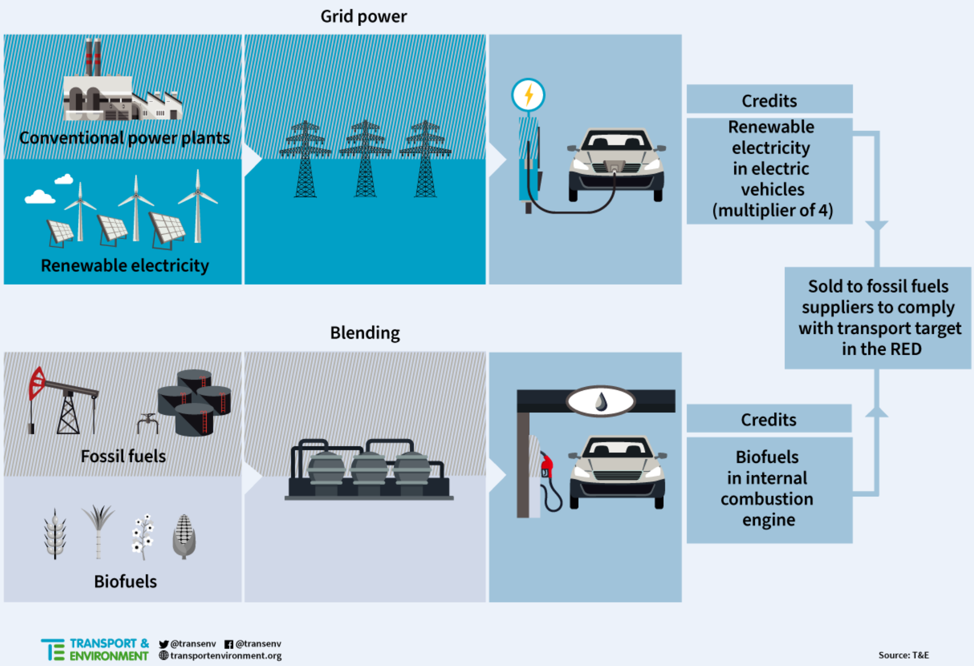
RED III and renewable electricity

Best practices for crediting renewable electricity as a transport fuel under the Renewable Energy Directive

August 2023

Summary

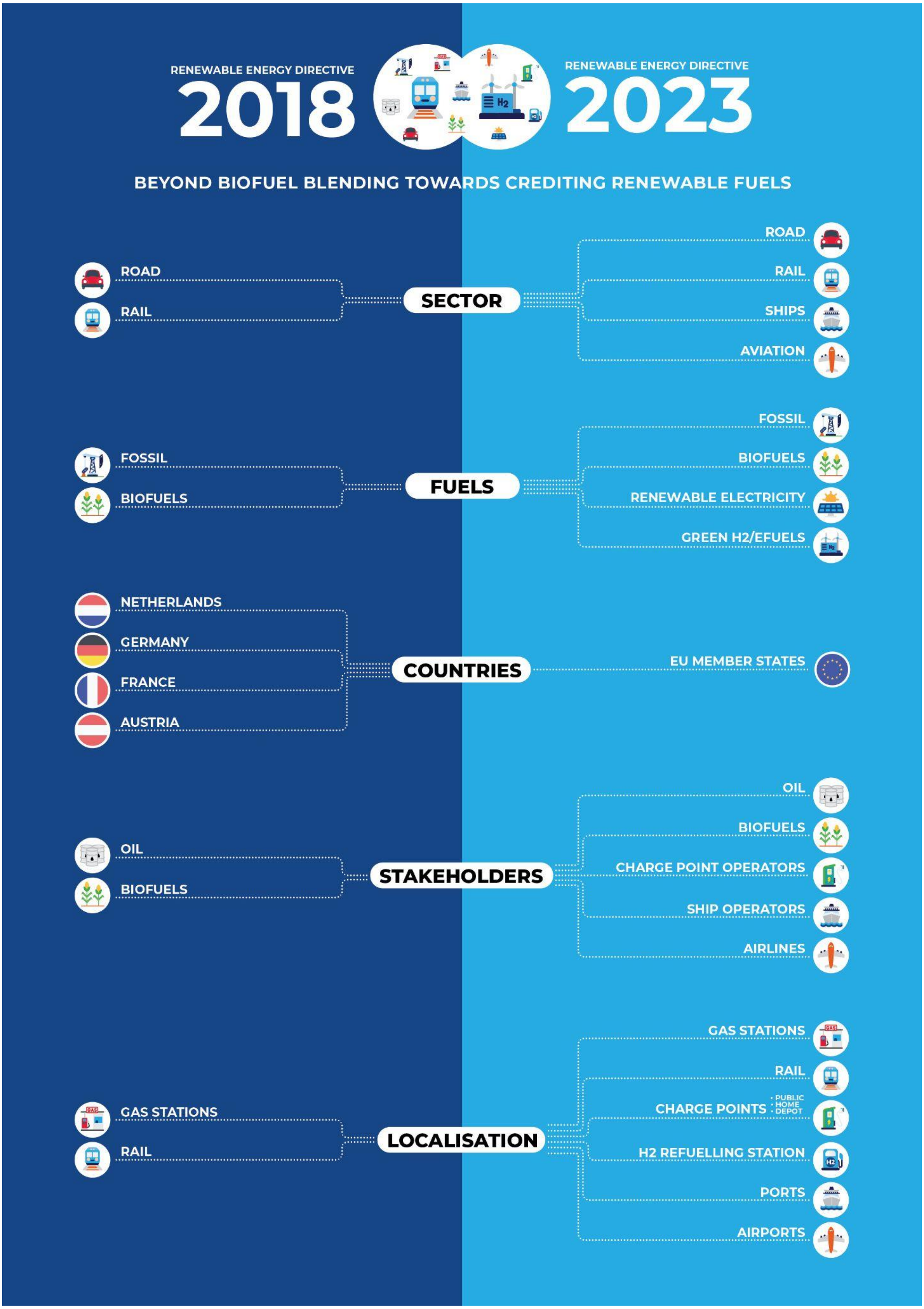
The 2023 revision of the Renewable Energy Directive (RED III) was adapted to momentous changes in the transport sector and road transport in particular: The role of gaseous and liquid fuels will shrink over time, as Battery Electric Vehicles (BEVs) will dominate in the longer term. Already by 2030, a rapid growth in BEV sales will result in a significant share of the existing fleet running on electricity. In that context, it is crucial to reserve a greater role for renewable electricity (RES-E) as transport fuel, moving away from an exclusive reliance on biofuel blending mandates. The RED III obliges member states to introduce a credit mechanism in all EU27 to allow operators of public recharging points to sell credits for the RES-E charged by BEVs to fuel suppliers. This will require significant changes in how member states promote renewables in transport. T&E advocates for an ambitious implementation of these credit mechanisms, in a way that supports the roll-out of public recharging infrastructure, electromobility in general and also encourages drivers to maximize the share of RES-E in their recharging sessions.



