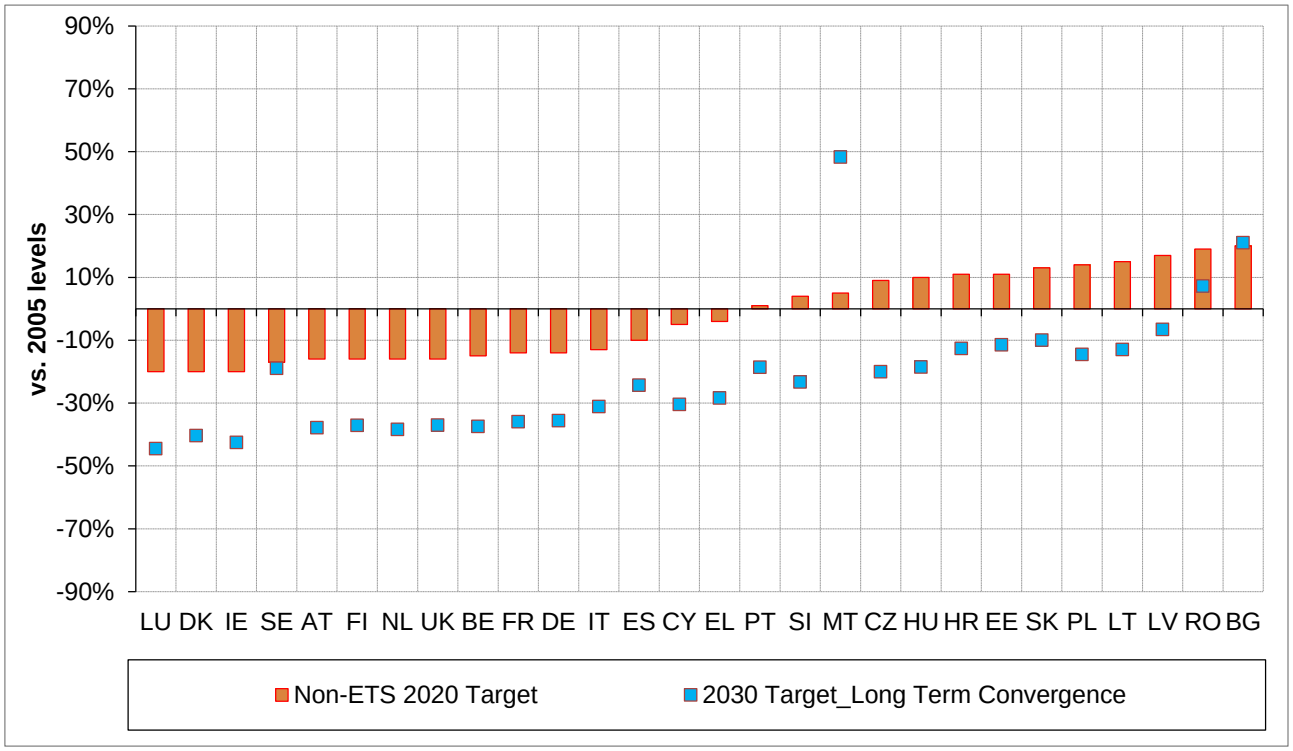
Two smaller Member States have rather extreme results with Luxembourg (LU) allocated a reduction target of 80 % below 2005 levels in 2030 (which declines to a non-ETS reduction of 60 % of 2005 emission levels below the 2020 target) whilst Malta (MT) would be allowed to continue to increase non-ETS emissions by 55 % above 2005 levels (which declines to a non-ETS limit of 50 % of 2005 emission levels above the 2020 target).

4.4. Long term convergence approach

Beyond 2030, the European Commission has formulated the target to reduce emissions to 80 % below 1990 levels through domestic reductions alone until 2050 (European Commission, 2011). The long term convergence approach allocates non-ETS targets in 2030 based on an equitable per capita approach that is consistent with this long term target.

