How to finance the Green Deal in 2030

Policy analysis

Synthesis / Abstract

To fight the effects of climate change, the European Commission presented in December 2019 an ambitious plan to be the first continent to become climate neutral in 2050: "the Green Deal". To meet this ambition, the Commission proposed to reduce CO_2-equivalent emissions by at least 55% relative to 1990 levels in 2030 during the State-of-the-Union speech. A 55% reduction is a significant step up from the current target that aims to cut GHG emissions by 40% in 2030. To attract investments in carbon-efficient technologies, the unprofitable top margin (UTM) of various greener technologies needs to be covered through a combination of subsidies, regulations, taxes and/or cross-border impact investing. In order to give citizens and national governments an impression of required effort, we estimated the total UTM for Europe and each member state, which can be used to make policy intervention fit-for-purpose.

In our approach we considered three carbon reduction targets, namely 40%, 55% and 60%. The UTM is calculated by multiplying the amount of CO_2 to be reduced between 2018-2030 with the difference between 'green' and 'grey' production methods. An average value of the difference between 'green' and 'grey' production methods of €125 per ton is used. Since this is an average value, an uncertainty range from €70 per ton to €180 per ton is considered. This approach allows us to calculate the UTM bandwidth for each of the three carbon reduction targets. Associated cost of infrastructure, stranded assets, technological development and differences in UTM between member states are not taken into account. The bandwidth hence can shift either up -or downward if all relevant – but out of scope – factors are taken into account.

Table 1 shows that the annual EU28 UTM is between 0.8 and 2.1 percent of GDP when meeting the Commission target to reduce CO_2 emissions by 55%. These results show that the UTM to reduce carbon emissions is – even when we would include cost of infrastructure and compensation for stranded assets – less than the cost of mitigating the adverse impact of climate change by the end of this century, which is estimated to be 4% of GDP by the ClimateCost project. In our view, investing in carbon-neutral technologies today, through a combination of additional EU-regulation, EU-taxation, (national) subsidies and (financial) cooperation between member states, is the obvious choice.

Key results EU28: three reduction targets and category limits, period 2018-2030	Low (€70/ton)			Moderate (€125/ton)			High (€180/ton)		
	40%	55%	60%	40%	55%	60%	40%	55%	60%
Total UTM (bln €)	850	1,527	1,767	1,517	2,728	3,155	2,185	3,928	4,543
Annual UTM (bln €)	171	127	147	126	227	263	182	327	379
Annual UTM per capita (€)	138	249	288	247	444	514	356	639	740
Annual UTM as share of GDP	0.44%	0.80%	0.92	0.79%	1.43%	1.65%	1.14%	2.05%	2.38%

Introduction

EU Parliament election results (May 2019) showed that European citizens' are increasingly concerned with the environment. In response European Commission President Ursula von der Leyen and Executive Vice President Frans Timmermans informed the public in December 2019 how their 'Green Deal' will "reconcile the economy with our planet". In practise, this means that the European Commission aims to become the first carbon neutral continent by 2050. To reach this objective a roadmap with intermediate milestones, of which the first will be 2030, is being developed. To achieve this the Commission proposed to reduce CO_2-equivalent emissions by at least 55% relative to 1990 levels in 2030 during the State-of-the-Union speech[1]. A 55% reduction is a significant step up from the current target that aims to cut GHG emissions by 40% in 2030.

Since 1990 the EU28 output of greenhouse gases decreased from 5.7 Gt CO_2eq in 1990 to 4.4 Gt CO_2eq in 2018 (23 percent)[2]. This reduction is partly achieved through financial incentives, such as subsidizing wind and solar projects, international agreements such as the Kyoto Protocol to curb methane emissions and the EU-ETS. To reach the ambitions set out in the Green Deal an additional reduction of 1.8 Gt CO_2eq should be achieved[3]. Additional European and national effort will play a significant role in achieving this reduction.