Drawing on best practices in countries with a credit mechanism, the following recommendations will deliver on the above-mentioned goals:

- For public recharging, credit should not be limited only to metered kWhs, but also introduce credits for rolling out (fast-recharging) capacity.
- Private recharging should be included in the scope. Fixed values for different types of BEVs are an easy way to recognize that the bulk of RES-E recharging will be 'behind the meter'.
- It should be possible to credit 100% RES-E by introducing workable rules on a 'direct connection' between a recharging point and e.g. wind and solar.
- Multipliers to recognize the higher efficiency and GHG savings are crucial to adequately credit RES-E. The RED III's 4x multiplier for RES-E is a good starting point.

Table of Contents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2018
RENEWABLE ENERGY DIRECTIVE
2023
BEYOND BIOFUEL BLENDING TOWARDS CREDITING RENEWABLE FUELS
ROAD
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GREEN H2/EFUELS
NETHERLANDS
GERMANY
FRANCE
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· DEPOT
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1. Introduction: Overview of existing credit mechanisms

The inspiration for a fuel-neutral credit mechanism that rewards all types of low-carbon and renewable fuels - including (renewable) electricity - originates in California. The California Air Resources Board adopted the Low Carbon Fuel Standard (LCFS) in 2009, setting a 10% GHG reduction target by 2020, from a 2010 baseline. In 2018, this target was increased to a 20% GHG reduction target by 2030 (and will likely be increased to 30% by 2030 in the near future). The LCFS included electricity from the start and established some of the key elements to recognize electricity as a transport fuel (e.g. Energy Efficiency Ratios or in RED language 'multipliers' to reflect the higher efficiency of BEVs).

It took a number of years before EU member states started to follow the example of the California LCFS. The first country to do so was the Netherlands, by means of its credit mechanism based on Renewable Fuel Units (*Hernieuwbare Brandstof Eenheden* or HBE for short). Since 2015, the Dutch credit mechanism allows the fuel suppliers to also buy credits for renewable electricity charged by BEVs at public chargers. The objective of this policy was twofold: Offer an extra compliance option to fuel suppliers to reach the RES-T targets, in particular in light of the growing sales of BEVs. And secondly, to support the roll-out of public chargers without relying on public subsidies. The HBE system played a key role in supporting the densest network of public chargers in Europe by improving the business case for public chargers in the Netherlands.

This Dutch success story was recognized elsewhere. After the last revision of the RED in 2018, Germany adapted its main instrument to reduce the carbon intensity of the fuels supplied - Treibhausgas Quote (THG Quote) - to also credit the emissions savings from electricity charged by BEVs, both from public and private recharging.[1] In 2022, France reformed its fiscal instrument to promote biofuels to also start crediting renewable electricity charged at public chargers (shifting from Taxe Incitative Relative à l'Incorporation de Biocarburants (TIRIB) to a more fuel-neutral instrument called Taxe Incitative Relative à l'Utilisation de l'Energie Renouvelable dans les Transports (TIRUERT).[2] The last member state to introduce a credit mechanism was Austria, which started generating credits in 2023.

As part of its 'Fit for 55' review of the RED in 2021, the European Commission's proposal included the mandatory introduction of a credit mechanism for renewable electricity in all EU member states. The goal was to foster the further development of electromobility, as BEVs will play an essential role in decarbonising the transport sector. The following text was adopted in April 2023:

> *Member States shall establish a mechanism allowing fuel suppliers in their territory to exchange credits for supplying renewable energy to the transport sector. Economic operators that supply renewable electricity to electric vehicles through public recharging points shall receive credits, irrespectively of whether the economic operators are subject to the obligation set by the Member State on fuel suppliers, and may sell those credits to fuel*

[1] BMUV (2022) Anrechnung der Elektromobilität auf die THG-Quote – Motivation und Wirkung. Link. and UBA (2023) Vollzug 38. BImSchV: Anrechnung von Strom für Elektrofahrzeuge. Link.

[2] Ministere de la Transition Ecologique of France (2023) TIRUERT électrique - Guide de la déclarante et du déclarant v3. Link.

suppliers, which shall be allowed to use the credits to fulfil the obligation set out in paragraph 1, first subparagraph. Member States may include private recharging points in this mechanism provided it can be demonstrated that renewable electricity supplied to those private recharging points is provided solely to electric vehicles.

While all the above-mentioned credit mechanisms share some key features, very different policy options were chosen in the design of the mechanism. This briefing intends to highlight some of the best practices from the above-mentioned examples for European policy-makers wanting to make the most of crediting RES-E as a transport fuel.

Country	GHG or energy target	Credit unit	Scope: public + private recharging	Metered data or fixed values
Netherlands	Energy	GJ	Only public	Metered data
Germany	GHG	Tonne of CO2 saved	Public and private	Both
France	Energy	Hectoliters	Only public	Metered data
Austria	GHG	Tonne of CO2 saved	Public and private	Both

What a credit mechanism can do for (BEVs in) your country.

A key challenge for the transition to electromobility is to ensure that recharging infrastructure keeps pace with the growing numbers of BEVs on European roads. For example, the number of Battery Electric Trucks will grow quickly in the coming decade and the right recharging infrastructure needs to become available on time to ensure that recharging points do not become a bottleneck for the adoption of electromobility.
A credit mechanism for renewable electricity is an important tool to ensure that recharging points will be available in every member state, including in areas where the business case of public recharging points may not (yet) be economically viable. Under the Alternative Fuels Infrastructure Regulation, member states have an obligation to ensure that sufficient publicly accessible recharging infrastructure is deployed in the next decade, for both cars and trucks. To achieve these goals, member states can provide public subsidies for CPOs to roll out the necessary infrastructure. An alternative (and possibly alternative) source of funding could be the credit mechanism.

However, the focus should not exclusively be on public recharging. By including private recharging in the scope, the credit mechanism does not create unintended consequences, whereby recharging that would have made sense at a private recharging point is moved to a public recharging point to artificially boost the revenue generated by the credits. Private recharging should remain the main mode of recharging on a daily basis (e.g. for trucks at the depot). More generally, the revenue from the credits will help improve the Total Cost of Ownership of BEVs and accelerate e.g. the cost-competitiveness of Battery Electric Trucks.[3]

2. Calculation of RES-E under RES-T

There are two ways in which the RES-E delivered to transport is calculated. There is the calculation that the member state performs to report to the European Commission whether it is reaching its target under the RED and how the different sectors of their economies - heating & cooling, industry and transport - are contributing. There is also the calculation that fuel suppliers need to do to demonstrate compliance with the 2030 mandate for the increase of renewables in transport. These 2 calculations are linked but not necessarily identical.

