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Improving the accounting of renewable electricity in transport within the new EU Renewable Energy Directive

Policy paper for Transport & Environment

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1. Introduction

The energy supply of EU transport still depends more than 90% on crude oil based fossil fuels despite the EU efforts on climate protection and air quality improvements. Transport contributes to one third of the final energy consumption in the EU and 23% of its total GHG emissions (2014), making transport the only sector with increased GHG emissions compared to 1990. Transport is also one of the main drivers for air quality concerns in European urban areas with more than 50% of total nitrogen oxides (NO_x) emissions, all of which demonstrates the high significance of the transformation of the transport system for a sustainable development.

The EU confirmed its ambition to become a climate-friendly society by being part of the Paris Agreement in December 2015. The year before, the EU decided to reduce GHG emissions by 40% or more (from 1990 level) until 2030 as an interim step towards the long-term goal of a cross-sectoral GHG emissions reduction of 80 to 95%. Even though no sector-specific targets were set as part of the 2030 Climate & Energy Framework, the 30% reduction target (compared to 2005) for the non-ETS sectors implies pressure to achieve fast GHG emission improvements and a structural change of energy supply in transport. In accordance with the White Paper on Transport (European Commission 2011) the European Strategy for Low-Emission-Mobility (European Commission 2016) indicates GHG emission reductions in the range of 18 to 22% in transport compared to the level of 2005 by 2030. The European Strategy for Low-Emission Mobility also confirms the long-term target of roughly 60% less GHG emissions in transport than in 1990.

The electricity sector is one of the main contributors to GHG emissions in the EU, but also has the biggest potential for emission reductions through the use of renewable energy sources. Strong decarbonisation of the electricity sector is therefore an essential step to reach the long-term goal of reducing greenhouse gas emissions. Growing shares of renewable electricity can help to decarbonise other sectors, such as the transport sector, although this means that even more renewable electricity will have to be generated in order to cover the additional demand. Zero-emission vehicles (tank-to-wheel) and low-emission energy supply options (well-to-tank) are therefore two main cornerstones of the long-term strategy for transport.

Battery electric vehicles are the key technology for short-distance road passenger transport, whereas biofuels and synthetic fuels produced from electricity are more relevant in long-distance transport applications. Both battery electric vehicles and synthetic fuels create new and increased interactions between the transport and electricity sectors. Because of the additional demand for electricity, GHG emissions from the electricity sector will rise unless appropriate countermeasures are taken. Therefore the upstream emissions have to be assessed carefully when evaluating the GHG reduction effects of the electrification strategy in transport.

The increasing link between the electricity and transport sectors creates new challenges for policy-makers and regulators, for instance stimulating the market for truly clean technologies and avoiding adverse incentives for technologies with low or negative effectiveness. Challenges also arise for the existing regulatory and accounting schemes, as the interplay of transport and electricity may make adjustments necessary to the current framework. And finally, green claims at an individual level (for instance green power or green hydrogen product labels) have to be carefully assessed to understand whether they are justified with regard to the impact on emissions of the overall system.

The EU Commission has proposed a draft for a revised Renewable Energy Directive (RED II) for the time period after 2020 as a part of the “winter package”. The new draft directive combines elements of the current RED I and the Fuel Quality Directive (FQD) for the timeframe up to 2030, while also adding new elements regarding the use of renewable energy in transport. The draft

RED II defines a binding overall target for the EU of at least 27% renewable energy in gross final energy consumption by 2030, but does not include any binding national targets or sector-specific targets for the use of renewable energy. However, the draft RED II contains an obligation on suppliers of fuels to road and rail transport to prove a minimum share of eligible renewable fuels in their sales portfolio ("blending obligation").

This policy paper assesses whether the accounting rules for electricity from renewable energy sources (RES-E) proposed in the RED II are consistent and whether they create appropriate incentives for the increased use of low-carbon energy in the transport sector. As starting points, Chapter 2 gives an overview of the situation of renewable energy in the EU electricity market and Chapter 3 summarises the most important effects of an intensified interplay of the transport and electricity sectors. Chapter 4 analyses the proposed accounting mechanisms for renewable electricity within the blending obligation on fuel suppliers. Chapter 5 assesses the role of renewable electricity for transport in the context of the overall Union target for renewable energy. A summary of the recommendations from the individual chapters is provided in Chapter 6.

2. Role of RES in the EU electricity market

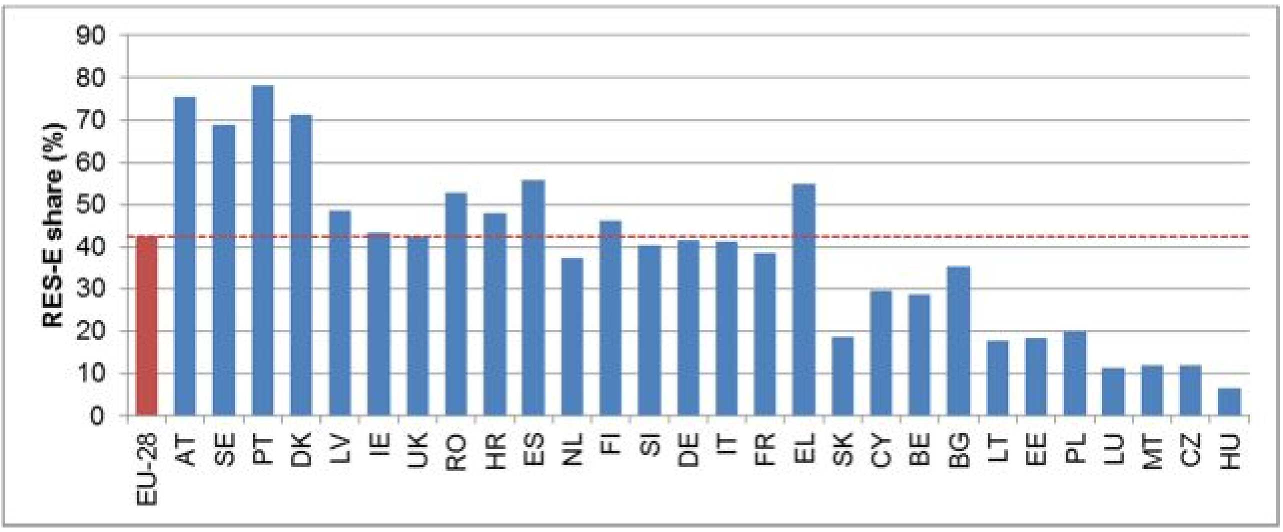
Many actors implicitly assume that the use of electricity in road transport implies that this electricity is produced from renewable energy sources and therefore is fully renewable or with zero carbon emissions. However, this is not the case per se, as relevant parts of electricity generation will still rely on fossil fuels even in the year 2030, and the interactions of the transport sector with the electricity sector are quite complex.

The environmental impact of electric vehicles on CO_2 emissions depends on the type of electricity that is used for charging in a system perspective. In other words, it is necessary to evaluate the effects of electric vehicles on the total emissions in the transport and in the electricity sector. To understand the extent to which electricity consumption of road transport can be based on renewable energy supply, this chapter describes the foreseen development of renewable generation in Europe and the possibility to link consumption in transport to renewable generation.

2.1. Scenarios for RES-E shares

Renewable energy plays an increasing role in the EU electricity market. The share of renewable electricity in EU-28 has increased strongly over the past decades and reached 29,6% in 2016 (Agora Energiewende & Sandbag 2017). Driven by EU climate policy, national support schemes and falling investments costs, the decarbonisation of the energy sector will continue and the emission intensity of power generation will decline further. The EU Reference Scenario 2016 of the European Commission projects an average RES-E share of 42 % in 2030 (Figure 2-1). However, the RES-E shares in MS differ greatly in this scenario. While in a number of MS the renewable generation will contribute more than half of their national generation mix, several countries will not even reach a level of 20 % RES-E generation.

Figure 2-1: RES shares in power generation in EU28 and its Member States in 2030 based on the EU Reference Scenario 2016

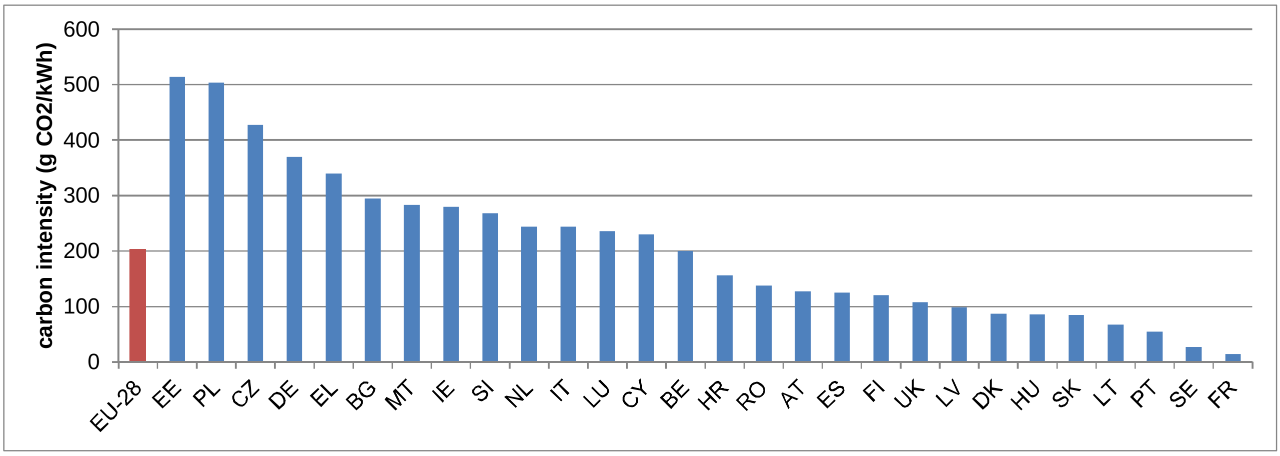


Source: EU Reference Scenario 2016

In comparison to scenarios developed by other actors, the EU Reference Scenario is a relatively minimally ambitious scenario with regard to CO_2 reductions and builds on conservative assumptions regarding the growth of RES in power generation. The European network of transmission system operators for electricity (ENTSO-E) projects a RES-E share for EU-28 in 2030 between 44 % (Vision 1 “slow progress”) and 59 % (Vision 4 “European Green Revolution”) in its scenarios used for planning of the future European grid infrastructure (ENTSO-E 2015). The International Energy Agency projects an EU-28 RES-E share between 39 % (current policy scenario) and 50 % (450ppm scenario) in its Energy Outlook 2016 (IEA 2016). In a more ambitious target-driven decarbonisation scenario for the EU presented by the European Renewable Energy Council and Greenpeace International, a RES-E share of 67 % is reached in 2030 (EREC & Greenpeace International 2012).

Although RES-E shares are increasing, electricity production in the EU will continue to rely strongly on coal, natural gas and oil-based production until at least 2030. This is demonstrated by the average CO_2 intensity of power production in 2030 according to the EU Reference Scenario 2016 (Figure 2-2). In 14 Member States the average CO_2 intensity will still be higher than 200 g CO_2/kWh, including countries with relative high expected electrification of transport (e.g. Italy and Germany).

Figure 2-2: Carbon intensity of power generation in EU28 and its Member States in 2030 based on the EU Reference Scenario 2016



Source: EU Reference Scenario 2016

To understand the impact of electricity demand from transport on power generation and the associated additional CO_2 emissions, it is important to take into account the generation mix of the respective countries and the specific consumption patterns of the transport sector (see Chapter 3).

2.2. Consumers pay for the expansion of renewable electricity

The specific costs for renewable power generation have dropped substantially over the past decade. Nevertheless, financial support will still be required for the future expansion of renewable electricity generation. Public support schemes will continue to be the main driver for RES-E development in Europe at least in the medium-term. In most Member States (20 out of 28) RES-E development is funded through non-tax levies paid by electricity consumers through the electricity bill (CEER 2017). These financing mechanisms ensure that consumers contribute to the development of RES-E according to their level of consumption. It seems appropriate to allocate the supported RES-E volumes to the electricity demand of these consumers as they bear the associated additional costs. With regard to the electrification of transport, these financing mechanisms mean that in most EU countries the additional demand by transport contributes automatically to the financing of the RES-E generation. It can therefore be justified to account the electricity consumption of transport based on average RES-E shares in power generation, which includes supported RES-E production.