According to the recent Impact Assessment prepared by the Commission, the total cost of reducing GHG emissions by 55% is approximately 420 billion annually in the period 2021-2030[4], or 2.5% of GDP (2018) at market prices. Although this is a considerable investment in the energy system, the estimated cost (as a share of GDP) is significantly less compared to the expected climate impact-induced bill, which is estimated at 4% of EU GDP by the end of this century[5].

The required annual investment in the energy system of about 420 billion euro mentioned in the Impact Assessment consists of three components: First, new sustainable energy sources will need to be developed and/or efficiency needs to be improved. Second, new infrastructure needs to be developed to connect the supply and demand of (new) energy sources. And third, owners of stranded assets will need to be compensated. However, in the Impact Assessment no differentiation is made between these three components or between member states. In this paper we will focus on the first component and give an indication of the total cost to society to attract sufficient 'green' investments. This component is also known as the Unprofitable Top Margin, or UTM.

Approach

In this paper we consider three reduction targets: the current target to save 40% CO_2 emissions[6], the Commissions target to save 55% CO_2 emissions and the European Parliament target to save 60% CO_2 emissions. As the recent Impact Assessment assessed the Commission proposal to reduce emissions by 55%, this target is presented in the results section[7].

To determine the UTM, an average value of €125 per ton is used. This value is based on an average reduction costs for the EU28 used by the EU[8]. Naturally, this value is an approximation of the actual average value of the UTM, which in practise differs between member states. Therefore, we also take an uncertainty range into account. The uncertainty range is based on the CO_2 'category limits' of the SDE++ subsidy, granted by the Dutch government[9]. These 'category limits' range from up to €70 per ton to up to €180 per ton and represents what the UTM is of most of the renewable technologies compared to conventional technologies. These values are used to represent the uncertainty range.

UTM: With unprofitable top margin (UTM) we refer to the difference between the cost price of green and grey technologies. In this paper the UTM is used as proxy for the subsidy/ regulations/taxes needed to allow greener production methods to compete with current (fossil fuel based) production methods (for instance to generate electricity).

1. On the 6th of October the European Parliament voted in favour of a reduction target of 60% CO2 emissions in 2030 compared to the 1990 baseline. As such, it is unclear which reduction target will end up in the EU Climate Law.
2. In the same period the economy grew with 61 percent. Ref: COM (2020) 80 final.
3. According to the EEA [env_air_gge] the EU emitted in 2018 4.4 Gt CO2eq (excluding LULUCF and memo items, including international aviation). A 40% reduction compared to 1990 levels means that in 2030 the EU can emit 3.4 Gt CO2eq, increasing this target to 55% reduces this value to 2.6 Gt CO2eq and an increase to 60% means that this value decreases to 2.3 Gt CO2eq.
4. These numbers reflect the total additional energy system investment cost (including the cost of stranded assets and infrastructure), the energy purchase cost and direct efficiency investment cost. These numbers exclude additional investment costs stemming from the transport sector. Costs in the transport sector, estimated at 620 billion euro annually, cover the additional capital cost for energy purposes (i.e. energy efficiency and use of alternative fuels). Total cost of the energy system in 2015 were 13.4 billion, or 10.6% of GDP. Ref: SWD(2020) 176 final, part 2/2, p.105-109.
5. According to the ClimateCost project the cost of sea and river flooding are be particularly high for Central and Eastern European member states due to the extensive river system that flows through them. Ref: Horizon (2014)

Note: much information on the future energy mix of member states as well as price developments of for instance green/ grey technologies remains largely unknown. Because of this these factors are not taken into account when performing calculations. In the discussion section we reflect how some of the most relevant factors will likely influence the calculated UTM, which can be either neutral (in case of a regulation), negative (in case of a reduction in fossil fuel prices) or positive (in case of a 'green' technological leap forward).