To be able to report how it is meeting its RES-T target, the member state needs to set the obligation on fuel suppliers. There is a lot of electricity that is already used in transport (e.g. in electrified rail), the renewable share of which is counted towards the RED targets, both the national transport target and the overall EU-wide RED target of 42.5%.[4] There is also - and definitely by 2030 - a significant share of road transport that will also be electrified and relying on an increasing share of renewable electricity on the grid. Member states can draw on national energy statistics to calculate the share of renewable energy supplied to transport, supplied via rail (e.g. in Germany, the electricity used by Deutsche Bahn). For road transport, a member state is allowed to make an estimate of the electricity supplied, based on the fleet of BEVs registered in the country, the average number of kilometers driven on a yearly basis by cars, vans and trucks and their average efficiency (e.g. 18 KWhs per 100km for a passenger car). There is a considerable amount of freedom for member states to gather this data by means of surveys, administrative data and estimates. To determine the share of renewable electricity, the RED does not offer the same level of flexibility: Member States must refer to the two-year period before the year, when the RES-T target needs to be compiled with. Concretely, the share of RES-E delivered to transport in 2023 needs to be determined on the basis of the share of RES-E on the grid in 2021. To factor in the higher efficiency of BEVs, the RED requires RES-E to be considered to be four times its energy content when supplied to BEVs.

It is worth noting the considerable flexibility for member states. There is no requirement in RED for member states to copy-paste the -14.5% GHG target or the 29% energy-based target and impose these targets as mandates on fuel suppliers. The obligation for fuel suppliers can be set at a substantially lower level, factoring in the renewable electricity supplied to raid and electrified public transport and the renewable electricity consumption supplied to BEVs. The RES-E that does not get credited (most of the private recharging) under a credit mechanism can still be counted towards the member states compliance with the RES-T and overall RED target, resulting in smaller volumes of biofuels that need to be

[3] T&E (2022) Electric trucks take charge. Link.

[4] In their NECPs, member states are required to report to the Commission how their joint effort of their national policies "will contribute to collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 42,5 %".

blended with gasoline and diesel. In addition, the RES-E supplied to transport via public recharging points that gets credited also helps to reduce the volume of biofuels that need to be supplied. Hence, It is highly recommended to undertake a detailed impact assessment of the contribution of RES-E in the transport sector before setting a specific RES-T target for fuel suppliers. In particular, the contribution of RES-E that would not be credited (e.g. in case private recharging is excluded from the credit mechanism's scope) needs to be factored in.

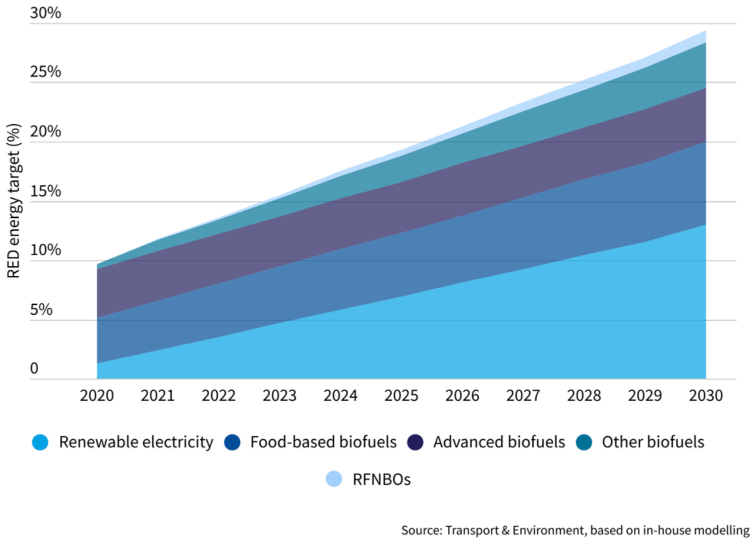


Figure 1: Contribution of RED III compliance options to RES-T target in 2030

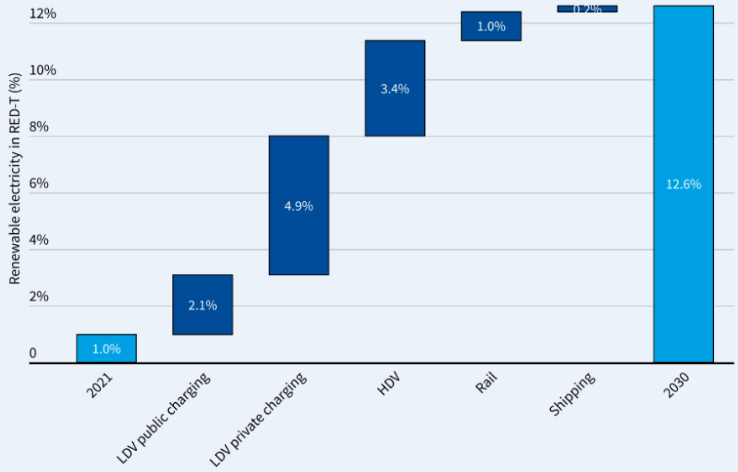
By 2030 and despite BEVs representing only 13% of the car fleet by then[5], RES-E supplied to transport will realize on its own almost half of the effort needed to reach the 29% RES-E target, namely 12.6% (see figure 1). The surge in BEVs will make an outsized contribution to the RED targets compared to biofuel blending in ICE vehicles. This is why Germany introduced a 'safety valve' in its THG Quote to ensure that the increasing share of RES-E does not take away market share of biofuels supplied to transport. If the amount of electricity supplied to BEVs in Germany exceeds a given threshold that increases every year (in line with the expected uptake of BEVs), the target of the THG Quote will be increased 1.5 times the emissions savings caused by the quantity of electricity exceeding the threshold. The German THG Quote was very successful in crediting most BEVs in its scope. 800 000 BEVs generate credits. This represents about 95% of purely battery-powered BEVs registered in Germany. This has triggered the safety valve. T&E strongly advocates against the introduction of such a safety valve: The credit mechanism used to achieve the RES-T target should remain fuel-neutral, offering fuel suppliers a choice between biofuels and (renewable) electricity (except for specific subtarget for advanced biofuels and RFNBO).[6]

[5] T&E internal modeling that computes BEV and PHEV sales required to meet car CO2 standards

[6] For a critical analysis of the 'safety valve' in the German THG Quote, see T&E (2023) Die Zukunft der THG Quote. Link.

How does RES-E contribute to RED III's 2030 RES-T target?

In 2021, RES-E only contributed only 1% to transport's energy demand. By 2030, this picture will change dramatically and RES-E will contribute 12.6%. Note the substantial contribution from private charging (4.9%) and trucks/HDVs (3.4%), totalling ⅔ of RES-E's total contribution.



LDV refer to light duty vehicles (cars and vans), HDV to heavy duty vehicles (trucks and buses). A 30% / 70% ratio was applied between public and private charging for LDVs.