The long term convergence approach requires the calculation of a linear pathway for each Member State from their per capita emissions in 2020 to a target of 1.3 t CO_2eq /capita in 2050 for all Member States. Under the approach, Member States with relatively high per capita emissions in 2020 (i.e. Luxembourg) will be required to reduce non-ETS emissions at a faster rate than Member States with relatively low per capita emissions in 2020 (i.e. Bulgaria).[14] Due to the slight difference between the 2030 non-ETS target proposed by the European Commission and the 2030 non-ETS target calculated in this study (see Section 3) – it was necessary to adjust the distribution of the non-ETS targets (by allowing certain Member States with low emissions per capita to emit slightly more) to be equivalent to the ambition of the European Commission proposal.[15] The resulting targets under the long term convergence approach are shown by the blue squares in Figure 4-4 for each Member State and compared with their existing non-ETS targets for 2020 (orange bars).

Figure 4-4: Comparison of 2020 and 2030 non-ETS targets (based on the long term convergence approach)



Source: EEA (2013a), EEA (2013b), (EU, 2009), Eurostat (2014a), Own Calculation (2014)

[14] Population is assumed to remain at 2012 levels to calculate per capita emissions - this is a simplification and in a consequtive study it may be necessary to incorporate population projections (compare footnote 4).

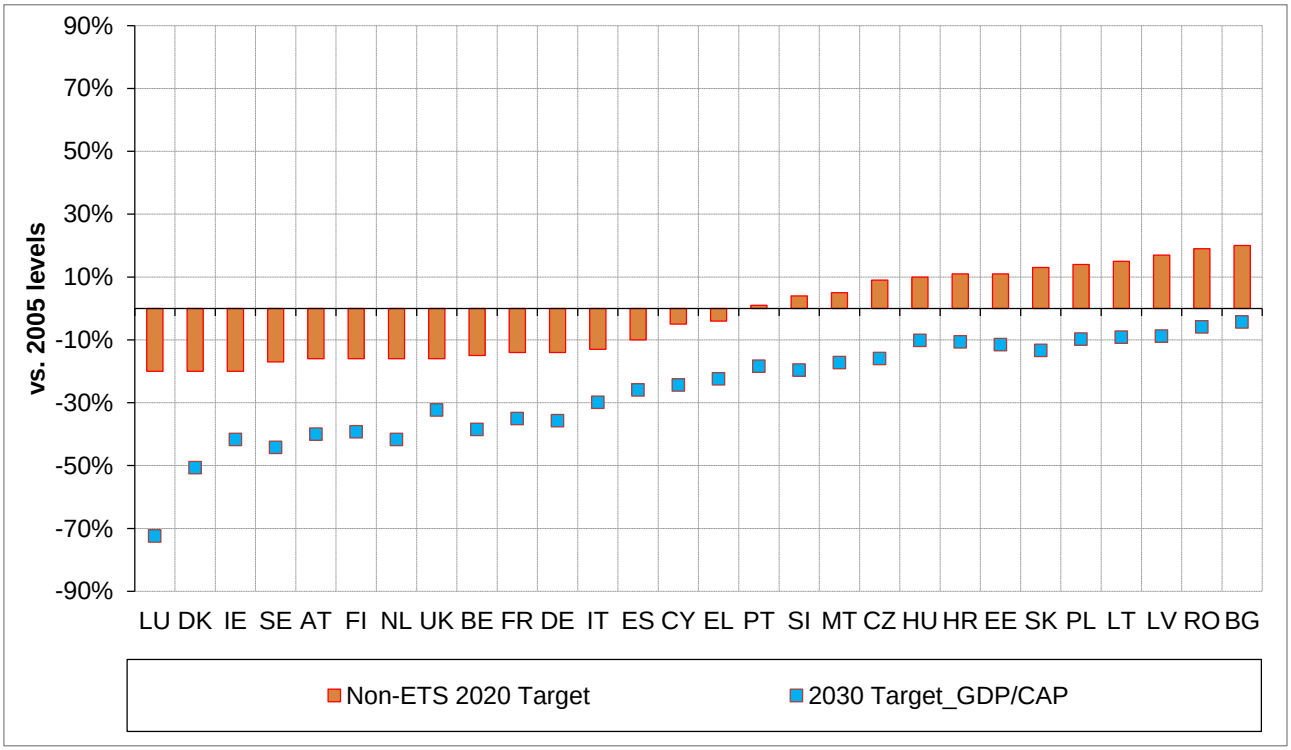
[15] The adjustment assumes that no Member States needs to reduce its emissions below 3.7 t CO_2eq per capita, which is calculated to result in emission reductions that are equivalent to the European Commission proposal.

