14 July 2025

# Credit where credit's due: Smarter alignment of renewable electricity and EV charging

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## Summary[1]

The Renewable Energy Directive (RED) features a credit mechanism for using renewable electricity to charge electric vehicles (EVs). This instrument originated from EU Member States that had experimented with the approach. Now that the RED requires all Member States to implement such a credit mechanism, it is time to look at practical ways to maximise its benefits.

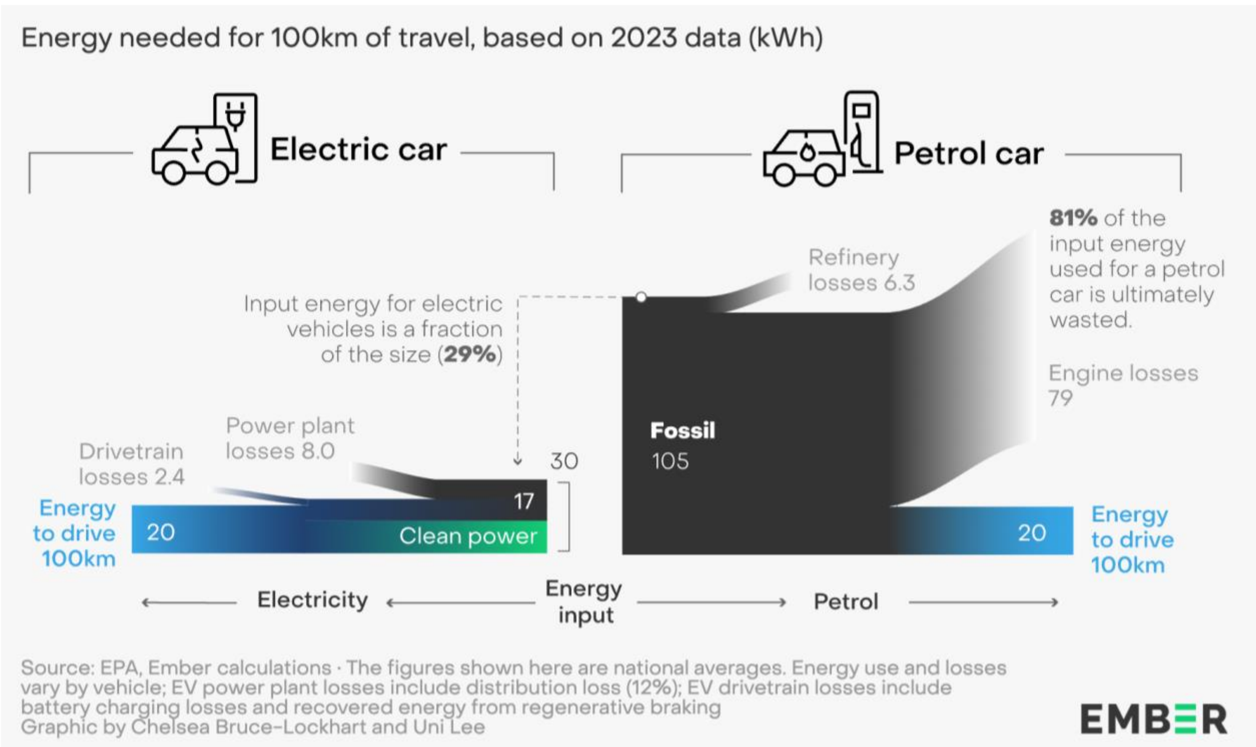
The electrification of road transport can be matched more effectively with renewable electricity by using existing technology to measure energy flows, to determine the share of renewable energy at a given time and location on the grid and, importantly, to intelligently match EV charging sessions to these parameters. Connecting to this existing innovation can give the transport and energy sectors a boost, limit costs and unlock broader benefits, such as more efficient use of local power networks.

[1] The author would like to thank Jane O'Malley (International Council on Clean Transportation) and Tim Simard and Julia Hildermeier (Regulatory Assistance Project) for their helpful comments and insights on earlier drafts of this paper. Deborah Bynum provided editorial support.

# Introduction

Road vehicles with a battery-electric drivetrain use only a third of the energy input compared to vehicles with an internal combustion engine. As the electricity used for EV charging increasingly comes from non-fossil sources, *fossil* energy use is reduced by a factor of six (Figure 1).[2]

**Figure 1. Electric cars use a third of the input energy of petrol cars and reduce fossil fuel use by a factor of six in the UK**




Electricity generation is already bound to a decarbonisation pathway by the Emissions Trading Scheme and other policies and mechanisms. As a result, EV charging is also growing cleaner over time. Linking EV charging and renewable energy generation more closely in location and time unleashes additional benefits for the transition to a clean power system. A proven starting point for capturing these benefits is to leverage existing accounting methods and available technologies such as EV smart charging.