Results

The annual costs to achieve a CO_2 reduction of 55% is reported in the Appendix[10] and ranges for the EU28 between 125 (0.8% of GDP) to 330 billion (2.0% of GDP) annually[11]. Figure 1 shows that there is a difference between member states[12]. Generally speaking, larger member states have a higher UTM compared to smaller member states[13]. To better compare the UTM between member states, the costs as a share of GDP per year per member state are presented in figure 2. This figure shows that most of the EU member states need to annually invest between 1.0% and 2.5% of their GDP in order to meet the 55% reduction. In the case of a 60% reduction the range increases towards 1.2% and 3.0% of GDP.

Scandinavian and Eastern Balkan member states have a relative low UTM. On the other side of the spectrum, Cyprus, Greece and Poland have a relative high UTM and will need to invest more in order to meet the average EU climate ambitions. Differences are caused by many factors, key among them are: investments made in the past, geological differences (such as access, or not, to hydropower), type and size of certain industries and temperature (fluctuation).

The size of the UTM is strongly dependent on the type of technologies that are installed. For example in the Netherlands, €12 billion is additionally needed annually when looking at the average value. However, this value ranges from €7 billion if the lowest category limit is fully considered whereas almost €18 billion is needed to reach the target in the highest category limit. Although both scenarios are extreme values, these values demonstrate that the mix of technologies has an extensive influence on the total UTM.

Furthermore results shows that the total UTM (as share of annual GDP) to reduce CO_2 emissions significantly differs between member states. Poland needs to spend 5% of their GDP to meet the 55% target, whereas nations like Denmark or Sweden meet the goal by spending only 0.7% of their GDP. If the EU wants to achieve its stated targets, it is important to get all EU member states on board. Therefore, these differences need to be taken into account when developing new subsidy schemes, regulations and/or taxes. The ambition to direct a large part of the Just Transition Fund towards phasing out coal[14] and to direct one-third of the NextGenerationEU to the Green Deal are good first steps in this direction.

Discussion

The results of this paper show that the total UTM is significant. However, as mentioned a number of simplifications were made to stay within the scope of this paper. As a result our findings can be both an overestimation or an underestimation of the total UTM per member state. Below we list the likely impact (positive or negative) of the most important simplifications to our results:

- **(-) UTM differences per member state:** First of all, the costs of reducing CO_2 emissions are based on the UTM 'category limits' as developed in the Netherlands. However, there is an extensive difference between European member states. The cost of reducing CO_2 emissions in the Netherlands is relatively high, among others due to the relative higher price of land and share of natural gas in the energy mix. In comparison, countries that have a high dependency on coal plants have likely lower costs, since replacing existing coal plants by natural gas combined cycle plants would lead to a comparably cost-effective reduction in CO_2 emissions[15]. For these countries the estimated UTM is likely an overestimation.

- **(+) Indirect (societal) cost of the transition:** Secondly, the costs of developing new infrastructure and cost of stranded assets are not taken into account. Most likely, a significant share of the required investments to expand and/ or replace infrastructure will be covered by the national and regional grid operators and lead to an increase in the total cost of the transition. When deciding on changes to

6. A reduction of 50% is considered in this paper to be on the lower end, nonetheless this would mean an increase of 10% from the existing target. This paper estimates the UTM to achieve additional reduction required between CO2 emissions in 2018 and a reduction target in 2030 compared to the 1990 baseline.
7. Values for the 50% and 60%, as well as calculations, can be obtained by contacting Berenschot and requesting the Excel file.
8. Ref: Enerdata (2014), Costs and benefits to EU member states of EU climate and energy targets
9. Ref: PBL, 2020.
10. Results for the 40 and 60 percent CO2 reduction targets can be found in the Excel-file.
11. GDP at market prices 2018. Ref: Eurostat
12. All EU member states and the UK are presented on the y-axis. The average value of €125 per ton is shown in the main bar for every country, where the uncertainty range from €70 per ton to €180 per ton is represented by the error bars.
13. For Lithuania we find that, as they already achieved a reduction of 55% compared to the 1990 baseline, they do not need to further reduce carbon emissions to meet the 2030 ambition.
14. Ref: Balkanenergynews, visited 11-09-2020.

the future energy mix it is important to take these cost into account. We expect that the cost of stranded assets will be covered by national governments.