Source: Transport & Environment, based on in-house modelling

Figure 2: Contribution of different electrified transport modes to RES-T target in 2030

3. Public recharging: Crediting fuel use or also infrastructure/capacity?

Once the RED III will be transposed into national law, operators of public recharging points will be able to be paid for the renewable fuel credits and be able to sell these credits to fuel suppliers. Member states are obliged to enable the use of renewable electricity credits for fuel suppliers to meet their obligation. The sale of these credits will improve the business case of public recharging points and accelerate their deployment. That has been the experience in e.g. the Netherlands, where renewable electricity at public recharging points has been credited since 2015.

While this basic requirement seems straightforward, there are several options to implement this in a more ambitious and creative way, ensuring that the key goal - supporting an accelerated roll-out of public recharging points - is achieved. European member states with a credit mechanism already in place have so far chosen to only allow credits for the (renewable) electricity charged, based on the data from the electricity meters connected to the public recharging stations. The obvious advantage of this approach is that CPOs are incentivised to think about good locations (shopping malls, grocery stores, busy highways) to maximize the kWhs charged and thus the return on investment.

The downside is that CPOs may not invest in more remote/less frequented locations, where recharging infrastructure is also needed. In addition, CPOs may be more hesitant to invest in high-powered recharging hubs or dedicated hubs for electric trucks given the uncertainty about how quickly the fleet of e.g. battery electric trucks will grow. This is why T&E advocates not only to allow metered data - based on kWhs charged - in a credit mechanism, but also to consider crediting power output of the deployed BEV recharging infrastructure (kW instead of kWh). The cost of the charger represents about 90% of total infrastructure costs for a fast recharging station.[7] Therefore, crediting kWs of deployed BEV recharging *capacity* could be particularly relevant to accelerate e.g. the roll-out of megawatt-sized recharging points for BETs.

California's LCFS introduced such an infrastructure credit, crediting recharging infrastructure regardless of how much fuel is actually used at the recharging point.[8] threshold. Infrastructure capacity credit generation starts from the total available capacity at a given site, estimated in kilowatt hours per day (kWh/day). These infrastructure credits are based on unused recharging capacity (total capacity of infrastructure in kWh/day, minus the electricity actually charged at the recharging point). If a recharging point is successful, fuel credits would more quickly start to replace the infrastructure credits. In other words, infrastructure credits are meant to be "self-sunsetting": In other words, these would not be permanent as electricity use ramps up and fuel credits replace them (figure 3 below). Such infrastructure credits will provide certainty that charge points can have a reasonable payback period.

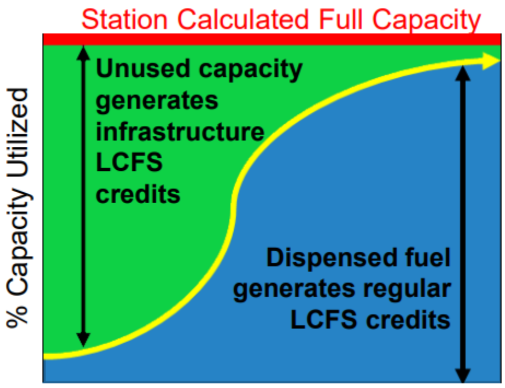


Figure 3: Design of LCFS capacity crediting[9]

The California LCFS limits the infrastructure credits to a pool of several recharging points with a combined maximum capacity of 2.5 MW. After a special approval, recharging points with up to 6 MW of capacity could even be credited. In the California case, the infrastructure credit requires that each charger must have a 50 kW minimum. Member states could tailor these infrastructure credits to only credit the MCS recharging pools with a capacity of at least 600 kW, supporting recharging infrastructure for BETs

[7] T&E (2022) Flicking the switch on truck charging. Link.
[8] ICCT (2021) Assessing the potential for low-carbon fuel standards as a mode of electric vehicle support. Link. Infrastructure capacity credit generation is based on the total available capacity at a given site, estimated in kilowatt hours per day (kWh/day), minus the quantity of electricity dispensed, measured in kilowatt hours (kWh)
[9] CARB (2021) Zero-Emission Vehicle (ZEV) Infrastructure Crediting within the LCFS: How Does it Work?. Link.

specifically.[10] This could provide important support for e.g. one ultra-fast recharging point or three 200 kW opportunity chargers or five 150 kW for overnight recharging in a publicly accessible parking lot for trucks.[11] To avoid any gaming of this system, an infrastructure credit must be limited in time (e.g. 5 years in California). The possibility for capacity credits also expires at the end of 2025: The expiry of the capacity credit gives a signal to CPOs to act quickly and can boost a rapid deployment of recharging stations. A last important point about capacity credits is that their contribution to the LCFS target is capped at 2.5% to ensure that the focus of the LCFS remains on delivered fuels and reduced emissions rather than theoretical capacity deployed. T&E advocated for similar capacity credits to be also introduced in Europe: These can support both the roll-out of truck recharging infrastructure, but also cater to the need to roll out recharging points for cars in less well-served areas.

The infrastructure credit should come with some minimum conditions: For starters, the station must be open to the public and supply (relatively) fast recharging (in California, at least 50 kW). Given the experience of many BEV drivers that many charge points are often out of order, the credit mechanism should only support fully operational infrastructure, requiring proof that the downtime of chargers for maintenance or other technical reasons to an absolute minimum (e.g. 5% per year or 438 hours). Stations should only get credits if they offer more than one charger type. Payment must be made easy for the customer, i.e. the recharging station must accept payment with major credit/debit cards. Last but not least, recharging points that receive infrastructure credits should not be able to benefit from CAPEX support from other public subsidies.

4. Private recharging: Getting 'behind the meter' by using fixed values for BEV recharging

Estimates vary, but it is widely accepted that private recharging in the EU will represent the bulk of BEV recharging. In 2030, the Commission estimated that private recharging will account for 60-85% of all kWhs supplied to BEVs. The introduction of a credit mechanism is an opportunity to also promote the roll-out of private recharging infrastructure, but more broadly a tool to accelerate the ongoing shift towards electromobility. Given its significance, we advocate for private recharging to be included in the scope of new credit mechanisms that will be launched in the EU as part of the implementation.

In the RED III negotiations, a specific reference was made to private recharging, but this is not mandatory for member states.

- *Member States may include private recharging points in this mechanism provided it can be demonstrated that renewable electricity supplied to those private recharging points is provided solely to electric vehicles.*

Including private recharging expands the number of participants in the credit scheme beyond the dozen or so CPOs active in the country, as it opens up the system to multiple 1000s of participants, which will

[10] The 600 kW minimum benchmark is aligned with the objectives in the Alternative Fuels Infrastructure Regulation, set for publicly accessible recharging pools along the Comprehensive TEN-T core and comprehensive road network
[11] T&E (2022) Grid-Related Challenges Of High-Power And Megawatt Charging Stations For Battery Electric Long-Haul Trucks. Link.

grow rapidly in the coming decade. This is why Member states need to reflect on how to keep the number of stakeholders involved manageable and to make it simple to credit private recharging.