Pairing EV charging with renewables can be mutually beneficial. Using renewable generation at scale improves profitability. Greater profitability, in turn, furthers the rollout of renewables and

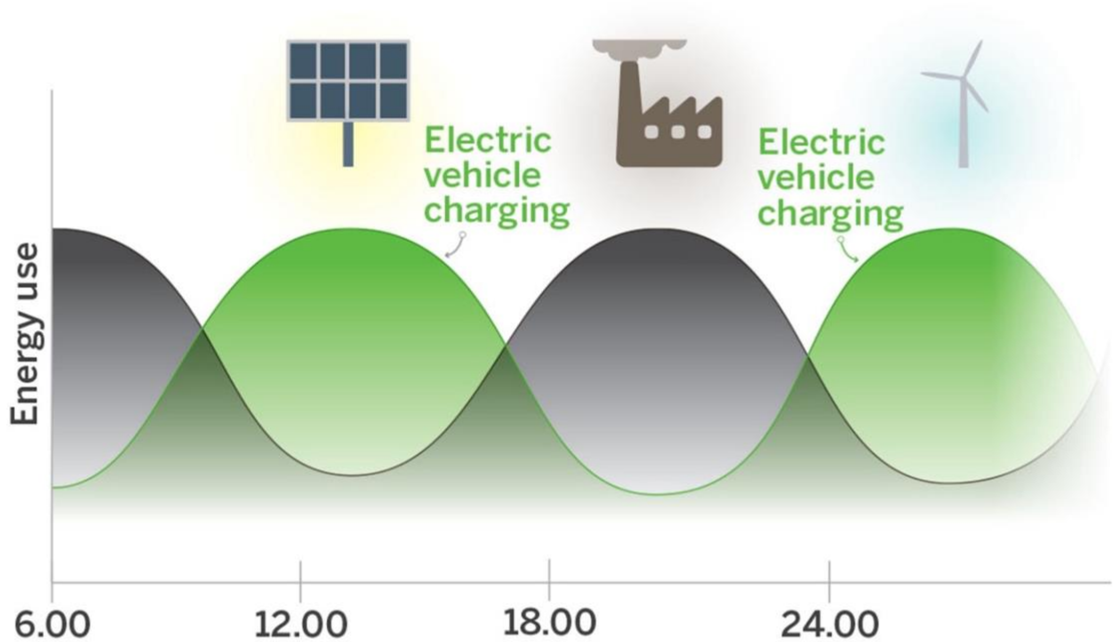
[2] May, F., & Lee, U. (2024). *The UK can enhance energy security through clean electrification*. Ember. https://ember-energy.org/latest-insights/uk-energy-security-clean-electrification/

counteracts the so-called cannibalisation[3] effects that can arise with the expansion of low-cost wind and solar. By the same token, shifting electricity demand for EV charging to hours with more renewables reduces both specific and overall electricity costs, contributing to a better total cost of ownership for electric driving.

# Smart EV charging

Smart charging means adjusting the power flow to EVs when it is most beneficial for consumers, for the power system and for the environment. In practice, smart charging means users charge when electricity is cheaper, when carbon emissions from electricity production are lower and during times when there is less stress on the power system (Figure 2).

**Figure 2. Smart EV charging integrates more renewable energy**




The RED highlights the beneficial combination of transport electrification and renewable energy production by enabling access to data for the current and forecast share of renewables on the grid and relevant data for EV batteries. However, it is another element of the RED that receives more attention when it comes to EV charging: whether renewable electricity supplies for EVs count towards national renewables targets.

[3] Growing shares of solar and wind generation with negligible running costs could lead to plummeting electricity prices if demand is not adjusted. This is also known as price cannibalisation. Scott, D., & Claeys, B. (2024, 13 August). *Solar and wind only cannibalise prices if you let them*. Power System Blueprint. Regulatory Assistance Project. https://blueprint.raponline.org/deep-dive/price-cannibalisation

# RED and the use of electricity from renewables for EV charging

The latest revision of the Renewable Energy Directive (RED III)[4] sets a binding target for the share of renewable energy in the EU. The legislation also introduces a credit mechanism to allow electricity used in road transport to be counted towards sectoral targets for all EU Member States. An efficiency factor of 0.4 reflects the fact that battery-electric vehicles are more energy-efficient than those powered by internal combustion engines. A multiplier has also been introduced to encourage the use of electrified transport, as this can help to address challenges in both the transport and energy sectors.[5]

The credit mechanism[6] that allows electricity for road transport to be counted towards renewables targets was first introduced in a few Member States under the previous version of the RED, and will have to be implemented in all 27 EU Member States as part of the RED III.[7] Member States have considerable flexibility in designing these mechanisms and deciding if and how to include residential recharging. Most mechanisms focus on public EV charging,[8] and some allow for private and semi-public depot charging.[9]

In the RED III, there are two main ways of counting the use of renewable electricity for EV charging. The first option is by using on-site renewable generation for EV charging through a direct line. This means the renewable electricity is produced on-site and is used for EV charging either immediately or later after intermediate storage in a battery. The second option is by using renewable electricity from the grid. In that case, data from two years previously determines the grid mix and thereby the renewables share, i.e., the 2025 calculation draws on 2023 figures.