Under the long term convergence approach, Luxembourg (LU), Denmark (DK) and Ireland (IE) would be expected to undertake further ambitious reductions (with non-ETS reductions below 2005 emissions levels in excess of 40 %) to ensure that all Member States have equal per capita emissions in the non-ETS sector by 2050. If 2020 is considered to be the starting point for target setting then the 2030 non-ETS targets for Luxembourg, Denmark and Ireland represent an emission reduction in excess of 20 % of 2005 levels below their 2020 targets. In contrast, under the long term convergence approach Bulgaria (BG) would be allowed to increase emissions by 1 percentage point of 2005 emissions above their 2020 target (which is equivalent to emissions that are 21 % above 2005 levels) due to the country's low emissions per capita. However, the majority of EU-13 Member States would be expected to reduce emissions below non-ETS emission levels in 2005 – reflecting the scale of the non-ETS reductions necessary to achieve the long term 2050 target.

4.5. GDP per capita approach

The GDP per capita approach distributes non-ETS targets in 2030 based on the economic capacity of each Member State to reduce their emissions.[16] It is important to acknowledge that the GDP per capita approach is very dependent upon how the maximum and minimum non-ETS reduction targets are set and therefore alternative distributions are possible based upon the parameterisation. The remaining Member States are then allocated non-ETS targets for 2030 between the maximum and minimum targets according to their GDP per capita.[17] Verdonk and Hof (2013) for example calculated two scenarios in which the Member State with the lowest GDP per capita was allocated a target equal to 2005 emissions (Scenario A) and a target 20 % above 2005 emissions (Scenario B). However, what parameterisation is reasonable? In this study the parameterisation of the GDP per capita approach is based on the logic that the average per capita emissions for the EU-15 and EU-13 group should be equal in 2030 (3.9 tCO_2eq). This results in minimum and maximum targets for the EU-15 and EU-13 groups of 34 % and 10 % below 2005 levels respectively in 2030. The resulting targets are shown by the blue squares in Figure 4-5 for each Member State and compared with their existing non-ETS targets for 2020 (orange bars).

Figure 4-5: Comparison of 2020 and 2030 non-ETS targets (based on GDP/ Cap to deliver equal per capita emissions in both the EU-15 and EU-13)



Source: EEA (2013a), EEA (2013b), (EU, 2009), Eurostat (2014b), Own Calculation (2014)

[16] 2010 GDP and 2010 population from Eurostat (2014a) and Eurostat (2014b) was used. The GDP per capita of Luxembourg (78,000 €/cap in 2010) was reduced to 60,000 €/cap (the average between the GDP per capita of Luxembourg and the second highest GDP per capita (Denmark)). Using a GDP per capita of 78,000 €/cap would have resulted into a reduction target of more than 100% for Luxembourg.

[17] For example, the GDP per capita of Romania is only slightly higher than Bulgaria and is therefore allocated a non-ETS reduction target in 2030 that is only slightly more ambitious (relative to 2005 levels) than Bulgaria's target. All of the non-ETS targets are then scaled to match the 30 % reduction below 2005 levels.