Member states have a choice between either using metering of actual electricity consumption delivered to BEVs or using fixed values about electricity for (different types of) BEVs, or combining both. For example, Austria also allows metered data to be used to credit private recharging, on the condition that a private charging point can deliver accurate values about the actual amount of electricity delivered to transport. Germany was the first country to include private recharging in its implementation of a credit mechanism.[12] As most private recharging happens 'behind the meter' and that separately metering the electricity supplied to a car would require access to the battery management system of the car, a choice was made to not use metered values based on actual consumption. Instead, fixed values ('Pauschalwerte') depending on the type of vehicle. Credits are generated on the basis of these fixed values.

The German law stipulates that these fixed values shall be based on current data about the average power consumption of battery electric vehicles in Germany (plug-in hybrids are excluded from the scope). The fixed basic value for various types of BEVs is 2000 kWh, assuming that an average BEV car drives about 13.000 kms per year and consumes 0.15 kWh/km.[13] For an electric van of class N1 (light duty vehicle), a fixed value of 3 000 kWh was put in place, assuming that an average electric van drives about 17.500 kms per year and consumes 0.17 kWh/km. Electric buses (class M3) are rewarded on the basis of 72 000 kWh, assuming that an average electric bus drives about 17.500 kms per year and consumes 0.17 kWh/km. The values for electric trucks in categories N2 and N3 will be announced soon.

For heavy-duty vehicles (HDVs), a solid base to determine these fixed values would be the EU's heavy-duty vehicle certification procedure which simulates CO2 emissions and fuel consumption under VECTO, the Vehicle Energy Consumption calculation TOol.[14] In addition, under the CO2 standards for HDVs, mileage factors are set for all regulated vehicle groups based on discussions and verifications with vehicle manufacturers. These data provide a solid basis for attributing fixed values for how much energy these HDVs consume annually and how this could be accurately credited. The table below gives an overview of the average mileage of selected, most common, vehicle groups. For example, the average mileage for a 40-tonne tractor-trailer in vehicle sub-group 5-LH is 116,000 km per year. Assuming that 70% of the charging happens privately at the destination or at the depot[15] and assuming an expected energy consumption of 1.30 kWh/km today,[16] the average amount of electricity that can be used as a basis for

[12] California's LCFS also credited private residential charging, whereby utilities use data on the average number of EV's in their service area in conjunction with assumptions on average nightly home charging.
[13] The 2000 kWh value is mainly intended to be used for passenger cars (vehicle categories M1 and M2), but covers any type of BEV. For private recharging in the Austrian credit mechanism, a fixed value of 1500 kWh is awarded, if a BEV driver is not able to access metered data. The Austrian system does not distinguish between different sizes of BEV and awards the same value to cars, vans and trucks.
[14] European Commission (2023) Vehicle Energy Consumption calculation TOol - VECTO. Link.
[15] T&E (2023) Fully charged for 2030. Link.
[16] TNO (2022) Techno-economic uptake potential of zero-emission trucks in Europe. Link.

crediting could be as much as 106 MWh per year for a truck in the 5-LH sub-group.[17] Only the renewable share of electricity on the grid can be credited. In other words, the exact amount will depend on the share of RES-E in the member states. However, the 4x multiplier for RES-E should be applied across the EU27.

With a conservative estimate of 5 Eurocents per kWh that could be earned via the credit mechanism, this would give a significant boost to the attractiveness of different types of electric vehicles. In particular for fleet operators of vans and trucks, these fixed values can improve the business case of going electric: The value of the credits will decrease the operational costs of BEVs, offsetting the higher initial purchasing costs of an electric van or truck.

Austria closely studied how Germany rewards private charging and drew some lessons from the German experience. In the German credit mechanism, third parties can 'pool' credits from public and private charging, selling credits to fuel suppliers in return for cash payments. This led to dozens of companies offering their services to pool these credits, aiming to convince in particular private BEV owners to register their car with them and paying them about EUR 300-400 (2021 value).[18] This approach, however, comes with some administrative challenges, especially for the Environment Agency having to verify the submitted applications for credits. In order to keep the credit mechanism more manageable, Austria introduced a threshold of at least 100.000 kWh per year of metered electricity for natural or legal persons to be allowed to sell their credits to fuel suppliers.[19] In addition, they must operate at least one public recharging point. These requirements limit participation in the scheme to Charge Point Operators of at least a dozen public charging stations (12 times about 7.5 MWh per year). In the Austrian system, CPOs could also collect meter readings from individual BEV owners.

In addition to CPOs, the Austrian credit mechanism also allows operators of semi-public recharging points to generate credits. Austria introduced this semi-public category for those chargers that do neither fit the AFIR definition of a publicly accessible recharging point, nor fit the category of purely private recharging point. Examples of semi-public recharging points include recharging points at e.g. hotels or shops, where the recharging point is only accessible to customers with their BEV. The threshold of at least 100.000 kWh per year of metered electricity and at least one public recharging point also applies to operators of semi-public recharging points. If they meet these requirements, operators of semi-public recharging points could also collect more meter readings from individual BEV owners.

5. Go beyond grid average of RES-E share

Unlike for biofuels, hydrogen or liquid e-fuels, it is less straightforward to claim that BEVs recharging on grid electricity are running on 100% renewable energy. The RED is quite restrictive in how much RES-E can be counted in transport, when BEVs charge on grid electricity: Only the share of renewable electricity during the two-year period before the year in which the electricity is supplied in their territory can be counted towards the RES-T target. There is one exception in the RED to this general rule: When electricity

[17] The Annex of this briefing has a comprehensive proposal of the suggested electricity consumption of different VECTO categories of HDVs.
[18] Electrive (2021) THG-Quote: Anbieter, Zielgruppen, Prämien – der Überblick. Link.
[19] Federal ministry of Climate Protection and Environment of Austria (2023) Kraftstoffverordnung 2012. Link.

is charged from a "direct connection to an installation generating renewable electricity", that electricity shall be fully counted as 100% RES-E. It is however difficult to operate a recharging point without a grid connection to ensure 24/7 availability. Especially for CPOs operating in a member state with a relatively low share of RES-E on the grid - both now and still in 2030 - this limits the amount of RES-E credits that they can generate, especially compared to countries with a high share of RES-E and/or moving rapidly in that direction.

Member states initially interpreted the 'direct connection' rather strictly, prohibiting any grid connection. The Dutch grid had until recently a low < 20% share of RES-E. The Netherlands has since 2022 relaxed its rules to also allow a combination of a 'direct connection' with a connection to the grid. This applies to publicly accessible recharging points, equipped with a Measurement Instrument Directive (MID) certified electricity meter.[20] There are two options: The CPO can count the locally generated PV or wind that is directly supplied to BEVs as 100% RES-E to generate credits. This needs to be demonstrated on an hourly basis. Another option is to contract some renewable electricity resources. The wind or solar installation needs to be supplying the electricity via a direct connection (but can make use of a battery for the purpose of temporary storage) and cannot have received any subsidies for feeding the renewable electricity into the grid (Guarantees of Origin can be used to prove this).