However, most Member States (22 out of 28) apply exemptions for non-tax levies for certain consumer groups (CEER 2017). In most cases these exceptions are in place for energy-intensive industries (as a means of preserving their international competitiveness) or for self-consumption. Policy makers might consider such exemptions also for the transport sector as an instrument to stimulate the market penetration of electric vehicles by lowering charging costs. However, in the case of such exemptions the transport sector would not bear the financial burden for a further expansion of RES-E generation. Instead, other “conventional” consumers would have to bear a disproportionate share of the cost of RES-E development. From a distributional perspective, this unbalanced sharing of costs can be judged as unfair. From an environmental perspective, the accounting of electricity demand of transport based on an average RES-E share in national power generation is hardly justifiable if the cost of the support to RES-E production is carried only by other consumers. To avoid the unfair bearing of costs between different consumers groups and to avoid the danger of undermining the environmental credibility of electricity-based road transport, such exceptions should not be introduced.

2.3. Green power market and GO

It is important to understand the characteristics of the green power market in Europe and the system of GO in order to assess the potential environmental impact of the consumption of renewable electricity in transport.

The European electricity market allows for the allocation of renewable electricity attributes to individual consumers. For the reliable tracking of renewable electricity generation volumes and their accurate allocation to consumers, the system of Guarantees of Origin (GO) has been established and is regulated by the current Renewable Energy Directive. This system allows for the allocation of specific volumes of renewable electricity generation from any European country to a specific consumption. The GO system is fully electronic and de-links the renewable origin of a certain volume of electricity from the physics and contractual relationships in the electricity market. If a supplier of electricity cancels a GO for RES-E in relation to the supply of a corresponding volume of electricity to a final consumer, supplier and consumer can claim that the supplied electricity was renewable. This very flexible system can be used at very low transaction costs.

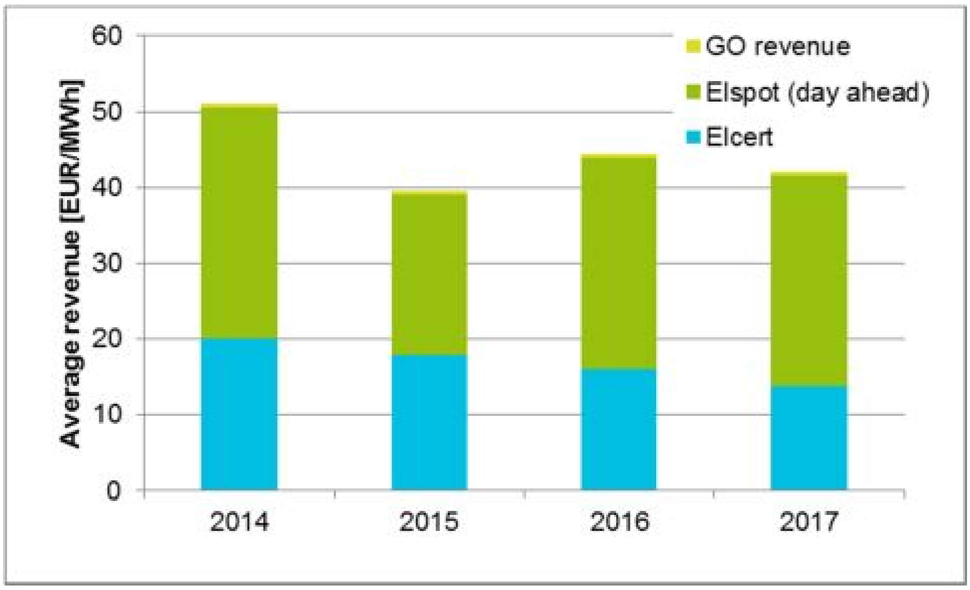
The analysis of the current market for renewable electricity shows that the allocation of renewable electricity to individual consumption is first of all a redistribution of existing RES-E generation between different consumer groups. The European market is characterised by large volumes of renewable electricity production (above 900 TWh in 2016, Agora Energiewende & Sandbag 2017). Although not all of this generation is available for individual allocation to consumers via GO, the total supply of renewable electricity based on GO greatly exceeds the explicit demand of consumers for renewable electricity.

This explicit demand by consumers for renewable energy is comparatively low, as most consumers are either not interested in their energy mix or the national market and its regulatory framework do not allow them to opt for a renewable energy-based supply. Therefore large shares of RES electricity are supplied to consumers which did not ask for a certain share of renewables in their electricity product.

As a consequence of this oversupply the wholesale prices for GO for RES-E are extremely low. The typical price range is 0,15-0,30 EUR/MWh, which corresponds to only 1% or less of the average wholesale price for physical electricity.[1] Figure 2-3 illustrates by the example of the Swedish and Norwegian market that the revenue from GO is negligible in comparison to the revenues from the wholesale market for electricity (Elspot) and national support schemes (Elcert).

[1] Market actors report that most GO are traded bilaterally and currently no reliable price indices are publicly available. The prices achieved by an auction of GO in Italy in 2016 averaged between 0,15-0,29 EUR/MWh (EC 2016). The prices reported by the EEX between 2013 and 2015 for GO (Hydropower from Scandinavia) had an average price between 0,06-0,20 EUR/MWh (EEX 2015) This is in line with bilateral information obtained from market parties.

Figure 2-3: Average revenues for Norwegian and Swedish RES-E operators 2014-2017 [EUR/MWh]



Source: own calculations Öko-Institut, based on NordPool 2017, NECS 2017 (last update 19 May 2017), assuming a GO price of 0,50 EUR/MWh, and extrapolating the average Elspot price of 2016 to 2017

Due to this market situation, an explicit demand for renewable electricity (e.g. from the transport sector) can easily be met at very low cost by redistributing existing renewable electricity volumes. The corresponding volumes can typically be taken away from other consumers who did not ask for a certain energy mix. Therefore, “greening” electricity consumption via the use of GO usually does not lead to an increase in renewable electricity production. The very low prices for GO also demonstrate that it would not be possible to finance investments in new renewable power plants based on the income from selling GO and physical electricity.

It is very likely that the oversupply of RES-E in the retail market will persist for a long time. The major reason for this development is that many countries have stipulated that GO for RES-E may be issued for renewable generation which has received public support. Therefore the full volume of renewable generation is available for allocation by the green power market based on GO, although the buyer of the GO usually only pays for a very small part of the total production cost of the energy in question (see Figure 2-3). The draft RED II contains a similar proposal, which features auctioning of the GO from supported generation. If RES-E generation which benefits from public support schemes would be allocated proportionally to all consumers of electricity which have paid for the cost of the support scheme, a large part of the oversupply would be taken away from the market. In this case, a situation where the explicit demand for green power overshoots the existing supply of transferable GO for RES-E, would become much more likely. Therefore policy makers should consider introducing an allocation of supported RES-E generation to the consumers who have paid for the support scheme, and to ban the transfer of GO issued for supported generation.

In conclusion, it is possible in an *individual perspective* to label a specific consumption (e.g. for charging electric vehicles or the production of fuels) as fully based on renewable electricity, proven by GO, and to claim that the production of the supplied electricity does not cause CO_2 emissions. However, in a *system perspective* such claims can be strongly misleading, in particular if they are made in relation to political strategies to electrify e.g. the transport sector, since the use of GO will most likely not increase the generation of RES-E and the additional electricity demand will therefore be covered mostly by fossil power plants. The communication of such misleading claims by electricity suppliers has been criticised by consumer organisations (BEUC 2016). Therefore electricity consumption in transport should be accounted for with the renewable energy share of the national generation mix for electricity. A deviation from this national RES share is only justified, if the consumption is linked to a contribution to truly additional renewable electricity generation.

2.4. Additionality

As explained above, electricity consumption in transport should only be accounted with higher than average RES shares if, and to the extent that, the respective consumption increases the overall RES-E generation. This can be achieved by meeting certain requirements of *additionality*. Additionality is fulfilled if a certain type of consumption (e.g. charging of electric vehicles) results in additional RES-E generation that would not have occurred without that specific consumption and related contractual relationships between the consumer and other actors in the electricity market. Such additional RES-E generation can occur in two different forms:

a) RES-E generation from new and unsupported production plants

If production from new RES-E capacities is added to the energy system, fossil fuel production will in principle be replaced due to the merit order of power plants (see Chapter 3). To ensure that the costs for adding new RES-E capacities to the system are not borne by all electricity consumers (in which case this new generation should be attributes to all consumers), the new generation should not receive financial support from public support schemes in order to be regarded as additional. The definition of additional production from "new" plants could build on criteria from green electricity labels and advanced guidelines for green public procurement of electricity.

The electricity consumption in transport can be linked to additional renewable energy generation from new and unsupported generation plants. The additional production does not have to be linked directly to the demand, neither physically nor in terms of contractual flows of electricity.

b) RES-E surplus production which would otherwise have been curtailed

If demand from transport is integrated into the electricity system in a smart and flexible way, it may enable the integration of RES-E generation that would otherwise have been curtailed due to a lack of flexibility in the electricity system. Such RES-E generation is usually referred to as "surplus generation", and its use by smart, flexible consumption can also be regarded as additional.

Currently, most RES-E surplus generation in EU Member States is caused by local or regional grid congestion. In order to use these surpluses, smart consumers have to be located in the region of the grid where the congestion takes place and may use electricity only during those hours of the year when surpluses actually occur. This is very difficult to achieve, and therefore the actual use of local surplus RES-E for transport will be very limited in the next years. In cases where this is possible the use of local surplus RES-E could be certified by the grid operator and the related volumes can be allocated to the smart consumer as additional RES-E generation. Different to case a) above, there has to be a close physical relationship between the surplus RES generation and the smart consumer.

In the longer term, with growing overall shares of RES-E generation and the expansion of electricity networks, global RES-E surpluses will become more relevant. Slightly simplified, these occur if the potential RES-E production in a larger area (a country or a group of countries) is higher than the total demand. In the case of well-developed electricity grids the location of the smart consumer is not relevant any more, but still the consumption of curtailed RES-E is only possible at hours of the year during which surpluses are actually present. This synchronisation of the timing of demand with the occurrence of the surplus RES generation could be certified by the grid operator. In most Member States significant volumes of global RES-E surpluses are expected to occur by or after 2030.

Linking consumption to additional RES-E generation increases the environmental profile of that consumption and thereby supports the credibility of environmental claims (vehicles supplied by additional RES-E, low-emission or even zero transport options). In all cases described above, such link can be established “virtually” based on a specific type of GO (see Section 2.5). When implementing a general concept for the accounting of additional RES-E generation, it should be taken into account that the selected solution may not only be used for the transport sector, but could also support ambitious consumers of green power in other segments of energy demand.

In order to make the additional RES-E generation truly additional, also in relation to the national or EU-wide targets for the expansion of renewable energy, the Commission and Member States should consider removing the additional RES-E generation stimulated by final consumers of electricity from the renewable energy volumes counted towards national or EU-wide targets.

2.5. GOplus as an accounting instrument for additional RES-E generation

The current system of GO for renewable electricity already records information related to the year when the production device was put into operation and whether public support has been or is being used for this plant. Based on this information, additional RES-E generation from new and unsupported production plants, as defined under item a) in the previous section, can be identified already today based on the GO system. This possibility is being used by a number of green power products and related quality labels across the EU which value the benefits of additional RES-E generation in the green power market.

However, the current GO system cannot handle additional RES-E production based on the integration of RES surpluses as defined under item b) in the previous section. Furthermore it could be sensible to make additional RES-E generation easily recognisable, without the need to look into the detailed data sets of individual GO in the related registries. Therefore it is advisable to introduce a new type of GO, which is issued only for additional RES-E generation. This new type of GO could be called “GOplus”.

The introduction of GOplus means that the current system of GO is split up into two instruments, the GO as known today and the GOplus. The purpose of both types of GO is the disclosure of electricity towards final consumers. For a unit of electricity generation, either a GO or a GOplus can be issued, and a supplier of electricity can either use GO or GOplus in order to be able to disclose RES-E to consumers. All regulations of the draft RED II for GO also apply to GOplus. This could be implemented by corresponding additions to Article 19.

The essential feature of GOplus is that they are issued only for additional RES-E generation, as defined in the previous section. Competent bodies for GO are required to issue GOplus on request of the generator if the related conditions are met, and to transfer and cancel them without any discrimination compared to GO. The coherent introduction of GOplus across the EU requires a harmonised definition of additionality. In order to ensure this, major principles should be defined in the RED II and the Commission could be empowered to define details by delegated acts.

As mentioned in the previous section, additional RES-E generation could be made truly additional if the corresponding energy volumes were not be taken into account when measuring compliance with the Union target (Article 3 of draft RED II) as well as targets on a Member State level. This would enhance the credibility of the green power market and of claims made based on the supply or consumption of additional RES-E. Therefore, the volumes of electricity represented by GOplus should be removed from the gross final consumption of electricity from renewable energy sources as defined in Article 7 of the draft RED II. A corresponding regulation could be added to Article 7 (2). Besides this there should be no relation between GO or GOplus and the Union or Member State targets.