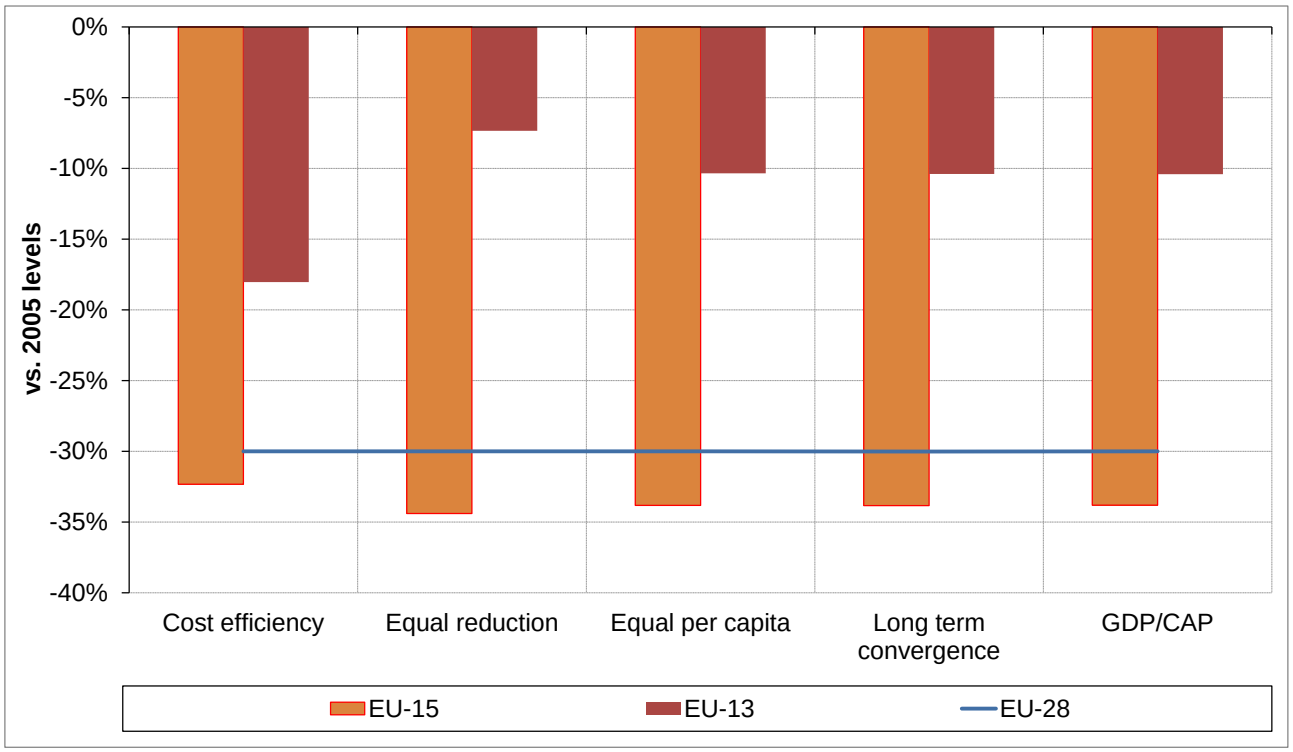
Under the GDP per capita approach, Luxembourg (LU) is expected to accept the highest 2030 non-ETS reduction target of 72 % below 2005 emission levels, which corresponds to 52 percentage points of 2005 emissions below their 2020 target. Bulgaria (BG) is allocated the least ambitious non-ETS reduction target of 4 % below 2005 emission levels. However, if 2020 is considered the starting point for target setting then Bulgaria (BG) actually reduces non-ETS emissions by 24 percentage points of 2005 emission levels below their 2020 target and this is equivalent to the 2030 non-ETS target for Austria (AT).

Instead of GDP also purchase power parities (PPP) could be used. A first analysis has shown that the parameterisation of the maximum and minimum targets is more important than selecting GDP or PPP. Therefore, only an analysis of GDP is included in this paper.

5. Discussion

The outcome of applying the different effort sharing approaches to allocate non-ETS reduction targets in 2030 is illustrated in Figure 5-1 for both the EU-15 (orange bars) and EU-13 (red bars) region. Each distribution approach delivers a non-ETS reduction of 30 % below 2005 emission levels as shown by the blue line. The variation in the EU-15 target is small ranging from a 32 % reduction below 2005 non-ETS emission levels under the cost efficiency approach to a 34 % reduction below 2005 non-ETS emission levels under the equal reduction approach. For the EU-13 the variation is larger. The equal reductions approach leads to emission reductions of 7 % below 2005 non-ETS emission levels. In contrast, emission reductions under the cost efficiency approach are 18 % below 2005 non-ETS levels.