The German system is also being reformed, relaxing the 'direct connection' rules for supplying renewable electricity generated directly at public recharging points.[21] If a CPO tracks the quantities of electricity generated by the wind or solar on the basis of a 15-minute interval and the electricity fed into the grid and withdrawn from the grid, this electricity can be counted as 100% renewable and used to generate the GHG reduction credits. The introduction of a credit mechanism for RES-E is first and foremost intended to provide additional financial support for the deployment of public chargers and electromobility more generally. However, enabling recharging points to go beyond the grid average and facilitating the recharging of wind and solar via a 'direction connection' will also create an incentive to set up additional renewable electricity generation facilities directly at public recharging points.

6. Rewarding BEV efficiency with multipliers

For a credit mechanism to adequately reward RES-E - compared to the renewable energy and GHG savings delivered by biofuels -, the higher efficiency of BEVs needs to be recognized. The RED and other EU laws such as the Fuel Quality Directive have always included a multiplier for RES-E, adjusting for the fact that final energy demand of BEVs for the same transport work is lower. This multiplier has varied over time - from 2.5x, then 5x -, but was fixed at 4x in the 2018 revision of the RED. The RED III revision did not make any changes and confirmed the 4x multiplier (although changes were made in how RES-E will be

[20] The supply of renewable electricity to a behind-the-meter private recharging point is also possible, but the operator will need to meet the same requirements as a public recharging, e.g. a separate electricity meter.

[21] BMUV (2023) Referentenentwurf einer Zweiten Verordnung zur Änderung der Verordnung zur Festlegung weiterer Bestimmungen zur Treibhausgasminderung bei Kraftstoffen. Link.

counted after 2030 towards the GHG savings RES-T target).[22] As a reminder, delivering a megajoule of zero carbon renewable electricity to a battery electric vehicle can be expected to do 3.2 times more transport work and deliver 5.4 times more GHG reductions - considering the full Well-to-Wheel efficiency - than delivering a megajoule of RED II compliant bioethanol to a combustion engine vehicle. Compared to fuel cell vehicles using green hydrogen, BEVs are twice as energy efficient and deliver more than double the emission savings.

The proposed switch to a GHG savings target to support renewables in transport required a new way of rewarding RES-E. The Commission proposed to use a dedicated fossil fuel comparator for RES-E, which is higher than the fossil fuel comparator for gaseous or liquid renewable fuels: i.e. the EF(t) of 94 gr. CO2 eq/MJ. The Annex V of the RED contains another fossil fuel comparator ECF(e) of 183 g CO2eq/MJ, which was intended to value the GHG savings from using bioliquids for the production of electricity. Valuing the GHG savings of RES-E charged by BEVs at almost twice the emissions of fossil gasoline and diesel severely underestimates the contribution from BEVs to decarbonising transport. Work undertaken by the Joint Research Centre of the European Commission and the California Air Resources board all conclude that BEVs reduce emissions to a much larger extent.[23] The fossil fuel comparator ECF(e) of 183 g CO2eq/MJ significantly discounts the carbon savings that could be delivered by BEVs. A BloombergNEF research briefing concluded that this "would slash the future amount of credits the BEV recharging industry could generate and disproportionately increase the amount of biofuels needed to meet the bloc's targets".[24] According to the same article, a BEV using grid electricity with an average EU27 carbon intensity will emit 4.4 times less carbon than a fossil-fueled ICE car. This is in line with the literature review commissioned by T&E, which found that an BEV using RES-E - considered to be zero-emission - will reduce 5.4x more GHG emissions than a RED-compliant biofuel delivering 60% GHG savings compared to the EF(t) of 94 gr. CO2 eq/MJ.

Member States have some flexibility in deciding how their respective credit mechanisms will recognize the superior efficiency of BEVs. The RED III is clear that energy-based systems can use the 4x multiplier. For carbon intensity targets, the German approach is instructive. The THG Quote system includes an efficiency factor of 0.4, which results in a lower carbon intensity of the electricity used, which in turn increases the GHG savings generated by recharging BEVs. These savings are then multiplied by a factor of 3 as a basis for the THG Quote credit. About 2.3 MWh of BEV recharging in Germany generates 1 credit of 1 tonne of CO2 reduced. A similar carbon intensity-based system is used in Austria, but the emission savings are multiplied by a factor of 4.

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[22] Article 27.1.b of RED III differentiates between 2 periods. In the first period until the end of 2030, Member States will only need to consider the emissions of the liquid fuels used in transport and be allowed to use the EF(t) in the denominator of the target. From 2031, Member States shall not only consider the emissions of the liquid fuels used in transport, but will also take into account the emissions of the electricity used to charge electric vehicles (assuming a carbon-intensive average grid mix as a baseline).
[23] European Commission Joint Research Centre (2017) Solid and gaseous bioenergy pathways: input values and GHG emissions: Calculated according to methodology set in COM(2016) 767: Version 2. Link.
California Air Resources Board (2023) LCFS Pathway Certified Carbon Intensities. Link.
[24] BloombergNEF & Fischer, Ryan (2023) Carbon Credits Could Be the Key to EV Charging Conundrum (behind paywall).