The use of GOplus provides certain benefits for the suppliers and consumers of electricity. The most important one is that individual claims can be made regarding the origin of the electricity supplied and the character of the generation as additional RES-E. A further benefit could be the possibility to credit GOplus which are used for electricity consumed by road vehicles or the production of synthetic fuels for road transport towards the blending obligation as described in Section 4.7 of this paper.

It is clear that the GOplus will have a market price which might be considerably higher than today's prices for GO. In the case of additional RES-E generation from new and unsupported production plants, the price of GOplus will have to close the gap between the total costs of production of RES-E and the revenues from the wholesale market for electricity. As a point for orientation, the prices for GOplus can be expected in this case to be equivalent to the levels of support granted by national support schemes. In the case of additional RES-E production based on the integration of RES surpluses, the price of the GOplus will have to cover the costs for keeping an electricity demand flexible and managing it depending on the availability of surplus RES-E.[2]

The GOplus concept builds on existing EU regulation regarding GO and a well-functioning infrastructure of registry operators and market actors across the EU and beyond. Synthetic fuels and power-to-gas products could be covered by similar tracking systems for these products which differentiate whether they were produced using grid average power, GO or GOplus. This could support a reliable market differentiation for these products, e.g. by defining a standard for high quality green hydrogen, based on additional RES-E generation.

As the current GO market also involves non-EU countries such as Norway and Switzerland, a decision should be taken whether and under which conditions additional RES production from these countries represented by GOplus would be accepted for electricity disclosure, but also for a potential role of the GOplus in the blending obligation.

3. Effects of the use of electricity in the transport sector

A growing electrification of transport will lead to reductions in GHG and local air pollutant emissions in the transport sector including its upstream emissions (see for example Kasten et al. 2016). Depending on the energy sources used for meeting the additional electricity demand, the reductions of direct emissions by electric vehicles and the use of synthetic fuels will be partially offset by additional emissions in the electricity sector. The current state of the EU carbon emission trading system (EU-ETS), which is dominated by a significant oversupply of emission rights, cannot guarantee that additional emissions in the electricity sector until 2030 will be balanced out by reductions in other sectors. Therefore the electrification of transport will not lead to a carbon-free mobility, unless

[2] See section 4.7.3 on a further discussion of cost implications of using GOplus.

the additional demand for electricity is completely covered by additional electricity generation from renewable energy.

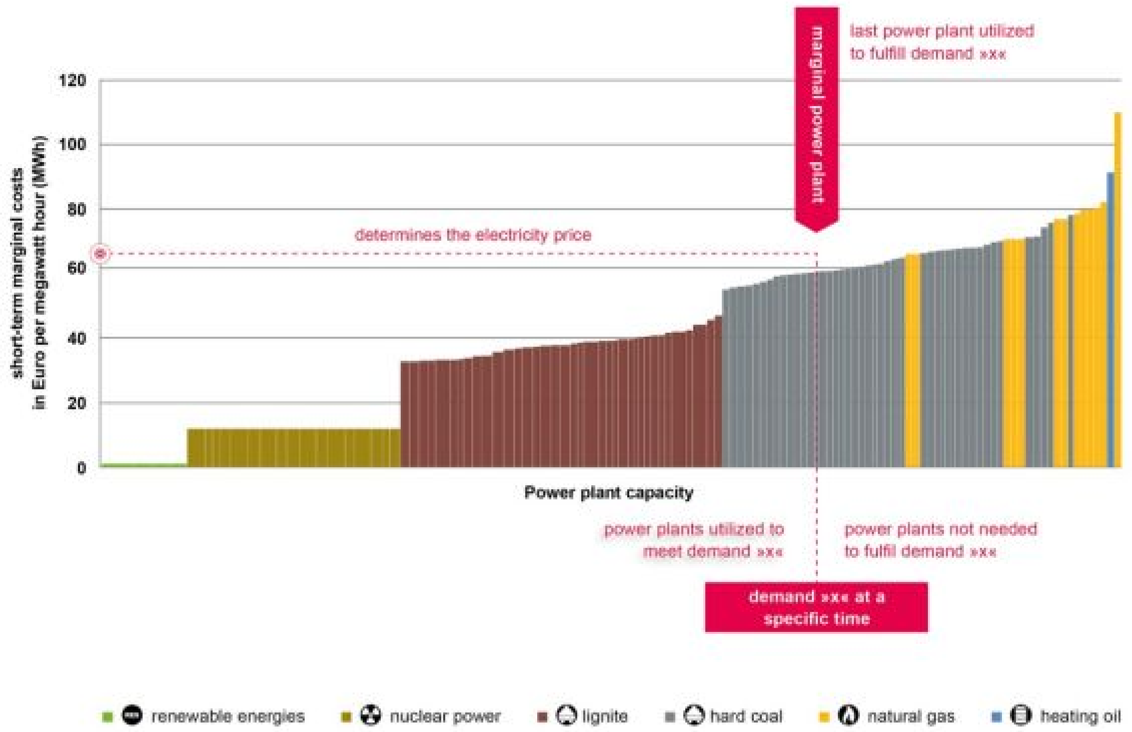
In the following, two aspects of the interplay of the transport and the electricity sectors are discussed in more detail.

Generation mix for electromobility

In order to analyse the effects of transport electrification it is important to understand the merit order principle which is a fundamental feature of competitive electricity markets. The electricity price and the operation of power plants are determined by the short-term operating costs of power plants. Available power plants are dispatched in the order of their marginal costs of power generation. This means that the power plants with the lowest operating costs are generally dispatched first. Therefore, renewable electricity plants are typically utilised first, as they usually have very low operating costs. In a slightly simplified picture, they are followed by nuclear, lignite, hard coal, natural gas and mineral oil power plants. This sequence of power generation options is called the "merit order". For two examples of the merit order curve in the year 2025 see the following two figures. Figure 3-1 shows the case of Germany, which is dominated by large capacities of lignite and hard coal power plants. Figure 3-2 depicts the situation in Italy, which is dominated by gas-fired power plants.

The utilisation of power plants is determined by this merit order and by the load demand in a certain hour of the year. The intersection of this load on the horizontal axis with the merit order curve determines the wholesale power price for that hour, and only power plants which have lower operating costs than this price will be operating.

Figure 3-1: The merit order principle (example of Germany in the year 2025)



Source: Illustration by Öko-Institut

Figure 3-2: The merit order principle (example of Italy in the year 2025)

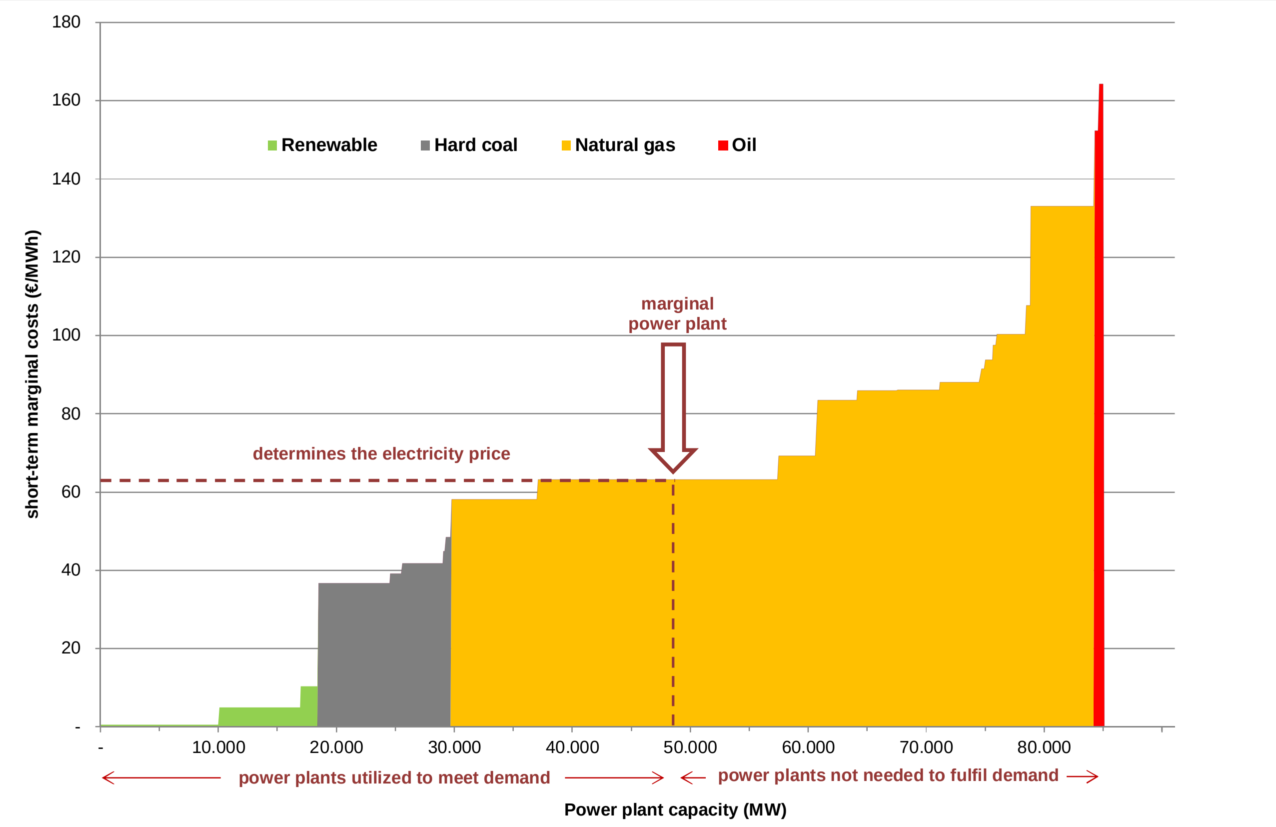


Illustration by Öko-Institut based on ENTSO-E - Scenario Outlook and Adequacy Forecast 2014, Scenario B 2025
Source: ENTSO-E 2014

With an increasing electricity demand (e.g. caused by charging electric vehicles) more expensive power plants are dispatched and the wholesale price for electricity rises. Following this market mechanism, additional power demand is met by the cheapest generation plant which is not yet in use (the “marginal power plant”). What type of power plant this is depends on the shape of the merit order curve and on the level of the total demand, both of which depend on the timing of the additional electricity consumption. Assuming that a country has a generation mix based only on renewable and fossil power plants, the additional demand will not lead to an equal increase of both generation technologies. Many or all of the lower cost power plants (in this case: renewable energy plants) may already be used at a given point in time, and so the marginal power plant may be fuelled completely by fossil energy.

The average CO_2 intensity of electricity production in a country varies during the hours of a day and between weekdays and weekends due to the different demand levels. However, the interactions can be complex: While PV generation increases the share of renewable generation during the day, the total demand at daytimes is higher than at night hours and might require that many fossil fuel power plants are dispatched. At night the level of demand is lower, but at the same time renewable generation is weakened because PV cannot operate. Differences in the average CO_2 intensity between the hours of a day or a week thus strongly depend on the mix of power generation capacity of the country in question, and potentially of connected other countries.

However, for the environmental evaluation of additional electricity demand, e.g. from electromobility, the emissions of the marginal power plant are the determining factor. In many European countries (e.g. Spain, Italy and UK) the marginal power plants in typical peak demand periods are fuelled by natural gas. In low demand periods, it is more likely that the marginal power plant is coal-fired, due to the lower marginal costs of these plants, and thus has higher specific emissions. Under such circumstances, the marginal power plants at night times would be even more emissions intensive than at day times (see the examples in Figure 3-1 and Figure 3-2).

At this point it is worthwhile to look at the patterns of electricity demand from transport. It can be expected that electric vehicles will be charged mostly over night, when they are parked at the homes or company sites of the users. Production plants for synthetic fuels will usually be operated 24 hours per day (“baseload”), as the chemical processes are difficult to interrupt and the high investments in the plants require a maximum usage of the available production capacity.

Therefore, even in the case of charging electric vehicles at night it cannot be assumed that the marginal plant is using renewable energy. In most Member States, the potential electricity generation from RES exceeds the demand only in a small number of hours of the year. Only in countries with very high shares of RES-E in the generation mix (e.g. Austria, Sweden, Portugal and Denmark), are there more hours of the year where the available RES-E supply exceeds consumption in off-peak periods. However, these countries are usually integrated in cross-border markets for electricity and therefore excess RES generation capacities will enable a country to export electricity to other countries and to offset more expensive fossil power plants located there. Therefore, an increased demand for electricity in the transport sector will mean the additional operation of fossil power plants in most hours of the year. This is only expected to change after 2030, when RES-E shares in the generation mixes of several large Member States are expected to exceed the threshold of 60 %. Relevant surpluses are only expected in countries above this level (Agora Energiewende 2014; Bauknecht et al. 2016). The countries with relevant electricity demand from transport will probably not reach such high shares until 2030 (e.g. Spain, UK, Germany and Italy). Until then, the specific CO_2 emissions resulting from additional demand for electricity may be higher than the average emissions of the national generation mix.