Figure 5-1: Overview of effort sharing approaches to non-ETS targets in 2030 relative to 2005 emission levels from a 2005 starting point



Source: EEA (2013a), EEA (2013b), (European Commission, 2014b), Own Calculation (2014)

The variability in non-ETS targets for 2030 is greater at the Member State level (Table 5-1) than at the EU sub-group level. For example, 2030 non-ETS targets for Luxembourg (LU) range from 20 % below 2005 levels under the cost efficient approach to 80 % below 2005 levels under the equal per capita approach. Therefore the selection of an effort sharing approach to distribute the non-ETS target in 2030 is highly significant for Member States that are associated with extreme indicator values. In contrast, the selection of the effort sharing approach is not as significant for countries with average indicator values such as the United Kingdom (UK) as the range of 2030 non-ETS targets under the different effort sharing approaches is relatively small (Table 5-1).

Table 5-1: Distribution of non-ETS targets in 2030 relative to 2005 emission levels from a 2005 starting point

	Cost efficiency	Equal reduction	Equal per capita	Long term convergence	GDP/CAP	Range between max and min
	vs. 2005					
Austria	-27%	-37%	-42%	-38%	-40%	16%
Belgium	-24%	-36%	-45%	-37%	-39%	21%
Bulgaria	-25%	-1%	26%	21%	-4%	51%
Croatia	-25%	-10%	-9%	-13%	-11%	16%
Cyprus	-20%	-26%	-42%	-30%	-24%	22%
Czech Republic	-23%	-12%	-32%	-20%	-16%	20%
Denmark	-30%	-41%	-41%	-40%	-51%	20%
Estonia	-23%	-10%	-8%	-11%	-12%	15%
Finland	-29%	-37%	-36%	-37%	-39%	10%
France	-33%	-35%	-37%	-36%	-35%	4%
Germany	-40%	-35%	-34%	-36%	-36%	6%
Greece	-38%	-25%	-29%	-28%	-22%	16%
Hungary	-28%	-11%	-24%	-19%	-10%	18%
Ireland	-21%	-41%	-61%	-43%	-42%	41%
Italy	-30%	-34%	-28%	-31%	-30%	6%
Latvia	-17%	-4%	-2%	-7%	-9%	14%
Lithuania	-23%	-6%	-9%	-13%	-9%	17%
Luxembourg	-20%	-41%	-80%	-44%	-72%	60%
Malta	-27%	-16%	55%	48%	-17%	81%
Netherlands	-28%	-37%	-47%	-38%	-42%	20%
Poland	-12%	-7%	-12%	-15%	-10%	8%
Portugal	-33%	-20%	-15%	-19%	-18%	18%
Romania	-18%	-2%	12%	7%	-6%	30%
Slovakia	-17%	-8%	-6%	-10%	-13%	11%
Slovenia	-14%	-17%	-31%	-23%	-20%	17%
Spain	-23%	-31%	-21%	-24%	-26%	10%
Sweden	-28%	-38%	-15%	-19%	-44%	29%
United Kingdom	-34%	-37%	-35%	-37%	-32%	5%
EU-15	-32.3%	-34.4%	-33.8%	-33.8%	-33.8%	2%
EU-13	-18.0%	-7.3%	-10.4%	-10.4%	-10.4%	11%
EU-28	-30.0%	-30.0%	-30.0%	-30.0%	-30.0%	0%

Source: EEA (2013a), EEA (2013b), (European Commission, 2014b), Own Calculation (2014)

The different effort sharing approaches that have been considered in this study are all associated with certain advantages and disadvantages. The key contributions of this paper to the discussion about 2030 non-ETS target is that the paper puts 2030 targets in the perspective of long term reduction needs.

This contextualisation illustrates that by 2030 all Member States (with the exception of Malta and Bulgaria) need to reduce their emissions considerably below the 2020 target. At the same time Member States with very high per capita emissions have a greater responsibility to reduce emissions compared to Member States with low per capita emissions.