- **(-) Fixed technology UTM 'category limits':** Further, categorizing of technologies led to an overestimation of the UTM, as the highest costs of each category limit is assumed. In practice the UTM of a technology will be lower than the maximum of its category limit. Also, technological development, which makes technologies cheaper over time due to a learning curve and economies of scale, are not taken into account.

- **(+/-) NDC's and EU-ETS:** Current and expected European and national legislation that will impact use of fossil fuel is not considered in the result[16]. The EU-ETS price for instance is expected to increase in the upcoming years, combined with the carbon border tax, a reduction in CO_2 emissions in ETS sectors is likely.. We however note that, although the EU-ETS reduces carbon emissions, the cost of the EU-ETS will be reflected in the price of products and as such does not impact the estimated UTM to a large extent.

- (**+/-) Other external factors:** Lastly, energy price fluctuations, inflation, economic developments and other indirect and external effects are not considered.

Part of the required subsidies and regulations to cover the UTM are already implemented by the EU (e.g. the EU multiannual budget, roughly €50 billion between 2021-2027 and the Next Generation EU, roughly €75 billion between 2021-2023) – and its member states (e.g. the German 9 billion euro National Hydrogen Fund). Although these measures are a good start, as shown by our analysis a more comprehensive and extensive package – that takes into account the EU principles of solidarity – is likely needed[17].

Insights for policymakers

Looking at the required investment effort one might conclude that reducing CO_2 emissions is too expensive. However, when taking into account that not tackling climate change will lead to – annual mitigation costs of up to 4% of EU GDP around 2100, hundred thousands of premature deaths every year[18] and have devastating effects of climate change on biodiversity, changing weather patterns etc – investing in carbon neutral technologies becomes the obvious choice. Moreover, facilitating the transition towards a carbon neutral economy will contribute to the creation of 87 million jobs

To ensure that the total UTM is covered and society is 'nudged' towards investing in greener technologies national governments have a number of tools at their disposal:

- **Subsidies:** First of all, the UTM can be covered by providing subsidies. These can be granted to private individuals (to install solar panels on homes) and to companies (to invest in more expensive but greener technologies). 'Green' subsidies are generally well received, especially if subsidies are spent on technologies that are expected to reduce in cost over time. However, take note that subsidies are not always available for all classes in society and likely not each member state is able or willing to provide subsidies equal to their UTM.

- **Taxes:** Second, a government can impose national taxes. This can for example be done by setting a pricing on each ton CO_2 emitted over the benchmark of a specific sector. The main goal of such a tax is to penalize the conventional technology in order to make renewable alternative more attractive. However, taxing tends to work best in sectors that operate on a national scale since sectors that operate on an European or international scale will face unfair competition and might be forced to relocate part of their production process, this practice is known as carbon leakage[19].