Use of regional RES-E surpluses for electromobility

It is often argued or implicitly assumed that electric vehicles and the production of synthetic fuels can be based largely on renewable electricity surplus production. Under these circumstances the additional consumption would not lead to any additional CO_2 emissions. However, a closer look at the availability of RES-E surpluses shows that the potential to use them for transport is restricted in several ways.

Firstly, system-wide renewable surplus production will only occur in Member States with high shares of fluctuating wind and solar production (see above), and even then the overall surplus volumes will be limited and might be used by exporting electricity to other countries. Regional RES-E surpluses and related curtailment of RES-E generation exist already today due to network congestions. These surpluses are limited to the regions close to the network congestion and are being counteracted by grid operators through grid reinforcement measures. Therefore, in order to use such regional surpluses for transport, the related demand would have to be located in the regions where the congestion is happening and this use would only be possible in the period until the grid has been reinforced.

Secondly, the timing of electricity demand would need to coincide with the RES-E surplus. This limits the potential of electric vehicles to harness RES-E surplus production due to their limited flexibility in charging patterns. Similarly, the production of synthetic fuels would have to operate only during those hours of the year when regional surpluses are actually available. Such an intermittent operation would be difficult in terms of management of the technical processes and it would reduce the usage of the capital-intensive plants, which would in turn increase the specific costs for the synthetic fuel product.

Thirdly, there are a number of competing options in the electricity sector for using surplus renewable generation, including battery energy storage and demand side management. Furthermore, other sectors (e.g. the heating sector) could also utilise RES-E surplus production, and the use in these sectors might achieve even higher emission reductions than in the transport sector. Thus only a part of the existing or expected RES-E surplus production would be available for the transport sector.

In summary it can be stated that the potential to utilise RES-E surplus production for the transport sector can be regarded as very limited until 2030 and is likely to be relevant only in those Member States which will have significantly higher shares of fluctuating solar and wind production than today.

Conclusion

Although a marginal analysis based on the merit order in the electricity market gives the most accurate results for the impact of additonal electricity demand on the electricity sector, it might be an acceptable first approximation to use the average generation mix of a country in order to assess the effects of electrification of transport. This approximation implicitly assumes that the volume of additional electricity demand is small compared to the overall electricity sector such that the changes due to the merit order effects are negligible. This can be seen as an acceptable approach for the EU in the period up to 2030.

A higher share of renewable energy and correspondingly a lower GHG emission factor could be credited to the additional electricity demand from transport if and to the extent that measures are taken to increase the generation of electricity from RES. This could be done, for example, by additional investments in new generation capacities, e.g. from wind or solar power.

4. Renewable electricity in the blending obligation

The blending obligation (Article 25 of the proposed RED II) is a key instrument at EU level aiming at increasing the share of renewables in transport and supporting the decarbonisation of the transport sector. It addresses several options for reaching this target, including “advanced” biofuels, fuels based on cooking oil, certain animal fats and molasses, and electricity, which can be used either directly in electric vehicles (EV) or in the form of synthetic fuels. As the use of biofuels can lead to a number of adverse effects, including indirect emissions through ILUC effects, an increased use of renewable electricity can be an important contribution to decarbonising the transport sector.

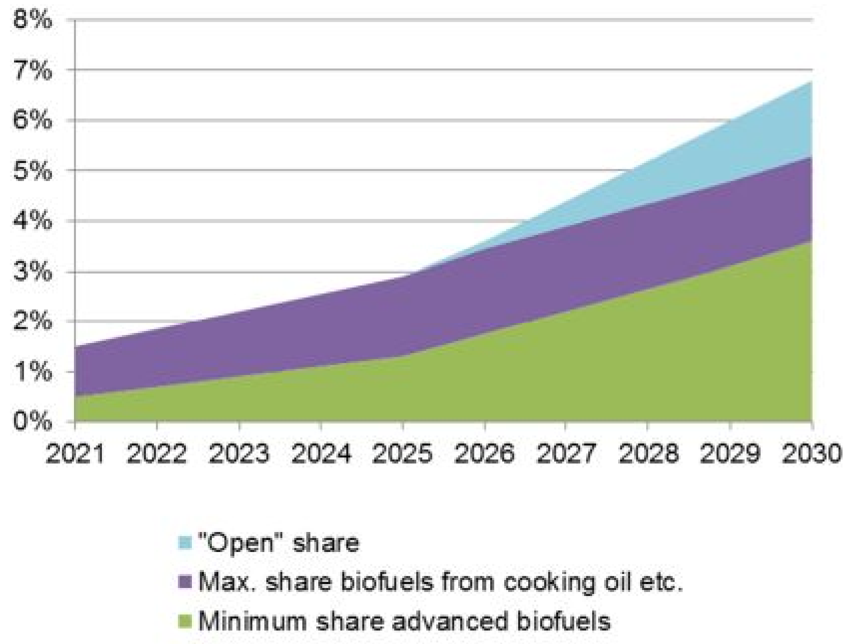
The blending obligation requires suppliers of fuels to transport to prove a minimum share of eligible renewable fuels in their sales portfolio. Figure 4-1 illustrates the shares of eligible renewable fuels as specified in Art. 25. The figure is based on the assumption that fuel suppliers will meet the required minimum share of advanced biofuels,[3] and will exhaust the allowed maximum share of biofuels from cooking oil, etc.[4] as a low-cost option before using other eligible sources. The remaining

[3] The feedstocks eligible for the production of advanced biofuels are listed in Section A of Annex IX of the draft RED II.

[4] The feedstocks whose use is limited by Article 25 (1) are listed in Section B of Annex IX of the draft RED II.

"open share" can be filled by renewable electricity, more advanced biofuels or other eligible options.

Figure 4-1: Differentiation of the blending obligation under the proposed RED II



Source: Öko-Institut, based on the proposed RED II

All suppliers of fuel and energy face the same obligations.[5] This means that a supplier of electricity also has to meet the defined minimum share for advanced biofuels. This is only possible if the transferability of blending obligations is implemented as discussed in Section 4.4.

It must be noted here that the proposed RED II does not include any sustainability criteria and related verification processes for synthetic fuels. However, the production of these fuels may result in adverse effects in relation to different sustainability goals. This can be even more relevant if these fuels are produced outside the EU. Potential criteria could include proportionate financing requirements for renewable electricity capacities in the national or regional energy mix, some form of additionality requirements for new renewable electricity production as well as other social and ecological issues (e.g. water use in arid areas and a non-fossil origin of CO_2 used for methanisation). The process for the development of such criteria should be initiated before a relevant market volume for synthetic fuels is realised to avoid a negative sustainability impact similar to the history of crop-based biofuels.

The following sections of this chapter analyse different aspects of the accounting of renewable electricity in the blending obligation and propose improvements of the accounting mechanisms.

5 The proposed RED II is not entirely clear on whether also utilities only providing electricity to the transport sector fall under the blending obligation. For the purpose of this paper, it is assumed that all types of fuel and energy suppliers, including utilities providing electricity for road and rail transport, are equally obliged to fulfil the obligations specified in Article 25.

4.1. Role of renewable electricity within the blending obligation

The COM proposal for RED II states that electricity used in road transport can be accounted towards the blending obligation by applying either the RES share in total electricity generation of the country where the electricity was used or the average RES share in electricity generation across the EU.

Under specific conditions, synthetic fuels can be accounted for as 100% eligible renewable fuel. The conditions for this possibility are:

- Renewable electricity is obtained from renewable power plants that came into operation at the time or after the start of the operation of the fuel production facility, and
- the respective renewable electricity plants are not connected to the grid.

It is assumed here that these conditions are quite difficult to meet in the practical operation of such plants, and therefore this report focuses on the application of statistical RES-E shares in power generation to electricity supplied to transport.

Figure 2-1 shows the variation of the expected shares of renewable electricity in power generation in the year 2030 across the EU in the EU Reference Scenario 2016 (which can be regarded conservative in estimating these shares). It becomes clear from the figure that the option to apply either the national RES share or the EU average share will inevitably lead to “cherry picking”, as all actors will go for their best result (the highest RES share). This will in the end lead to an overestimation of the RES share in power generation across the EU. The national RES share gives a good picture of the electricity mix which is actually available for transport. Therefore the option to apply the EU share should be removed from Art. 25.

Although there are significant variations in the RES share in national electricity generation mixes, this share will in most Member States be significantly higher than the overall RES target under the blending obligation in all years from 2020 to 2030. Thus, electricity used in road transport will be accounted with a RES share which is considerably higher than the total obligation on fuel suppliers.

Therefore suppliers of electricity to road transport will not only meet their overall obligation with no additional efforts, they will even be able to accept transfers of significant volumes of obligations from conventional fuel suppliers.[6] This creates a clear incentive for using electricity in road transport, which can be helpful to support the decarbonisation of the transport sector.

This effect depends strongly on the RES-E share which can be applied to electricity used in road transport, and it is fortified if the direct use of electricity for charging road vehicles benefits from a multiplier, which takes into account the higher energy efficiency of electric vehicles (see section 4.6).

4.2. Sensitivity analysis on the effect of electricity on the blending obligation

The base case for this sensitivity analysis can be described as follows:

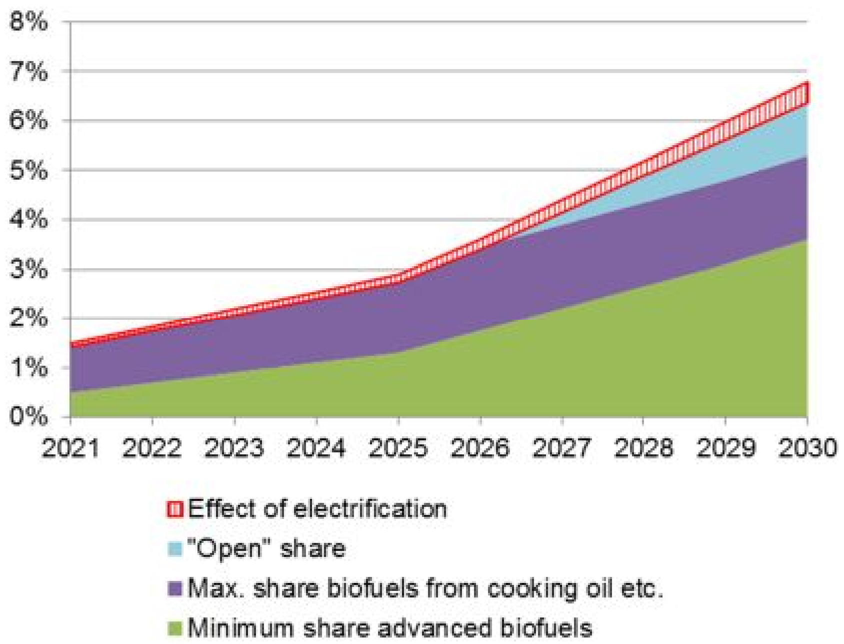
- Development of the use of electricity in road transport according to the EU Reference Scenario 2016 (this share is 0,2 % of all fuels used in road transport in 2020 and grows slowly to 0,9 % in 2030).

[6] Note that suppliers of electricity also have to meet the minimum obligation for advanced biofuels.

- The national share of RES electricity in power generation starts with 36% in 2020 and rises to 45% in 2030.
- No multiplier is applied for electricity used directly in vehicles (as in the proposed RED II).
- The minimum share for advanced biofuels is set at 3,6 % in 2030 (as in the proposed RED II).

The following figure shows the effect of electrification of road transport for this base case as a red area. This area represents the part of the obligation which is fulfilled "automatically" by the supply of electricity to road transport, a part of which is assumed to be renewable. In this base case, this part corresponds to 0,41 % of the total fuels supplied in the year 2030. The minimum share for advanced biofuels is a separate requirement which must be met at all times. Therefore, the area between the minimum share for advanced biofuels and the red area has to be covered by other eligible fuels, e.g. biofuels from cooking oil, etc. (up to the maximum limit allowed), renewable fuels from non-biological origin (RFNBO) such as hydrogen and other synthetic fuels, more advanced biofuels or waste-based fossil fuels.