Often the **cost efficiency approach** is the starting point for discussing non-ETS targets. It allocates non-ETS targets in 2030 based upon the abatement potential of the Member States, which should reduce the overall abatement costs for the EU-28. However, the cost efficiency approach results in the EU-13 Member States having to reduce their non-ETS emissions by considerably more than the EU-15 Member States in comparison to 2020 non-ETS targets. The cost efficiency approach allows high per capita emissions for a few EU-15 Member States, which is problematic from an equity point of view. It is uncertain whether 2030 non-ETS target setting based upon a cost efficiency approach would be politically acceptable. However, cost-efficiency is the only approach to directly take into account the potentials for GHG mitigation within the EU.

The **equal reduction effort approach** may be considered fairer than the cost efficiency approach given that all Member States reduce non-ETS emissions by an equal amount in relative terms (by 21 % below their non-ETS target in 2020). However, it is important to acknowledge that this effort sharing approach neither takes into account previous efforts to reduce non-ETS emissions nor does it differentiate 2020 to 2030 effort based on capacity to invest.

The **long term convergence approach** modifies the previous equal per capita approach by allowing Member States more time to converge to equal per capita emissions.[18] Member States with very high per capita emissions need to reduce the most; whereas Member States that have already achieved comparably low per capita emissions only will need to slightly reduce emissions by 2030. This approach is fairer than the GDP per capita approach as it automatically incorporates early action to the extent that emissions have been reduced below average levels. At the same time the approach asks realistic emission reductions from Member States with very high per capita emissions. However, a disadvantage of the long term convergence approach is the lack of differentiation according to the ability of Member States to pay for emissions abatement.

The **GDP per capita approach** distributes 2030 non-ETS targets on the basis of GDP to reflect the capacity of Member States to mitigate emissions, which is considered a fairer approach to adopt than allocating 2030 non-ETS targets based on a purely cost efficient approach. Central to a GDP per capita approach is the possibility to transfer emission reductions as currently foreseen under the Effort Sharing Decision. Richer Member States with higher targets could then purchase low-cost reductions from poorer Members. However, the GDP per capita approach also asks ambitious emission reductions from countries that have already reached low per capita emissions. Furthermore, the outcome of allocating 2030 non-ETS targets based upon GDP per capita is highly dependent upon the setting of parameters to determine the range and distribution of targets.

Comparing the GDP per capita approach with the **equal per capita approach** is a useful check, because it compares the relative targets of the GDP per capita approach with equal per capita emissions. In this approach each inhabitant receives the same emission budget of 3.9 t CO_2eq in 2030. However, this effort sharing approach is likely to be considered as too ambitious for Member States with currently high per capita emissions.

The approaches presented in this study are considered a useful starting point for future negotiations on 2030 non-ETS target setting and there is potential to further modify or even combine these effort sharing approaches in order to reach a politically acceptable outcome.

[18] In 2030, each Member State is allocated a non-ETS target that is on a linear trajectory towards equal per capita emissions in 2050 of 1.3 t CO_2eq.

6. Annex:

6.1. Additional summary tables

Additional information on the effort sharing approaches evaluated in this study are provided below considering a different starting point (Table 6-1) and a different metric (Table 6-2) for reductions.

Table 6-1: Distribution of non-ETS targets in 2030 relative to 2005 emission levels from a 2020 starting point