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[4] European Parliament and Council of the European Union. Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L2413&qid=1699364355105

[5] European Parliament and Council of the European Union, 2023, see preamble point 14.

[6] This mechanism is often referred to as RED or RFNBO (Renewable Fuels of Non-Biological Origin) credits, THQ (Treibhausgasquote [greenhouse gas quota]) or HBE (Hernieuwbare Brandstofeenheden [renewable fuel units]).

[7] The details of this mechanism are explained in greater detail in Transport & Environment. (2023). *RED III and renewable electricity: Best practices for crediting renewable electricity as a transport fuel under the Renewable Energy Directive*. https://www.transportenvironment.org/articles/red-iii-and-renewable-electricity Baldino, C. (2023). *Provisions for transport fuels in the European Union's finalized "Fit for 55" package.* The ICCT. https://theicct.org/publication/fuels-fit-for-55-red-iii-jul23/

[8] For various national implementations of credit mechanisms for public EV charging, see for instance ChargeUp Europe. (2024). *RED III Implementation Guide*. https://www.chargeupeurope.eu/red

[9] O'Malley, J., Basma, H., & Baldino, C. (2025). *Electricity crediting for depot charging: Assessing a cost advantage for truck operators in Poland.* ICCT. https://theicct.org/publication/electricity-crediting-for-depot-charging-assessing-a-cost-advantage-for-poland-truck-operators-may25

Below are suggested multiple pathways that would bring renewable electricity production and EV charging closer together in time. These approaches rely on mechanisms already in place — for EV smart charging, for tracking the grid's carbon intensity and renewables share, and for managing energy flows within a geographically defined area. Different approaches could emerge depending on the local circumstances, existing metering, accounting solutions and data availability in a given country or grid area. Encouraging Member States to run pilots with accompanying research could bring about new, more effective and more efficient solutions. There might also be value in exploring whether to use some of these approaches for corporate carbon accounting and reporting as well. Making better use of what is already available — renewable energy generation, vehicle batteries and data solutions — can increase the effectiveness of individual measures and reduce costs.

# Considerations for exploring new solutions

## Looking beyond the direct line for local use of renewable generation

Some current direct-line approaches to crediting renewable electricity used in EV charging impose relatively high energy volume thresholds or accounting requirements. At the national or local levels, various mechanisms encourage or require solar panels on car parks or larger roofs. France has had such a requirement in place since 2024, and various German states have similar requirements for new developments. More broadly, the Energy Performance of Buildings Directive stimulates the on-site generation and use of renewable electricity.

While the RED III encourages the local use of renewable energy through a direct line, ideally it would include other opportunities to bring generation and consumption together if they are geographically close — even if they partly use the grid. Decision-makers can make the most of existing systems by tapping into the potential and current accounting and settlement mechanisms for energy communities, energy sharing within multi-tenant buildings or neighbourhoods, and commercial and industrial sites where multiple tenants collectively balance energy. These systems closely monitor energy flows within the relevant settlement period and, by using existing systems' data on production and consumption, could track the local use of renewable generation for EV charging.

# EV smart charging with renewable energy production data

Using local or remote information to align EV charging with renewable energy production is an important element in smart charging services. For instance, 195 of the 480 smart tariffs and services RAP surveyed in Europe[10] use this data to optimise energy flows.

Some services involve optimising the consumption of local solar generation. Others use information about the current and expected energy production mix, automatically postponing charging until the 'greenest' hours, for example. These smart charging services often work with other input parameters, such as time-varying electricity prices and local or national grid requirements.

The Renewable Energy Directive cites this type of control as an express reason for system operators to make the current and predicted grid mix available via an application programming interface (API). The provisions[11] introduced under the RED III to facilitate system integration of renewable electricity are also intended to enable more smart charging use cases. The legislation requires transmission system operators and, where applicable, distribution system operators to share through an API the real-time and forecast share of renewables in the respective grid section. During national implementation of the RED, or as part of a 'regulatory sandbox' experimenting with innovation,[12] Member States could replace the average yearly grid mix with the hourly-specific grid mix based on this API (see text box below for various examples). In particular, this approach can be extended to private residential and workplace charging or be used in conjunction with greenhouse gas emissions accounting practices.[13]

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[10] Burger, J. (2024, updated 12 March 2025). *Imagine all the people*. *Strong growth in tariffs and services for demand-side flexibility in Europe*. Regulatory Assistance Project. https://www.raponline.org/toolkit/strong-growth-in-tariffs-and-services-for-demand-side-flexibility-in-europe/

[11] European Parliament and Council of the European Union, 2023, Article 20a.