Figure 4-2: Effects of the electrification of road transport on the blending obligation (base case)

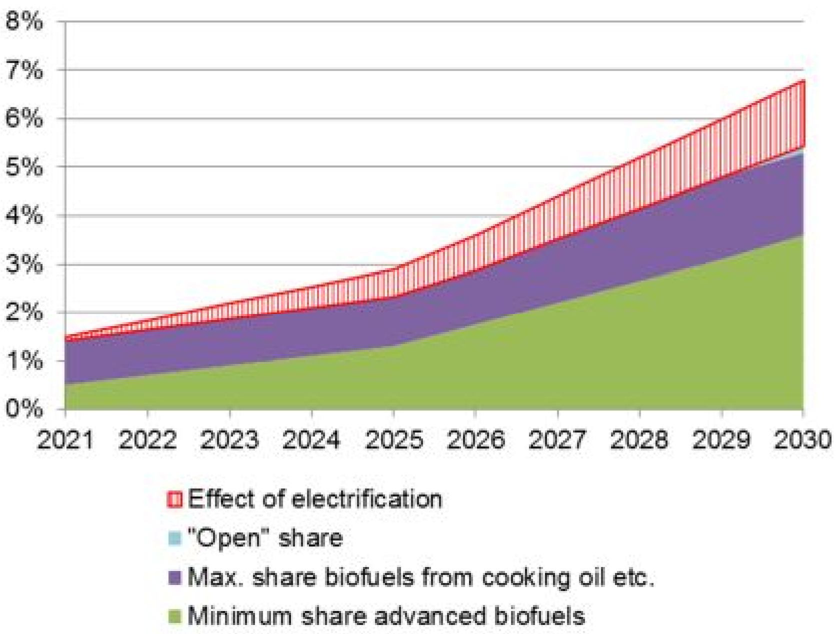


Source: Calculations by Öko-Institut

As a variation to the base case, the following figure shows the impact of electrification in the case of an increased uptake of the electrification of road transport, starting with 0,2 % in 2020 and rising to 3,0 % in 2030.[7]

[7] In the decarbonisation scenarios of the European Strategy for Low-Emission Mobility the share of electricity in road transport varies between 2-3 % (European Commission 2016).

Figure 4-3: Effects of the electrification of road transport on the blending obligation (variant of base case: electrification of transport rises to 3 % in 2030)



Source: Calculations by Öko-Institut

As Figure 4-3 shows, the assumed increase of the electrification of road transport has a strong impact on the blending obligation. Most of the “open” share of the obligation is covered by the “automatic” effect of electrification.

In order to present the remaining sensitivity analysis in a condensed way, the following figures only refer to the situation in the year 2030 and neglect the path from 2020 to this target year.

<u>Impact of the share of RES electricity in the national generation mix</u>

Today’s shares of RES electricity in the national generation mix differ significantly between the Member States and similar differences can be expected for the year 2030. Based on the EU Reference Scenario 2016, Germany, Spain, the United Kingdom, Italy, Poland and France are expected to become the largest markets for electromobility within the EU-28 by 2030. Taking this into account, and the shares of RES electricity in the generation mix of these countries by 2030 according to the EU Reference Scenario 2016 and the scenarios of the European transmission system operators for electricity (ENTSO-E 2015), the following sensitivities have been selected for 2030:

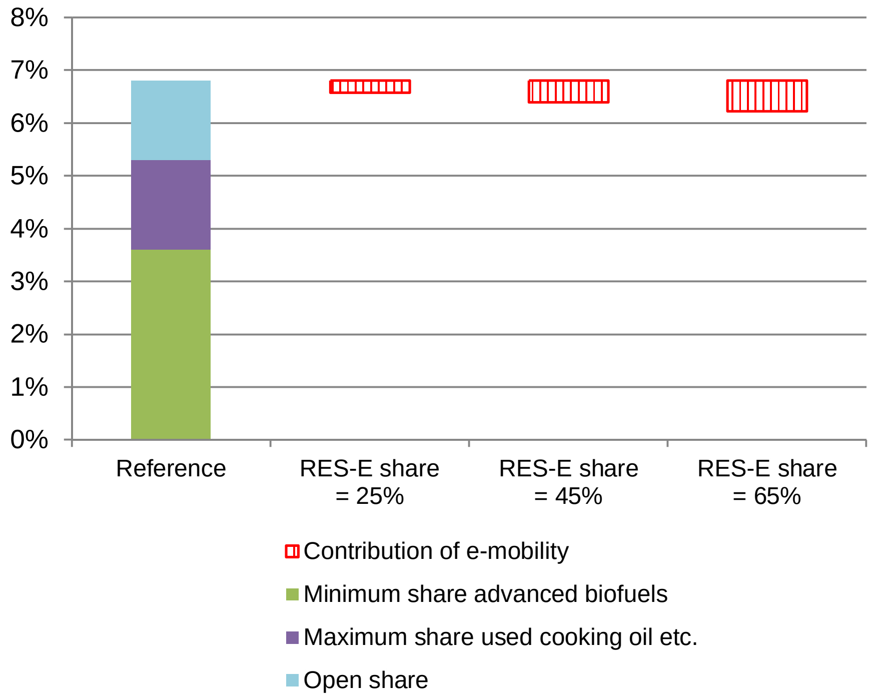
Low RES-E share: 25 %

Medium RES-E share: 45 %

High RES-E share: 65 %

The following figure shows the base case with the effects of these three variants.

Figure 4-4: Effects of the electrification of road transport on the blending obligation (base case with variants of the RES-E share in the national mix)



Source: Calculations by Öko-Institut

The effect on the blending obligation is 0,23 % in the country with the low share of RES-E, 0,41 % in the country with the medium share and 0,59 % in the country with the high share.

Impact of a faster uptake of electricity in road transport

For this sensitivity, we assume a country with a medium RES-E share of 45 % in 2030, as defined in the base case. The share of electricity in the overall energy demand for road transport is varied as follows:

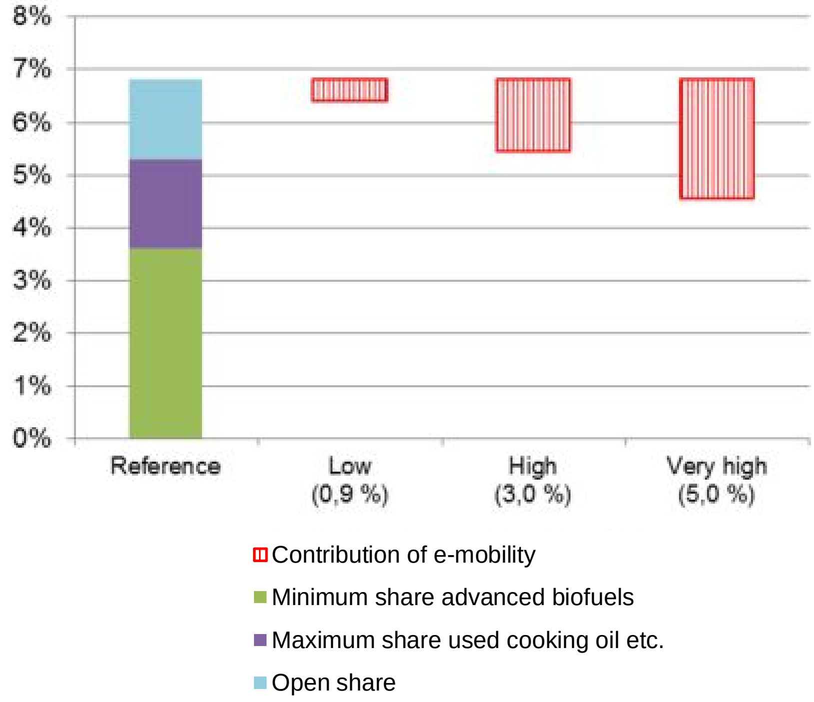
Low share (0,9 %) – as in the EU Reference Scenario 2016

High share (3,0 %) – a level which can be related to the decarbonisation scenarios of the European Strategy for Low-Emission Mobility (European Commission 2016).

Very high share (5,0 %) – a level which is assumed in very ambitious decarbonisation scenarios (e.g. Zimmer et al. 2016 for the case of Germany).

The other parameters are set as in the base case. The following figure shows the effects of the three variants.

Figure 4-5: Effects of the electrification of road transport on the blending obligation (base case with different penetrations of electricity in road transport)



Source: Calculations by Öko-Institut

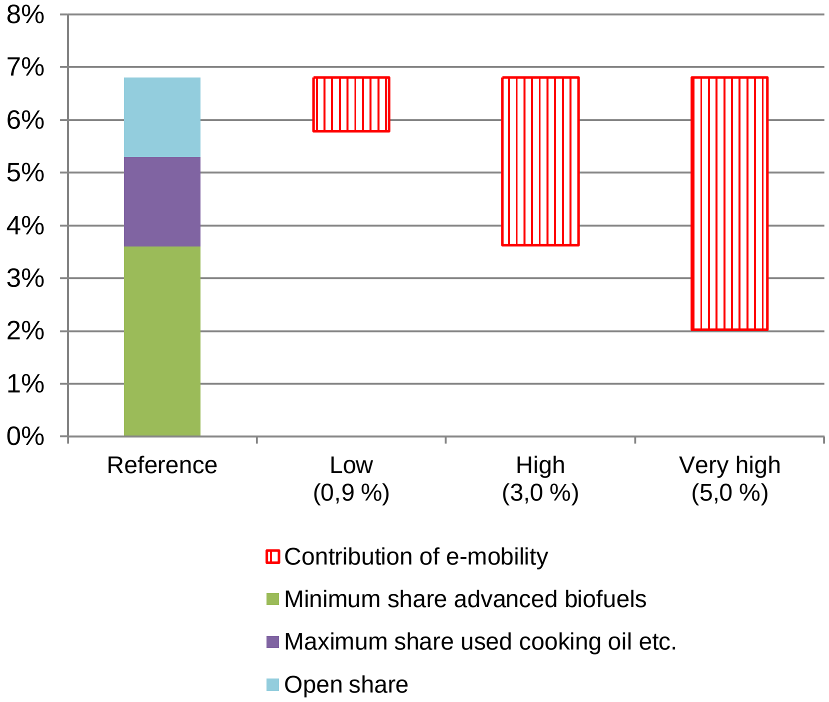
The effect of a faster penetration of electricity in road transport on the blending obligation can be quite significant. In the case of a 3 % share of electricity in transport, the contribution to the obligation is already 1,35 %. The same assumption in a country with a 65 % share of RES-E in power generation yields a contribution to the obligation of even 1,95 %. In a quite extreme variant with a 5 % share of electricity in transport the contribution to the obligation would rise to 2,25 % (3,25 % in a country with a 65 % share of RES-E in power generation).

Impact of a multiplier for the direct use of electricity

This sensitivity uses the same data as in the previous section (Figure 4-5), but it now introduces a multiplier for the direct use of electricity in electric vehicles.

The following figure shows the results under the assumption that a multiplier of 2,5 is introduced. In the case of 0,9 % penetration of electricity, all electricity supplied to road transport is assumed to be used directly by electric vehicles. In the case of 3,0 % penetration, a 10 % share of synthetic fuels is assumed, and in the case of 5,0 % penetration, a 25 % share of synthetic fuels is assumed.

Figure 4-6: Effects of the electrification of road transport on the blending obligation (multiplier 2,5 with different penetrations of electricity in road transport)



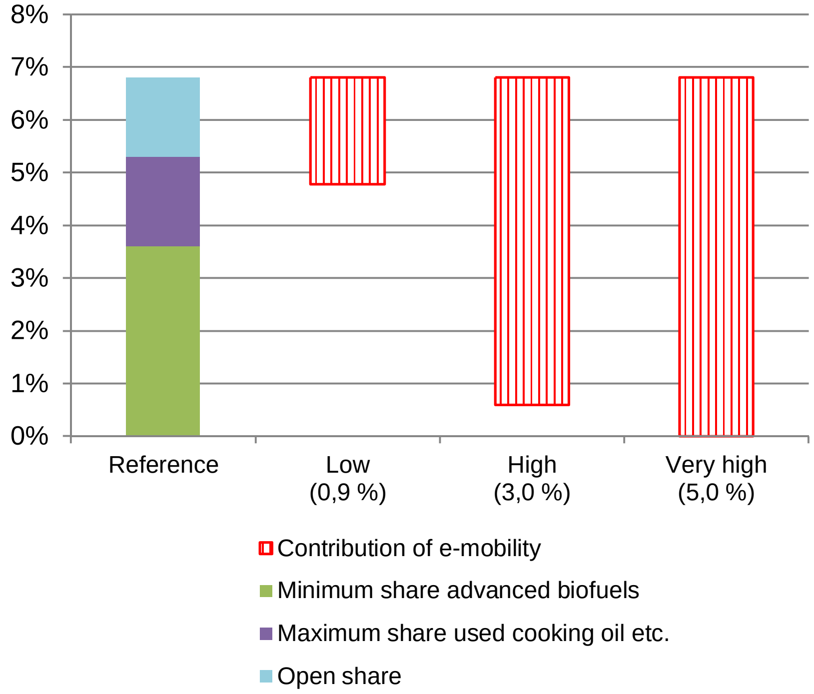
Source: Calculations by Öko-Institut

The assumed multiplier magnifies the effect of the penetration of electricity in road transport. In the case of low penetration (0,9 %), the contribution to the obligation is already 1,01 % (1,46 % in a country with a 65 % share of RES-E in power generation). With a 3 % share of electricity in transport, the contribution rises to 3,17 %. In this case, the obligation of fuel suppliers would be met by the minimum share of advanced biofuels plus the automatic effect of electrification. In a country with a 65 % share of RES-E in power generation, the contribution of electrification to the obligation would increase to 4,58 %. In the extreme variant with a 5 % share of electricity in transport, the contribution to the obligation is even 4,78 %. If this extreme penetration is reached in a country with a 65 % share of RES-E in power generation, then the full obligation of 6,8 % would automatically be met by the electrification. Still, all fuel suppliers would have to meet the minimum share of advanced biofuels, but the effects of electrification would allow them to take over relevant volumes of obligations from suppliers in other countries without any additional costs.