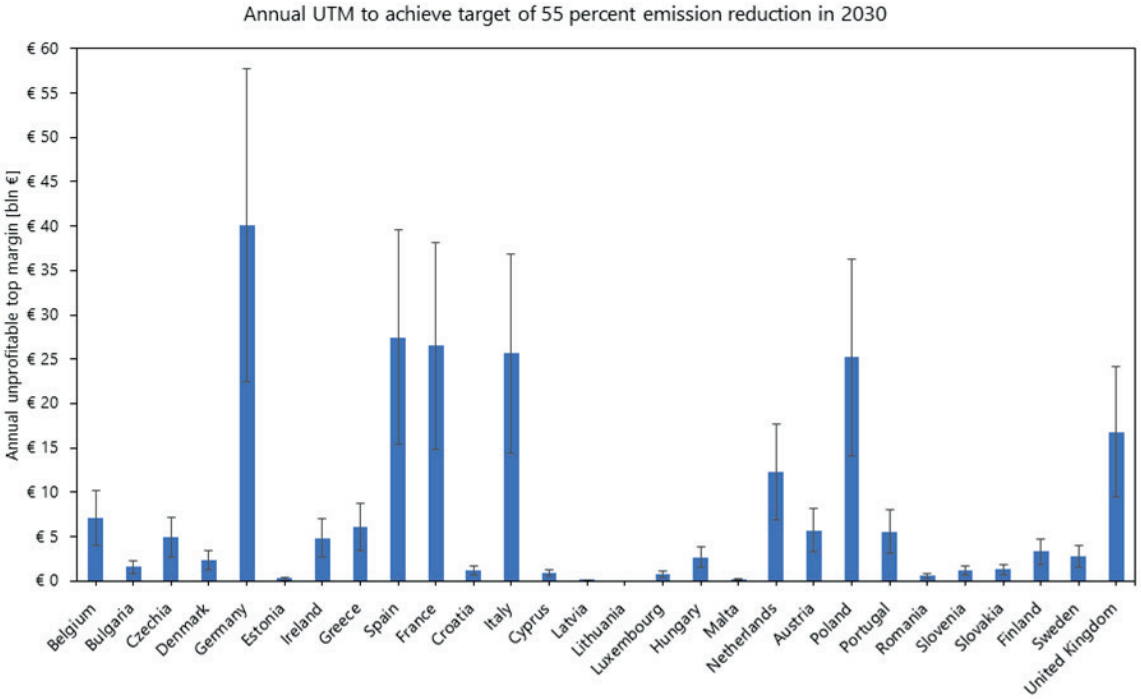
15. Note that investing in natural gas plants to replace coal plants can lead to significant (and cost-effective) reductions in CO2 emissions in the short term. Towards 2050 carbon capture and storage technologies or biogas should be adopted to ensure that the risk of a 'fossil fuel lock-in' (as new gas plants have a lifespan over 20 years) is mitigated.
16. With respect to the NDC's we note that, according to a recent paper by Roelfsema et al (Nature, 2020), the impact of NDC's is insufficient to re-ach the 40% climate reduction target. They estimated that the total emission gap (taking national policies into account) for the 2 degree scenario is 1.6 Gt CO2eq. This paper assumes a 40% reduction target for the EU.
17. We did not compile a comprehensive list of subsidy schemes and expected regulations and hence speculate that existing 'tools' are insufficient.
18. Ref: European Environmental Agency (2019)