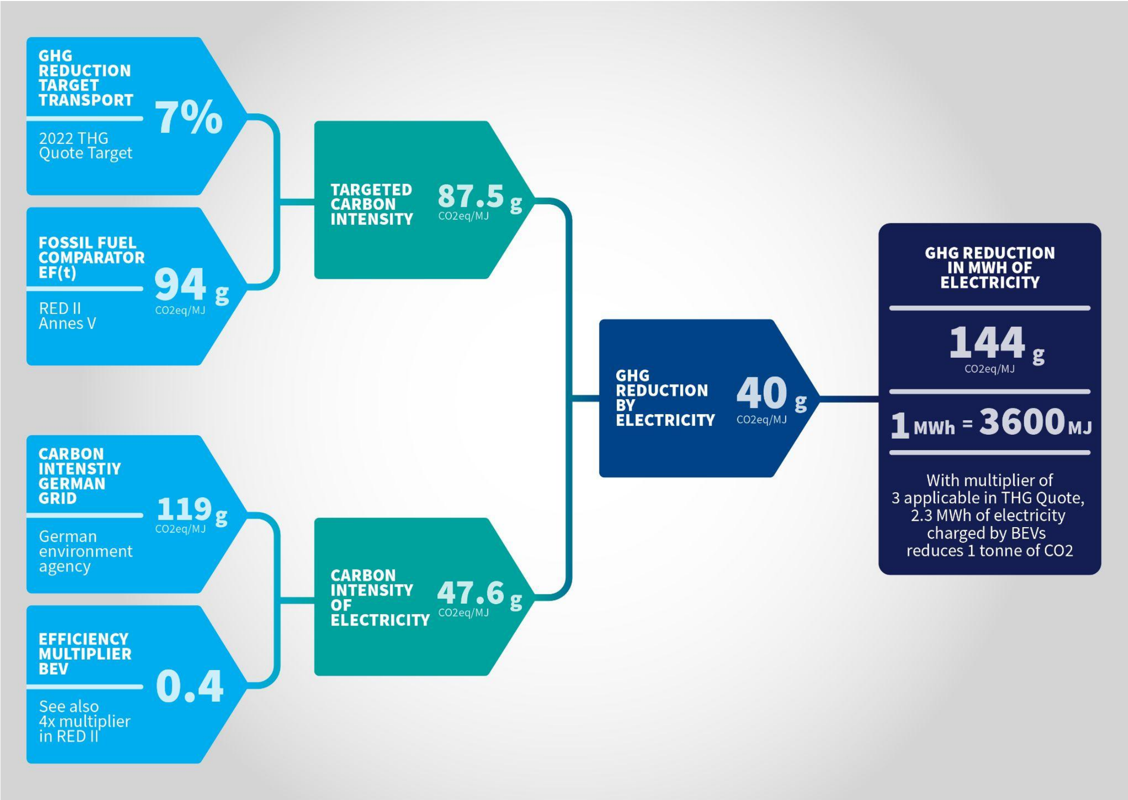

Figure 4: Calculation of German THG Quote credit

7. Pricing of the RES-E credit and generated revenue

The price of RES-E credits that fuel suppliers are willing to pay fluctuates depending on the price of the biofuels and their feedstocks. In the first years of the Dutch credit mechanism (2015-2017), the prices fluctuated between EUR 5.50-6.50/GJ. Due to the war in Ukraine and the resulting shock for global food commodity markets, the price of biofuels skyrocketed and so did the price of the credits, doubling to around EUR 12/GJ in early 2023.[25] In 2021, the credit price even reached EUR 15/GJ.[26]

[25] As the trading of the credits is a B2B transaction, there is little publicly available information. See this response to a parliamentary question (link) and this commercial website (link) These figures have also been confirmed in conversations with representatives of credit trading companies.
[26] Trinomics (2021) Onderzoek kleine spelers elektrisch vervoer. Link.

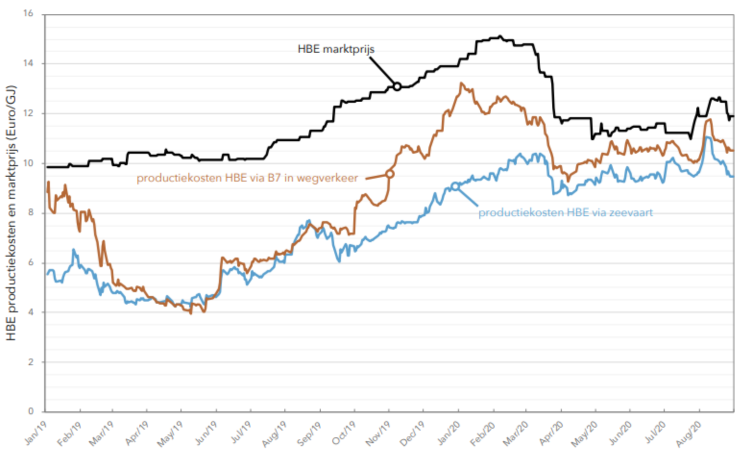

Figure 5: 2019- mid-2020 price evolution of Dutch HBE credits[27]

The German THG Quote allows trading of credits that are based on 1 tonne of GHG reduced. The price of the credit in Germany was in 2019 around € 150-200/tCO_2. In 2022, the price of the credit sat constantly higher than € 400/tCO_2. By mid-2023, the price had slumped to around € 250/tCO_2.[28] A credit of EUR 6 and 12/GJ converts into a credit value of respectively around 3 and 6 Eurocents per kWh. In other words, if the average price for normal-speed public recharging is around 50 Eurocents per kWh, the price of the credit alone would cover around 10% of the electricity price charged to the BEV driver.[29] Despite the near halving of the German credit price, the € 250/tCO_2 still translates into around 14 cents/kWh. If a charge point operator can show that renewable electricity was charged via a direct connection, that 100% renewable electricity will generate more emission savings and therefore get a higher credit price, around 750/tCO_2, which translates to 35 cents/kWh.

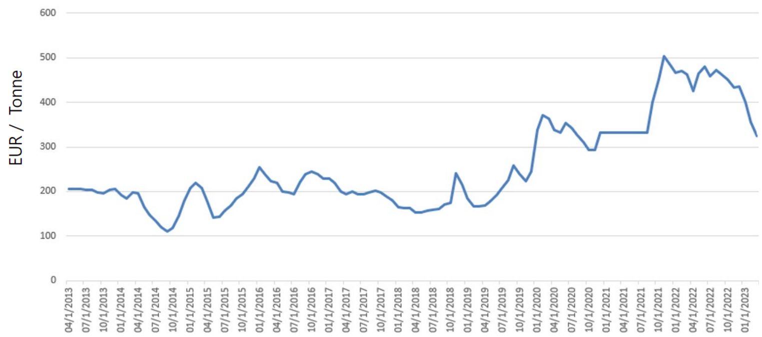

Figure 6: Price evolution of German THG Quote credits

[27] Studio Gear Up (2021) Hernieuwbare brandstoffen via opt-in zeevaart. Link.

[28] Equota (2023) Aktueller Preis der THG-Quote und Infos zur Marktentwicklung. Link. The price drop was linked to an administrative mistake of the German Federal Food & Agricultural Agency, which had mislabeled 'brown grease' as a feedstock for advanced biofuels. As a result, fuel suppliers could count the volumes of biofuels made with brown grease twice towards the target, which had a negative impact on the demand for credits (Efahrer (2023) Maximale THG-Quote holen: Das ist der beste Zeitpunkt. Link).

[29] Source for average recharging price in Europe at a public charger: European Commission (2023) Europe Alternative Fuels Observatory. Monthly Recharging Price Calculator. Link.

What impact has this revenue had on the business case for public recharging? Experience from the Netherlands, which has the public densest recharging network in Europe shows that the credits have significantly improved the business case of chargers and incentivised CPOs to rapidly install chargers.[30] The revenue from the credits helps to cut the payback time for chargers by half, from 13 down to 7 years for public recharging points with a median use (6MWh/year).

Impact of no more revenues from trading renewable energy units (HBEs)

- Overall the business case detoriates significantly;
- In particular for the charging station with median usage, a decisive turning point can be observed.