Finally, the case of an extreme multiplier of 5 is presented.[8] All other assumptions remain unchanged.

[8] Note that this high value would be hard to justify based on the differences in efficiency of the vehicles, see Section 4.6.

Figure 4-7: Effects of the electrification of road transport on the blending obligation (multiplier 5 with different penetrations of electricity in road transport)



Source: Calculations by Öko-Institut

With the multiplier of 5 the magnifying effect is even fortified. In the case of low penetration (0,9 %), the contribution to the obligation is already 2,03 % (2,93 % in a country with a 65 % share of RES-E in power generation). With a 3 % share of electricity in transport, the contribution rises to 6,21 % (in a country with a 65 % share of RES-E in power generation the contribution would be nearly 9,0 % and thus would exceed the total obligation of the fuel suppliers in the country in question). The same value of 9,0 % would be reached in the extreme variant with a 5 % share of electricity in transport. In combination of this variant with a country with a 65 % share of RES-E in power generation, the fuel suppliers could cover even 13,0 % of their fuel supplies to road transport by the automatic effect of electrification. Again, this would allow the fuel suppliers to take over relevant volumes of obligations from suppliers in other countries without any additional costs.

The sensitivity analysis shows that higher rates of electrification of road transport, possibly fortified by a multiplier for the direct use of electricity in vehicles, can have a significant impact on the remaining obligation of fuel suppliers, depending on the share of RES electricity in the generation mix of the country in question.

4.3. Options for metering electricity consumption in road transport

The inclusion of the supply of electricity to road transport into the blending obligation requires that the total volume of electricity supplied to vehicles is metered and that the volumes of each charging process are allocated to a specific electricity supplier. However, Member States might also be interested in accurate metering of electricity in road transport due to potential specific support and taxations measures[9] for electric vehicles (EV). The difficulty of metering the quantitiy of electricity used in road transport stems from the fact that electric vehicles can charge at different locations and different types of charging spots:

- Public and semi-public charging[10]

  Measuring and monitoring electricity supply to vehicles appears straightforward as long as the public charging infrastructure is solely used by road transport vehicles. However, currently there are no measurement devices available to correctly monitor the volumes of electricity supplied at high power and fast charging stations with DC power supply. Their market introduction and approval of the authorities are expected over the next years. The accounting of electricity volumes and the allocation to electricity suppliers could be coupled with other requirements (e.g. uniform connectors, free choice of electricity supplier) as a standard for charging infrastructure operators. Nevertheless, most experts expect that public and semi-public charging points will only supply a small share of the total electricity charged to vehicles. The largest part will most likely be supplied by private charging at home and at work.[11]

- Private charging

  Electric vehicles will most likely be charged mainly during long parking periods at private charging spots at home and at work. The allocation of the supplied electricity to a specific supplier appears to be straightforward through the electricity supply of the household or the company. However, the electricity supplied to vehicles is part of the total consumpton at a certain site, and current metering practices usually only address the total consumption. Specific charging plugs (e.g. wallboxes) can be equipped with (sub-) meters for electric vehicles, but no legal requirement exists and it is unclear how the data from these meters would be collected. Moreover, any electricity socket at home or at work could in principle be used for charging electric vehicles. This makes it difficult, if not impossible, to record electricity specifically supplied to electric vehicles, except in cases where an on-board metering solution is installed in the EV.

Thus, it can be concluded that the electricity supply to road transport cannot be monitored completely at the point of consumption (public and private charging spots) under the current regulatory framework. This metering concept is nevertheless one of the three general options for recording electricity supply in road transport which are presented below.

<u>Option 1: Stationary metering at the point of consumption (public and private charging spots)</u>

As discussed above, measuring electricity volumes supplied to road transport should be technically available in the short-term future for all (semi-) public charging infrastructure. Private charging spots woud have to be equipped with specific metering devices and the data would have to be

9 Financial support schemes which are based in the total volume of electricity supplied to electric vehicles would require that the corresponding electricity volumes are clearly recognisable. On the other hand, the current levels of the excise duty on electricity across the EU are multiple times smaller (related to the energy used) than the excise duties on liquid fuels. Additionally, electric vehicles are multiple times more efficient per km travelled. Both effects result in tax income cuts with an increasing EV share. Thus, in mid-term Member States might choose to increase the excise duty specifically for electricity used in road transport.

10 Public charging infrastructure: Charging infrastructure for EV in public space; semi-public charging infrastructure: Charging infrastructure for EV on private property open to the public (e.g. parking lots of supermarkets)

11 For example: Figenbaum et al. 2016: Learning from Norwegian Battery Electric and Plug-in Hybrid Vehicle users. Results from a survey of vehicle owners. Institute of Transport Economics; Norwegian Centre for Transport Research.; BuW Schaufenster Elektromobilität 2017. Schaufenster-Programm Elektromobilität. Abschlussbericht der Begleit- und Wirkungsforschung.

collected separately from the total consumption at the site. Allocation of these electricity volumes to specific electricity suppliers is possible which would be necessary for implementing the blending obligation proposed in RED II. Grid standards could be adjusted to require metering systems at any charging spot for electric vehicles and to specify technical and system requirements at publicly accessible charging infrastructure (e.g. uniform connectors, free choice of electricity supplier). Nevertheless, any electricity plug could potentially be used for charging the EV. EV charging would have to be prevented at electricity sockets which are not metered separately, if the total volume of electricity supplied to road transport has to be recorded reliably at the point of consumption.

Option 2: On-board metering in the electric vehicle

On-board metering systems could allow the quantification of the electricity consumed independently of the type and location of the charging spots. Existing intelligent on-board metering systems measure and record the electricity charged to the electric vehicle and can also allocate the electricity to the specific electricity supplier. Measuring devices for DC power supply should be available in the near future as well for on-board metering systems. Contrary to stationary metering systems, the vehicles or the charging cable would have be equipped with the electricity measurement and data management device which would increase the vehicle costs only by a small amount.[12] Furthermore, procedures for collecting the data from the metering devices would have to be defined.

Option 3: Statistical estimations based on the distance travelled and the vehicle efficiency

The current method for quantification of electricity in road transport is laid down in Annex I of Directive EU/2015/652, which defines the methods for the calculation of the GHG intensity of fuels and energy supplied. Fuel suppliers are required to report the volumes of electricity based on the distance travelled and the pre-defined vehicle efficiency. System losses of the charging process are not considered with the current regulation. Neither the distance travelled nor the real-world vehicle efficiency (including system losses) are systematically monitored to provide the required data for this approach. If the distance travelled and the vehicle efficiency cannot be measured properly, rather rough estimations about both parameters have to be applied. Additionally, the allocation of the electricity to different charging spots and different electricity suppliers appears to be infeasible.

Option 1 and option 2 are recommended with regard to the accuracy of the metering process and the potential to allocate the electricity supply to specific fuel suppliers. However, as described above, some issues remain to be solved. Accurate metering of all electricity for vehicles appears to be also in the interest of electricity suppliers, as this would facilitate volume-based electricity tariffs for electric vehicles, which are currently not the standard at public and semi-public charging points. Option 3 should only be applied if the other two options are not possible due to the less accurate monitoring. Since the technical issue of the DC power supply measurement will probably be solved in the near future, option 1 and option 2 will likely be available soon. Option 2 appears to be the more convenient solution for consumers, since any electricity socket could be used for EV charging even if all electricity supply in road transport has to be recorded.

[12] At present, no on-board metering systems are available at a commercial scale. The start-up *Ubitricity* has developed an on-board metering system that is integrated in the charging cable. Additional costs have been estimated at about 100 EUR per unit (ubitricity 2014). Further cost reductions are likely in the case of mass production of such systems.

4.4. Transferability of obligations and accounting of fuel volumes

Art. 25 of the proposed RED II establishes transferability of obligations between obliged parties and the accounting of volumes and characteristics of fuel placed on the market, which is eligible for meeting the obligations. For this purpose, national databases shall be set up and connected with each other in order to allow tracing of cross-border transfers of eligible fuels.[13]

Thus each obliged actor can transfer parts of its obligation to other obliged actors (and pay them for meeting the obligation). It is unclear from the current proposal whether such a transfer of obligation would always relate to integrated parts of the total obligation of (up to) 6,8 %, which would include the corresponding minimum share of advanced biofuels and the cap on biofuels based on cooking oil, etc., or whether the individual elements of an obligation can be transferred separately to different fuel suppliers. The latter approach would allow electricity suppliers to transfer their biofuels obligation to conventional fuel suppliers. In turn, the conventional fuel suppliers could transfer parts of their obligation to electric utilities which might be able to meet them at a lower cost compared to the eligible options in the market for liquid fuels.

The text of the COM proposal implies, in connection with the Impact Assessment, that the tracing of eligible fuels has to follow a mass balance system as a means of providing a chain of custody. The tracing would therefore be linked to the physical transfer of such fuels and no de-linked certificate system would be established. Documentation has to include volumes (probably in energy units), upstream GHG emissions and other sustainability information. This tracing approach builds on the existing legal requirements and databases for sustainability criteria for liquid biofuels which are established in several European countries.

The draft RED II empowers the Commission to issue technical specifications regarding the content and use of the databases.

The tracking system for transfers of obligations and eligible fuels will be quite complex, and the validity of the information entered into this system must be ensured. It is vital that the Commission issues a detailed set of requirements for the national databases. Experiences from the current accounting systems for biofuels and from the registries established for managing GO for RES electricity under RED I can be used to set up requirements for a robust European database system.

4.5. Relation to the system of GO for renewable electricity

The current RED I established a system of Guarantees of Origin (GO) for electricity produced from renewable energy sources, which is also applied to heating and cooling from RES (Article 15 of RED I). The proposed RED II takes over this concept in Article 19 with some modifications. The purpose of the GO is clearly defined as an instrument of proving the origin of energy supplied to final consumers.

In the case of using electricity as a transport fuel, the proposed RED II allows for the application of either the national or the EU average share of renewable energy in electricity generation (see the discussion in Section 4.1). Furthermore, it requires that a number of GOs for RES electricity be cancelled, equivalent to the total volume of RES-E accounted for in the blending obligation based on this regulation. It is obvious that this provision aims to avoid double counting of this volume of RES-E in relation to the disclosure of electricity to final consumers: It ensures that the volumes of

[13] The proposed RED II is not entirely clear whether transfers of obligations between fuel suppliers in different Member States shall be allowed. If this is the case, then the databases would have to be able to trace such transfers as well.

RES-E accounted for by fuel suppliers under the blending obligation cannot be used for green electricity marketed to other electricity consumers. Therefore this requirement is sensible and should be retained.[14]

However, the function of the GO is to provide proof to the final customer that a given share or quantity of energy supplied to him was produced from renewable sources. This function is defined by Articles 2 and 19 of the proposed RED II and does not support the cancellation of GO by fuel suppliers unless this is related to the supply of electricity to final consumers. For full compliance with the defined function of the GO, the RED II should clarify that the GO cancelled in context of the blending obligation should be used by the electric utilities for disclosing the origin of electricity supplied to vehicles according to Article 3 (9) of the (existing) IEM Directive 2009/72/EC.

In order to ensure consistency regarding the use of GO and the accounting of RES-E based on the national (or EU) RES-E shares, Art. 25 should at least specify that the GO used by fuel suppliers must relate to RES-E generation in the EU (and not be imported from outside the EU). If fuel suppliers are required to apply the national RES share in power generation, as proposed in Section 4.1 above, then fuel suppliers could be required to use GO relating to domestic generation of that country. This would avoid distortions based on large-scale imports of GO.