	Cost efficiency	Equal reduction	Equal per capita	Long term convergence	GDP/CAP	Range between max and min
	vs. 2020 targets (in percentage points of 2005 emissions)					
Austria	-11%	-21%	-26%	-22%	-24%	16%
Belgium	-9%	-21%	-30%	-22%	-24%	21%
Bulgaria	-45%	-21%	6%	1%	-24%	51%
Croatia	-36%	-21%	-20%	-24%	-22%	16%
Cyprus	-15%	-21%	-37%	-25%	-19%	22%
Czech Republic	-32%	-21%	-41%	-29%	-25%	20%
Denmark	-10%	-21%	-21%	-20%	-31%	20%
Estonia	-34%	-21%	-19%	-22%	-23%	15%
Finland	-13%	-21%	-20%	-21%	-23%	10%
France	-19%	-21%	-23%	-22%	-21%	4%
Germany	-26%	-21%	-20%	-22%	-22%	6%
Greece	-34%	-21%	-25%	-24%	-18%	16%
Hungary	-38%	-21%	-34%	-29%	-20%	18%
Ireland	-1%	-21%	-41%	-23%	-22%	41%
Italy	-17%	-21%	-15%	-18%	-17%	6%
Latvia	-34%	-21%	-19%	-24%	-26%	14%
Lithuania	-38%	-21%	-24%	-28%	-24%	17%
Luxembourg	0%	-21%	-60%	-24%	-52%	60%
Malta	-32%	-21%	50%	43%	-22%	81%
Netherlands	-12%	-21%	-31%	-22%	-26%	20%
Poland	-26%	-21%	-26%	-29%	-24%	8%
Portugal	-34%	-21%	-16%	-20%	-19%	18%
Romania	-37%	-21%	-7%	-12%	-25%	30%
Slovakia	-30%	-21%	-19%	-23%	-26%	11%
Slovenia	-18%	-21%	-35%	-27%	-24%	17%
Spain	-13%	-21%	-11%	-14%	-16%	10%
Sweden	-11%	-21%	2%	-2%	-27%	29%
United Kingdom	-18%	-21%	-19%	-21%	-16%	5%
EU-15	-19%	-21%	-20%	-20%	-20%	2%
EU-13	-31%	-21%	-24%	-24%	-24%	11%
EU-28	-21%	-21%	-21%	-21%	-21%	0%

Source: Own Calculation (2014)

Table 6-2: Distribution of non-ETS targets in 2030 converted into per capita emissions

	Cost efficiency	Equal reduction	Equal per capita	Long term convergence	GDP/CAP	Range between max and min
	t CO_2eq / Capita					
Austria	5.0	4.3	3.9	4.2	4.1	1.1
Belgium	5.4	4.5	3.9	4.4	4.3	1.5
Bulgaria	2.3	3.1	3.9	3.7	3.0	1.6
Croatia	3.2	3.9	3.9	3.7	3.8	0.7
Cyprus	5.4	5.0	3.9	4.7	5.1	1.5
Czech Republic	4.4	5.1	3.9	4.6	4.8	1.2
Denmark	4.6	4.0	3.9	4.0	3.3	1.3
Estonia	3.3	3.8	3.9	3.7	3.7	0.6
Finland	4.3	3.9	3.9	3.8	3.7	0.6
France	4.2	4.1	3.9	4.0	4.0	0.2
Germany	3.5	3.9	3.9	3.8	3.8	0.4
Greece	3.4	4.2	3.9	3.9	4.3	0.9
Hungary	3.7	4.6	3.9	4.2	4.7	0.9
Ireland	8.1	6.0	3.9	5.8	5.9	4.1
Italy	3.8	3.6	3.9	3.7	3.8	0.3
Latvia	3.3	3.9	3.9	3.7	3.7	0.6
Lithuania	3.3	4.1	3.9	3.7	3.9	0.7
Luxembourg	15.5	11.4	3.9	10.7	5.3	11.6
Malta	1.9	2.1	3.9	3.7	2.1	2.1
Netherlands	5.4	4.7	3.9	4.6	4.3	1.5
Poland	3.9	4.1	3.9	3.8	4.0	0.3
Portugal	3.1	3.7	3.9	3.7	3.8	0.8
Romania	2.9	3.4	3.9	3.7	3.3	1.0
Slovakia	3.5	3.8	3.9	3.7	3.6	0.4
Slovenia	4.9	4.7	3.9	4.3	4.6	1.0
Spain	3.8	3.4	3.9	3.7	3.7	0.5
Sweden	3.3	2.9	3.9	3.7	2.6	1.3
United Kingdom	3.9	3.8	3.9	3.8	4.1	0.3
EU-15	4.0	3.9	3.9	3.9	3.9	0.1
EU-13	3.6	4.0	3.9	3.9	3.9	0.5
EU-28	3.9	3.9	3.9	3.9	3.9	0.0

Source: Own Calculation (2014)

7. Sources

7.1. Data sources

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