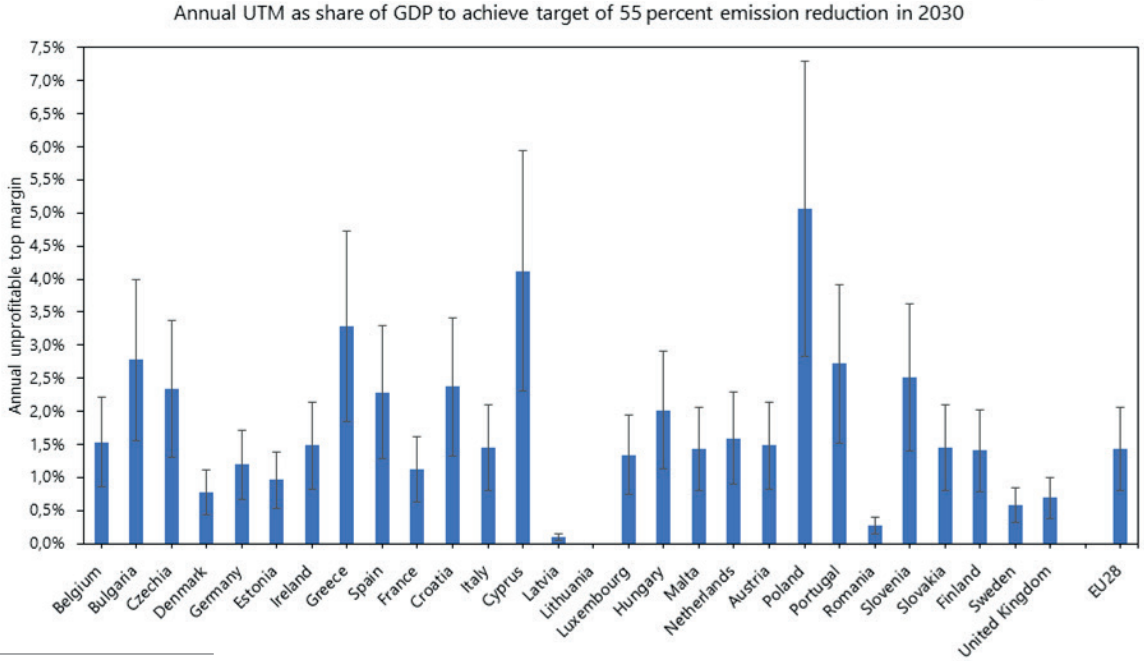
- **Regulation:** Third, a government can impose certain quality levels to whom houses, products, etc. need to comply. Introduction of this type of regulation, as well as with taxes, should only be introduced in markets that have a national scale. Introducing a new regulation has similar drawbacks as is the case with taxes, and introducing a new European or international regulation is likely better received.

- **Cross-border impact investing:** Lastly, as mentioned there are significant differences between the cost to reduce a ton of CO_2 per member state. As such, there is room for optimization, not only between sectors but also across borders. If member states address the EU climate target as a shared objective and collectively work towards achieving CO_2 reduction, the total cost of the transition now until 2030 could be lower.

To achieve the 2030 climate target national governments, supported by their colleagues at the European level, are advised to implement a combination of the above tools. An assessment of the impact of European measures (expected mid 2021) and national measures to reduce CO_2 emissions is useful, as this provides information on the 'climate reduction' gap. Bridging the 'climate reduction' gap of each member state should – in our view – be seen as a shared European objective as achieving it provides benefits to all.

Appendix





19. In light of this we welcome the carbon border adjustment mechanism and sincerely hope that efforts in this area are not watered down nor delayed, as without it additional action (that has a larger impact on the European internal market) might be required.

Energy Expertise & Energy Services Berenschot

The energy transition brings radical changes, creating opportunities as well as challenges for enterprises, businesses and governments involved. The development towards a more sustainable energy system is a dynamic process, with different development paths. These paths are surrounded with a wide range of uncertainties, risks, policy questions and technological challenges. Think of increased generation of sustainable energy, more local production, more urgency for system flexibility and a growing complexity of the energy system.

In order to accelerate the energy transition, Berenschot supports EU institutions, national governments, European regions, enterprises and organizations by performing scenario studies (Development of four Climate Neutral scenario's for 2050, NBNL), development of strategic sector roadmaps (Roadmap for the Dutch chemical industry, VNCI; Roadmap of supply, demand and infrastructure for hydrogen towards 2050, EBN), qualitative and quantitative policy analysis (comparing options of solar energy production, Enpuls) and participative governance in the field of energy (facilitating focus groups with the socially disadvantaged, KBF, on-going).

In our work we make use of the best-practices among our (Dutch) experiences and expertise, our approach integrates extensive and in depth expertise of energy markets, knowledge on sustainability with deep technical insight (electricity, gas, heat power, hydrogen and CO_2).

Would you like to learn more about our expertise in the energy sector? Please contact:

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- Communication;
- Cross-border cooperation and governance;
- Mobility; and
- Participative governance.