Some stakeholders have proposed that the supply of RES-E to road vehicles or to producers of synthetic fuels, proven by the use of GO, should be accounted under the blending obligation without limitation or reference to the national or EU generation shares. Depending on the number of GO cancelled, this would mean that up to 100% of the electricity supplied could be regarded as renewable fuel. This would aggravate the effects of electrification on the blending obligation described in the sensitivity analysis of Section 4.1. Given the oversupply of RES-E in the European markets for electricity (see Section 2.3), the proposed unlimited use of GO would therefore not reduce the environmental impact of electricity use in transport, as no additional RES-E generation would be stimulated. Instead, this proposal could significantly water down the intended effects of the blending obligation on the market for liquid fuels. Therefore this proposal is not sensible and GO should not be used to determine the share of RES in electricity supplied to road transport under the blending obligation.

However, if the new type of GOplus is introduced as described in Section 2.5, which stimulate and account for additional RES-E generation, fuel suppliers might be allowed to use cancellations of GOplus for increasing the allowable RES-E share in electricity supplied to road transport above the national average share (see Section 4.7 for details).

4.6. Reflecting the energy efficiency advantage of electric driving

The various electricity-based energy options in the transport sector differ in their electricity demand, as they have different energy efficiencies along the production chain of the fuels and within the vehicles. Battery electric vehicles and electric road systems use electricity directly from the electricity grid. Fuel cell vehicles transform hydrogen which is potentially produced through electrolysis into electricity for propulsion. Synthesis processes can transform hydrogen through the addition of CO_2 into methane and liquid fuels in order to use these energy carriers in combustion engines.

The different conversion efficiencies of these energy supply options imply that they differ significantly in the volume of electricity needed to reach the same mobility output in terms of kilometres.

[14] Note that the ITRE rapporteur has proposed to delete this requirement.

As the blending obligation for fuel suppliers refers to the renewable share of the energy consumed in the transport sector the varying fuel production efficiencies of the different energy supply options (well-to-tank) are considered in the proposed RED II. The renewable share of renewable liquid or gaseous fuels of non-biological origin (RFNBO) is "*determined on the basis of the share of renewable energy in the total energy input used for the production of the fuel*" (Article 25 (3)). Therefore, the renewable share of RFNBOs equals the relative share of renewable energy in the total energy input into the production process. In terms of the percentage share it makes no difference whether electricity produced in a given country is used directly in an electric vehicle or whether the energy is used for producing RFNBOs. However, the electricity input for the production of RFNBOs is several times higher in comparison to direct charging of electric vehicles, and therefore the total electricity demand of a country will increase if it strongly relies on the production of RFNBOs. Depending on the balance of imports and exports of electricity, this might require a higher absolute volume of renewable electricity generation in order to reach the same share of renewable energy in total power generation.

Electric vehicles are also more energy efficient in terms of the km travelled per energy unit consumed (tank-to-wheel). The efficiency of electric vehicles is 2,5 to 3 times higher than the one of internal combustion engines. Compared to fuel cell vehicles the efficiency gain of electric vehicles is in the range of 20% to 35%. Contrary to the existing RED I[15] and the FQD[16], the efficiency advantages of electric driving are not considered in the current proposal of the RED II. In order to reflect the mobility output (the kilometres travelled) in the RED II, multipliers for the more efficient propulsion technologies should be granted.

The factor of 2,5 which has been applied in the FQD is based on studies and does not reflect the actual efficiencies of the vehicle fleet. The future development of energy efficiencies of the different propulsion technologies is not obvious, as it will depend on the upcoming policy framework and business strategies of vehicle manufacturers. Monitoring of energy efficiency for new vehicles is part of the CO_2 regulation for cars and vans. Even though only new vehicles are considered in these databases, this data could be applied to reflect the energy efficiencies of the different propulsion technologies. Similar to the RES share of electricity, which is accounted for based on the data "as measured two years before the year in question", a corresponding approach could be chosen to reflect the differences in actual energy efficiencies of the technologies used.

4.7. Options to improve the accounting of renewable electricity in the blending obligation

Whereas the previous sections of this chapter have addressed selected issues related to the accounting of RES-E in the blending obligation, this section outlines two options for improving the principles of accounting.

As described above, the proposed RED II allows obliged fuel suppliers to apply either the national share of RES in power generation in the country of supply, or the EU average share, to electricity which they have supplied to road transport. This applies to electricity supplied directly to electric vehicles as well as to electricity used for the production of synthetic fuels for use in road vehicles. This procedure is referred to as "statistical approach" in the remainder of this paper.

15 The multiplier of 2,5 for electricity in road transport has been increased to 5 (double counting approach) by the ILUC Directive from 2015.

16 The efficiency factor of 0,4 for electricity and hydrogen reflects the energy efficiency advantage of electric vehicles compared to internal combustion vehicles, but does not consider the differing energy efficiency between battery and fuel cell electric vehicles.

As a supplement or as an alternative to the statistical approach, the origin of the electricity consumed in road transport or for the production of fuels, determined based on the information given to consumers by the suppliers in the course of electricity disclosure, could be taken into account. As explained in Chapter 2 and in Section 4.5 of this chapter, any reference to the contractual allocation of renewable electricity to electricity consumers should take into account the general situation in the retail market for electricity, which is characterised by a significant oversupply of RES-E generation compared to the explicit demand for green power. As Member States will continue to increase their efforts in decarbonising the electricity sector, this oversupply is very likely to persist in the future. Therefore, if a contractual green power supply, based on the use of Guarantees of Origin (GO) for renewable electricity, would be recognised under the blending obligation, electricity suppliers could easily demonstrate a 100% share of renewable energy in their supply to road transport at very low cost and without any positive effect on the actual production of renewable electricity. This approach, which is currently advocated by several interest groups, cannot be recommended.

In order to overcome this situation, and to allow for credible accounting of renewable electricity which is additional to those RES-E volumes which will be generated anyway by existing plants and the effects of public support schemes, the concept of "GOplus" has been introduced in Section 2.5. If GOplus were introduced by the RED II, they would make it possible to account for renewable electricity which is additional to the "business as usual case", and to refer to such additional RES-E in the blending obligation.

4.7.1. Option A: Improved statistical approach

If policy makers choose to base the accounting of renewable electricity in the blending obligation on a statistical share of RES in power generation, then there should be a clear regulation for which RES share has to be applied. As already stated above, the choice between the RES share in power generation in the country of supply and the EU average share, as currently proposed in RED II, should be removed in order to avoid cherry-picking, which would result in an over-estimation of the actual RES share across the EU in the accounting for the blending mandate. Because the national share of RES in power generation gives a better picture of the regional situation, it is recommended that the option to choose the EU average share be removed from the RED II.

It must be noted that the significance of the national generation mix for the statistical approach is limited in countries with a high share of electricity imports. For example, six Member States (net) imported a share of 25% or more of their total electricity demand in 2015 from other countries (Luxemburg, Lithuania, Croatia, Hungary, Latvia and Belgium), and therefore the domestic generation mix of these countries did not give a full picture of the energy sources used to meet the energy demand (Bracker & Seebach 2017).[17] Nevertheless, for the whole of EU Member States it still seems more appropriate to apply the RES share in the national generation mix rather than using a uniform EU share for all countries.

As an expansion of this purely statistical approach, suppliers of electricity to road transport could be allowed to increase the volume of RES-E which is credited to their electricity sales above the national share of RES in power generation. In order to do this, the suppliers could acquire and cancel GOplus, which represent RES-E generation that is additional to the business as usual case.

[17] ENTSO-E Statistical Factsheet 2015

The blending obligation could be expanded as follows in order to reflect such additional effort by the suppliers:

- In a first step, the suppliers determine the national share of RES-E in power generation of the country of supply and multiply this share by their total supply of electricity to road transport in this country in the year in question. As described in the draft RED II, the RES share can be based on statistical data relating to the calendar year two years before the year in question.
- In a second step, the suppliers determine the volume of RES-E represented by the GOplus they have cancelled in the year in question.
- In a third step, the suppliers add the volumes of eligible renewable fuels from step 1 and step 2. This total is then entered into the national database referred to in Article 25 and thus accounted for under the blending obligation. However, the total cannot be higher than the volume of electricity supplied to road transport in the year in question (the share of eligible renewable fuels cannot be higher than 100%).

This addition to the statistical approach within the blending obligation would create an incentive for suppliers of electricity to financially support the expansion of RES-E generation beyond the business as usual scenario. This could also help to support the environmental credibility of electromobility and its attractiveness for vehicle owners and users. However, the additional cost of using GOplus must be taken into account (see Section 4.7.3). It would be up to the suppliers of electricity to decide whether and to which extent they use GOplus to top up their eligible RES-E share.

In order to avoid double counting of RES-E volumes and to support a fair allocation of the related benefits, the following rules and specifications should apply:

- RES-E generation represented by GOplus should not be taken into account in the national shares of RES-E in power generation used in step 1. This could be supported by the operators of the GO registries, which could publish the corresponding adjusted RES-E shares for each Member State.
- As provided by the proposed RED II, suppliers should be required to cancel a number of (conventional) GO for RES-E which corresponds to the volume determined in step 1.[18] The information from these GO should be disclosed proportionally to all final consumers of electricity in road transport supplied by the supplier in question, i.e. the users of electric vehicles and/or the operators of plants which produce synthetic fuels for use by road vehicles. The information from these GO should not be disclosed to any other consumers of electricity.
- Suppliers should only be allowed to use GOplus for the calculation in step 2, if the corresponding volumes are also disclosed proportionally to all final consumers of electricity in road transport supplied by the supplier in question. GOplus used for disclosure of the origin of electricity to other consumers of electricity should not be taken into account in step 2.
- In order to ensure the accuracy of the data entered into the national databases, fuel suppliers should be required to involve independent external auditors for verifying the data and the calculations behind it.

The Commission should define these rules and specifications as part of the minimum criteria for the national databases by means of an implementing act as specified in Article 25 (4) of the draft RED II.

[18] Note that the ITRE rapporteur has proposed to delete this requirement. This proposal should not be followed.

It seems straightforward that if the statistical approach is used, then the users of electric vehicles and the operators of plants producing synthetic fuels for road transport should contribute proportionally to the financing of the public support schemes, which trigger the gradual increase of the RES-E share in a member states' generation mix over time. Therefore, the electricity demand of electromobility should not be exempted from the related charges which are levied on other sectors of the electricity demand in the respective country.

4.7.2. Option B: Additionality approach

As an alternative to the (improved) statistical approach, the accounting of eligible volumes of renewable electricity under the blending obligation could be based solely on the use of GOplus by suppliers of electricity to road transport. Under this option, the possibility to use the statistical share of RES in the power generation mix of a Member State would be removed from Article 25.

Therefore, if a supplier intends to account for renewable electricity under the blending obligation, it would have to acquire and cancel GOplus, which represent additional RES-E generation. The volume of eligible renewable fuel entered into the national database and thus accounted for under the blending obligation would be determined exclusively on the volume of RES-E represented by the GOplus the supplier has cancelled in the year in question.

This option for the accounting of renewable electricity under the blending obligation would make it considerably more difficult for fuel suppliers to meet the blending obligation through the supply of electricity. Instead of just relying on the RES share in the national power generation mix, the suppliers would have to acquire and use GOplus. If the level of the overall obligation is not reduced, this would also imply significant additional cost for fuel suppliers in meeting their obligation. The "automatic" effects of electrification of transport on the blending obligation, as shown in the sensitivity analysis in Section 4.1 would be removed. Any accounting for renewable electricity under Article 25 would require an effort to increase the generation of RES-E beyond what would happen anyhow in the business-as-usual case.

In turn, these efforts for additional RES-E generation would significantly increase the credibility of the accounting mechanism for renewable electricity under the blending obligation, and could help to communicate the GHG benefits of electromobility to the public and to owners and users of vehicles. Whereas the (pure) statistical approach creates a general incentive for using electricity in road transport, and takes a certain share of RES-E for granted, the additionality approach only accounts for true efforts by suppliers of electricity to road transport to increase the generation of renewable electricity. This could be seen as a measure to treat the use of electricity and of advanced biofuels similarly under the blending obligation: In both cases, the suppliers of fuel have to make efforts to use newly generated renewable energy in transport.

The statistical approach allows fuel suppliers to meet a significant share of the blending obligation at no additional cost,[19] if the penetration of road transport by electric vehicles or synthetic fuels can be increased. In contrast, the additionality approach not only requires an increase in electromobility, it also forces fuel suppliers to support the additional generation of RES-E, unless they want to rely on other options for meeting their obligation. This certainly implies higher cost for the fuel suppliers (see Section 4.7.3). In order to keep the cost of meeting the obligation at comparable levels when moving from the statistical approach to the additionality approach, policy makers could consider reducing the overall level of the obligation.