Charging station typologie		Scenario: Baseline		Scenario: No revenues from HBEs	
Volume (kw-hr/yr)	Charging price (€/kw-hr)	Payback (yr)	IRR (%)	Payback (yr)	IRR (%)
Low	low	>16	-20%	>16	Nvt.
	median	14	-12%	>16	Nvt.
	high	11	-5%	>16	-27%
Median	low	9	3%	>16	-31%
	median	7	12%	13	-11%
	high	6	20%	9	1%
High	low	5	28%	12	-8%
	median	3	44%	7	11%
	high	2	65%	4	28%
Average	low	>16	-16%	>16	Nvt.
	median	11	-4%	>16	-23%
	high	8	5%	13	-9%

Source: ECORYS

Table 1: Impact of Dutch HBE credit mechanism on business case of public chargers

The credit mechanism can also make a difference for BEVs in general. Based on the fixed values for different types of BEVs (see section 4) that were introduced in Germany, their drivers/owners can earn money by registering their vehicles in the credit mechanism. The table below shows the annual revenue that can help to improve the TCO of BEVs, as the credit sales help offset the higher CAPEX costs. This is the case in particular for high-mileage vehicles like buses and trucks.

Vehicle type	Estimated annual energy consumption via private recharging	Annual revenue from THG Quote credit based on € 300/tCO_2 price
Including, but not limited to category M1 and M2	2 MWh	EUR 210
Category N1	3 MWh	EUR 315
Category M3	72 MWh	EUR 7600
Category N3 / vehicle sub-group 5-LH	106 MWh *T&E estimate*	EUR 11000 *T&E estimate*

Table 2: Annual revenue from THG Quote credit[31]

[30] Ecorys (2020) Onderzoek naar de businesscase van laadinfrastructuur (tabel 3.4, p. 22). Link.
[31] Greentrax (2023) Webinar für Geschäftskunden Einführung in die THG-Quote für die Elektromobilität. Link.

8. Implementation of the credit mechanism

One of the key lessons learnt from previous implementations of the system is that the practical, ICT and administrative challenges are not to be underestimated. Below are several lessons learnt. It is important to secure early on the cooperation from other government departments (e.g. fiscal revenue agencies involved in collecting excise duties) to ensure good access to data about the total amount of gasoline and diesel that every fuel supplier delivers to transport, in order to establish the right level of blending obligation. The agency managing the credit mechanism and certifying the credits for private recharging will need access to vehicle registration data to verify that these BEVs are actually registered in the member state in question. The IT infrastructure where fuel suppliers, CPOs and aggregators can register their credit request needs to be set up. Making it possible to upload the required data in a user-friendly format to a website hosted by one agency and enabling the paperless trading of the credits between e.g. CPOs and fuel suppliers reduces the administrative burden and can help with creating a more liquid market for credit trading. To help liquidity, allowing for some limited banking of RES-E credits from one year to the next would make them more interesting for fuel suppliers: They would be able to acquire and use the RES-E credits in a more flexible way, as managing the exact blending volumes of biofuels first would be less of a constraint. Allowing for regular (e.g. quarterly) trading of RES-E credits would also be helpful to improve liquidity.

This is why, in the initial start-up phase, the credit mechanism needs to be kept manageable: Which BEVs are eligible needs to be clearly delineated to avoid that e.g. 1000s of electric steps would qualify for credits. The role of aggregators that can organise 'pooling' the required data from individual BEV owners or operators of small fleets to request credits is another way to reduce the administrative complexity.[32] Instead of imposing one deadline for submitting the data to the environment agency responsible for verifying the credit applications, allowing a longer period of a couple of months for submitting applications or quarterly processing will help to process them efficiently. Member states can also decide to take more time to set up a well-functioning credit mechanism, while allowing e.g. CPOs to claim credits from the years that precede the entry into operation of the national credit mechanism.

9. Conclusions

T&E calls on member states to swiftly implement this credit mechanism for RES-E and to maximize the potential contribution from BEVs to the RED III targets for transport. Implementation of such credit mechanisms may be challenging. Hence, member states will be tempted to go for minimal ambition initially. However, including e.g. private recharging in the scope can be made very complex by requiring metered data. Or it could be implemented by using appropriate fixed values for certain types of BEVs. Allowing and enabling the crediting of 100% RES-E - beyond the grid average - will boost a local deployment of RES-E near recharging points. To conclude, learning from the 'do's and don'ts' in other countries will be crucial to properly reward renewable electricity as the road transport fuel of the future.

[32] Research in the Netherlands showed that the benefits of registering in the Dutch credit mechanism only outweighs the costs from 50-140MWh of electricity delivered to transport, depending on the price of the credit. More details in Trinomics (2021) Onderzoek kleine spelers elektrisch vervoer. Link.

Further information

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Annex: Electricity consumption for VECTO categories of HDVs

Vehicle sub-group based on VECTO[33]	Vehicle type and GVW	Mileage factor[34]	Share of private charging[35]	Private charging to be credited	Energy consumption (kWh/km)[36]	Energy value for private charging (kWh/y)	GHG reduction for private charging (in tonnes of reduced CO2/y)
53	Medium trucks (5 - 7.4 t)	58,000	70%	40,600	0.62	25,172	9
54	Medium trucks (5 - 7.4 t)	58,000	70%	40,600	0.62	25,172	9
1s	Heavy trucks (7.4 - 16 t)	58,000	70%	40,600	0.62	25,172	9
1	Heavy trucks (7.4 - 16 t)	58,000	70%	40,600	0.62	25,172	9
2	Heavy trucks (7.4 - 16 t)	60,000	70%	42,000	0.62	26,040	9
3	Heavy trucks (7.4 - 16 t)	60,000	70%	42,000	0.62	26,040	9
4-UD	Heavy trucks (> 16 t)	60,000	70%	42,000	0.62	26,040	9
4-RD	Heavy trucks (> 16 t)	78,000	70%	54,600	1.17	63,882	22
4-LH	Heavy trucks (> 16 t)	98,000	70%	68,600	1.30	89,180	30
5-RD	Heavy trucks (> 16 t)	78,000	70%	54,600	1.17	63,882	22
5-LH	Heavy trucks (> 16 t)	116,000	70%	81,200	1.30	105,560	36
9-RD	Heavy trucks (> 16 t)	73,000	70%	51,100	1.17	59,787	20
9-LH	Heavy trucks (> 16 t)	108,000	70%	75,600	1.30	98,280	33
10-RD	Heavy trucks (> 16 t)	68,000	70%	47,600	1.17	55,692	19
10-LH	Heavy trucks (> 16 t)	107,000	70%	74,900	1.30	97,370	33
11	Heavy trucks with special axle combinations (all weights)	65,000	70%	45,500	1.30	59,150	20
12	Heavy trucks with special axle combinations (all weights)	67,000	70%	46,900	1.30	60,970	21
16	Heavy trucks with special axle combinations (all weights)	60,000	70%	42,000	1.41	59,220	20

[33] EU (2017) CO2 standards regulation for HDVs. Link.
[34] European Commission (2023) Proposal for a review of the CO2 standards regulation for HDVs. Link.
[35] T&E (2023) Fully charged for 2030. Link.
[36] TNO (2022) Techno-economic uptake potential of zero emission trucks in Europe. Link.