[19] See the sensitivity analysis in Section 4.1 for a discussion of these parts and the factors influencing them.

If the additionality approach is being implemented, the following rules and specifications should apply:

- Suppliers should only be allowed to account cancelled GOplus towards their obligation, if the corresponding volumes are disclosed proportionally to all final consumers of electricity in road transport supplied by the supplier in question. GOplus used for disclosure of the origin of electricity to other consumers of electricity should not be taken into account.
- In order to ensure the accuracy of the data entered into the national databases, fuel suppliers should be required to involve independent external auditors for verifying the data and the calculations behind it.

The Commission should define these rules and specifications as part of the minimum criteria for the national databases by means of an implementing act as specified in Article 25 (4) of the draft RED II.

4.7.3. Cost implications of involving GOplus in the blending obligation

The integration of additional RES-E generation into the blending obligation will impact the costs of fuel suppliers for meeting their obligation. Therefore it is worthwhile to consider the potential costs of fuel suppliers for the acquisition of GOplus. As stated above, GOplus, which stimulate additional RES generation, will inevitably be more costly than the pure statistical approach which is currently foreseen in Article 25 of the draft RED II or a simple reallocation of existing RES-E generation based on simple GO.

Currently, public support schemes close the gap between the total cost of RES-E generation in new plants and the revenues from the electricity market. The support is usually granted for a number of years and contributes to covering capital and operational costs of the power plants.

The current levels of public support for new RES-E plants can be used as a first estimate of the price levels of GOplus for additional RES-E generation. As GOplus can only be issued if the operator of the power plant refrains from using public support, the prices of GOplus need to be slightly higher than the level of support in order to compensate the generator for the opportunity costs of waiving the support. On top of this, a plant operator who relies on the voluntary market for GOplus instead of the relatively stable, long-term public support system will most likely add a certain surcharge in his calculations in order to cover the higher economic risks. Such risk premiums could be reduced to a minimum if the public support schemes allow for easy switches between periods of time where support is used and others when GOplus are issued. On the other hand, most support systems are capped in terms of the new capacity supported in a certain period and therefore projects for new plants which were not successful in applying for support may be interested in the alternative of the GOplus market as a continuous solution.

Future levels of public support are difficult to predict as they depend on the development of the total costs for generation by different RES technologies and of the market prices for electricity, and both factors may differ across the EU. Over the past years, most RES technologies for power generation have shown a significant decline in generation cost, but at the same time the wholesale prices on the power market have also decreased due to the stronger role of RES-E plants with their low operational cost. At least for onshore and offshore wind power, further cost reductions can be expected in the future.

Therefore, the current levels of public support can be used as a rough, conservative estimate of the expected costs for GOplus. These levels differ considerably between RES technologies and Member States. As an example, prices for the support certificates of the joint Swedish/Norwegian support scheme (ElCert) have been fluctuating between 14 and 24 EUR/MWh for a long period (Bracker & Seebach 2017). This support system does not differ between RES technologies. A recent report by the Council of European Energy Regulators shows that the typical support paid for newly built onshore wind power varied between 20-30 EUR/MWh across the EU in the year 2015 (CEER 2017).[20] The market premium for new onshore wind power in Germany as determined in May 2017, which is 57 EUR/MWh on average, can be regarded as the upper border of the price surplus needed to stimulate additional generation.

It should be noted that besides new RES plants operating outside of public support, there may also be limited possibilities to stimulate the use of surplus RES electricity, which may also be accounted for based on GOplus (see Sections 2.4 and 2.5). The range of costs for this option is very difficult to estimate and therefore no figures can be stated here.

4.7.4. Conclusion and recommendation

The numbers presented clearly indicate that the costs for GOplus would be significantly higher than the extremely low costs of simple GO, which are traded at a range of 0,15-0,30 EUR/MWh, and the plain statistical approach for the blending obligation which implies no additional cost for fuel suppliers. However, the higher costs of GOplus reflect the impact which this instrument has on the additional generation of RES electricity and the related much higher credibility of claims based on the use of this instrument. These aspects have to be weighed for a decision between the plain statistical approach as currently foreseen in the draft RED II and the improved options described in the previous sections of this paper.

If the range of 20-30 EUR/MWh is assumed as an estimate for the costs of GOplus, then suppliers of electricity to road transport could cover a 1 % share of their blending obligation at costs of 0,20-0,30 EUR per MWh of total electricity supplied. Depending on the expected availability and costs of advanced biofuels, an adequate role of additional renewable electricity in the blending obligation should be determined.

Based on such considerations, European policy makers should implement the blending obligation either using the improved statistical approach as described in Section 4.7.1 or the additionality approach as described in Section 4.7.2. In both cases the appropriate minimum share of advanced biofuels and the maximum share of biofuels based on used cooking oils, etc. should be considered carefully, and the overall level of the obligation should be adjusted accordingly.

[20] This survey showed a very high support level in Cyprus (165 EUR/MWh) and very low levels in Portugal and Romania (3-8 EUR/MWh), which are not taken into account here.

5. Renewable electricity for transport in the overall RES targets for the EU and Member States

Whereas Chapter 4 has addressed the role of renewable electricity used in transport in the context of the blending obligation, this chapter discusses the implications for the overall target for renewable energy use in the EU and on related targets on the level of the Member States.

5.1. Proposed regulation

Article 3 of the draft RED II defines a binding cross-sectoral minimum target for the share of renewable energy in the gross final energy consumption of the EU. The Commission proposes that this minimum target is set at 27 % for the year 2030.[21]

Article 7 defines *inter alia* the rules for accounting renewable energy used in transport in the verification of the overall Union target. Compared to the existing RED I the maximum share of crop-based biofuels in transport to be taken into account is lowered to 3,8% by 2030. In order to avoid double-counting of renewable electricity with hydrogen or other liquid or gaseous synthetic fuels produced from renewable electricity, these fuels are only accounted for at the level of electricity consumption.

The overall RES target is defined in Article 7 (7) as the ratio between the gross final consumption of energy from renewable sources and the gross final consumption of energy from all energy sources.

5.2. Discussion and recommendation

The regulations of the draft RED II make sure that renewable electricity used for the production of hydrogen and other synthetic fuels is not double-counted with these fuels. This is an important safeguard for a proper accounting of renewable electricity used in transport for the Union target.

However, the impact of electric vehicles which are using electricity directly from the grid, in comparison to hydrogen vehicles or internal combustion vehicles (ICV) using synthetic fuels on the Union target deserves a closer look. The background of this analysis is that the production and use of hydrogen and in particular of synthetic fuels consumes significantly more electricity per kilometre driven than electric vehicles.[22] This is due to the substantial losses in the production processes of synthetic fuels (and to a lesser extent of hydrogen), and to the high conversion efficiency of electric vehicles compared to fuel cell vehicles or ICV (see also Section 4.6). Consequently, the required total volume of renewable electricity for the production of synthetic fuel used in ICV per kilometre is multiple times higher than for electric vehicles, if the same renewable share is supposed to be reached.

Based on the regulations in Article 7 of the draft RED II, the numerator of the target calculation will be determined by the total of gross final consumption of electricity from renewable energy sources

[21] Note that the rapporteurs from the EP have made proposals to raise the ambition of the target proposed by the Commission. This includes a higher overall target of up to 45 % in 2030 and breaking down the Union target into binding national targets for the Member States. It is assumed here that if targets for Members States are introduced, then the regulations discussed here with regard to the Union target will apply correspondingly to the targets of Member States.

[22] The overall ratio between the electricity demand per kilometre of an ICV using synthetic fuel and a battery-electric vehicle charged directly from the grid can be estimated at 5 in the longer term (see for example Öko-Institut e.V. 2013).

and of energy from renewable sources for heating and cooling, and the final consumption of energy from renewable sources in transport. As already mentioned, renewable liquid and gaseous transport fuels of non-biological origin (RFNBO) are not accounted for in this total. Instead, the renewable share of the electricity input into the production of these fuels is considered in the gross final consumption of electricity from renewable energy sources. However, this means that RFNBO are not accounted for at the level of final consumption, but rather at the level of energy input to the conversion processes. This results in a higher numerator for the target calculation compared to the actual final energy demand from RES, which in the case of RFNBO would be calculated based on the energy content of the fuels supplied to vehicles.

The denominator of the target calculation is set as the gross final consumption of energy from all energy sources. The definition of this term in Article 2 (d) suggests that all fuels used in transport are taken into account at the level of final consumption, i.e. the energy content of all fuels supplied to vehicles.

This means that the losses in the process chain for the production of RFNBO are included in the numerator of the target calculation, to the extent that they are covered by renewable electricity, but they are not included in the denominator of the calculation. This can be seen as an inconsistent regulation, which understates the impact of potential shifts between the direct use of electricity and the use of synthetic fuels in vehicles on the total electricity demand in the EU. It must be noted that the difference in the conversion efficiency within the vehicles is taken into account in the proposed target calculation, but the differences in the conversion efficiency of the fuel production is not.

In order to improve the consistency of the target calculation in relation to the differences in conversion efficiency of electricity used in transport, the definition of "gross final energy consumption" in Article 2 (d) should be modified by including the electricity consumed in the production processes of liquid and gaseous transport fuels of non-biological origin.

6. Summary of recommendations

Based on the analysis in this paper, two recommendations have been developed regarding the accounting of renewable electricity across all sectors:

- Electricity from RES which has received public support should be allocated to all consumers who have paid for the costs of the support scheme. Correspondingly, if Guarantees of Origin (GO) are issued for supported RES-E generation, these GO should only be used for this allocation and should not be freely transferable.
- In order to allow for a clear distinction between additional RES-E generation and other renewable electricity, the existing system of Guarantees of Origin should be extended by the introduction of GOplus as described in Section 2.5.

There is one general recommendation on the bearing of the costs of the support schemes for RES electricity:

- Electricity used in transport should contribute to financing the costs of the expansion of renewable electricity generation like other sectors of electricity consumption. This justifies the accounting of the national share of RES in power generation in the blending obligation and is also helpful in keeping up the credibility of the carbon benefit of electromobility. Therefore, electricity used in transport should not be exempted from charges related to public support for RES electricity.

With regard to the blending obligation in the draft RED II, the following recommendations can be summarised:

- European policy makers should modify the proposed blending obligation by either using the improved statistical approach as described in Section 4.7.1 or the additionality approach as described in Section 4.7.2. In both cases the appropriate minimum share of advanced biofuels and the maximum share of biofuels based on used cooking oils, etc. should be considered carefully, and the overall level of the obligation should be adjusted accordingly.
- In any case the option to choose between the share of RES electricity in the power generation mix of the country where electricity was supplied to transport and the EU average share should be removed in order to avoid cherry-picking and an overestimation of the RES electricity produced. If an average RES share is used in the blending obligation, then it should be based on the national generation mix.
- In order to reflect the mobility output (the kilometres travelled per energy input to the vehicle) in the RED II, multipliers for the more efficient propulsion technologies should be granted. The multipliers used should reflect the actual development of the energy efficiencies of the vehicle fleet.
- There should be no possibility for fuel suppliers to determine a share of RES in electricity supplied to road transport based on cancelled GO for RES-E, as this would only result in a reallocation of already existing RES-E volumes between different consumer groups. Only the use of GOplus should have an impact on the blending obligation.
- It is vital that the Commission issue a detailed set of requirements for the national databases which record transfers of obligations between fuel suppliers and the volumes of eligible renewable fuels. The RED II should clarify whether a transfer of obligation always relates to integrated parts of the total obligation, including the corresponding minimum share of advanced biofuels and the cap on biofuels from cooking oil, etc., or whether the individual elements of an obligation can be transferred separately to different fuel suppliers.
- The requirement to cancel GO (or GOplus) for RES-E corresponding to the volume of RES-E accounted for in the blending obligation is sensible and should be retained. The RED II should clarify that the GO or GOplus cancelled should be used by electric utilities for disclosing the origin of electricity supplied to all vehicles on a pro-rata basis. The GO or GOplus used by fuel suppliers should relate to RES-E generation in the country where the electricity is supplied, or at least from generation within the EU.

Finally, there is one recommendation regarding a more consistent treatment of electricity used in transport within the calculation procedure for the cross-sectoral Union target and related targets on a Member State level:

- The definition of “gross final energy consumption” in Article 2 (d) should be modified and should include the electricity consumed in the production processes of liquid and gaseous transport fuels of non-biological origin. This ensures a consistent treatment of these volumes of electricity in the target calculations.

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