[12] The 'regulatory sandboxes' were announced by the European Commission in the Industrial Action Plan for the European automotive sector. European Commission. (2025). *Questions and answers on the Commission unveiling the Action Plan to drive innovation, sustainability, and competitiveness in the automotive sector*. https://ec.europa.eu/commission/presscorner/detail/en/qanda_25_636

[13] Greenhouse Gas Protocol. (n.d.). *Scope 2 and 3 emissions*. https://ghgprotocol.org

### Technological innovation for smart EV charging

Green Grid Compass[14] is a project by the German transmission system operators 50Hertz and TenneT, with Forschungsstelle für Energiewirtschaft (FfE). The website and API give information about the current and forecast shares of different energy production sources, with varying $CO_2$ intensities and shares of renewable energy.

In the UK, NESO (National Energy System Operator) provides similar tools,[15] with an app enabling consumers to schedule energy-intensive activities to greener periods on the grid. Electricity Maps[16] aims to provide production mix and $CO_2$ intensity information for many countries and energy bidding zones across the globe.

In the United States, Apple[17] provides a Grid Forecast API to developers to integrate in their own apps, e.g., to automatically schedule EV charging to the cleanest hours.

Decision-makers can add value for smart charging without increasing complexity by using existing charging techniques and processes to determine the charging mix based on time and location-specific factors. Charging point operators, users and the energy system all benefit. This approach could boost the proliferation of smart charging at private and public EV charging locations, also benefiting renewables integration at scale. By introducing a more granular element, this type of 'green' optimised charging could also help alleviate local grid stress.[18]

## Going one step further with granular certificates of origin

Another method policymakers can explore is using granular certificates of origin, which is also enabled by RED III.[19] One example is the Energy Track & Trace[20] project from the Danish

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[14] Green Grid Compass. (n.d.). *Europe*. 50Hertz, TenneT and the Forschungsstelle für Energiewirtschaft e.V. (FfE). Cited 10 July 2025. https://www.greengrid-compass.eu

[15] National Energy System Operator (NESO). (2025). *Carbon Intensity Dashboard*. Cited 7 July 2025. https://www.neso.energy/about-neso/our-progress-towards-net-zero/carbon-intensity-dashboard

[16] Electricity Maps. (2025). *Carbon intensity*. Electricity Maps. Cited 10 July 2025. https://app.electricitymaps.com/map/72h/hourly

[17] Apple Developer. (n.d.). *EnergyKit Beta.* Apple. https://developer.apple.com/documentation/energykit

[18] See Digital Hub Mobility. (n.d.). *Trusted Green Charging 2.0.* https://mobility.unternehmertum.de/en/co-innovation/trusted-green-charging-2/ and UnternehmerTUM. (n.d.). *Grids & benefits: Building dynamic grid fees for grid- and market-friendly charging*. https://www.unternehmertum.de/en/landingpages/grids-and-benefits for projects that combine national, regional and local grid signals and carbon intensity information to optimise EV charging.

[19] European Parliament and Council of the European Union, 2023, preamble point 48.

[20] Energinet. (n.d.). *Energy Origin*. Cited 10 July 2025. https://en.energinet.dk/energy-data/datahub/energy-origin/

transmission system operator and German-Belgian Elia Group, which features a mechanism for generating hourly energy origin certificates. This, and other pilot projects, could be extended to account for the use of renewable electricity in EV charging — especially where measurements are already captured in detail, such as at public EV charging stations. Member States could also consider introducing this method for private charging. With these projects still in their infancy, they could benefit from the income generated from credits for renewable fuels of non-biological origin. This would also provide insight into applicability at scale.

## What about bidirectional EV charging?

Bidirectional charging of EVs poses new challenges and offers new opportunities. In the context of the renewables credit mechanism, the energy discharged from a vehicle is neither counted nor subtracted. As a result, more credits are allocated to those vehicles than are actually used for road transport. Assuming the discharged energy replaces mainly fossil energy during peak times, this could increase the share of renewables on the grid.

What might be the best approach to move from assumption to certainty? Using the two methods outlined above, more accuracy can be introduced for bidirectional charging use cases, possibly also exploring the beneficial impact of the discharging action on the grid. The 'regulatory sandboxes' announced by the European Commission in the Industrial Action Plan for the European automotive sector[21] could be used to test this.

[21] European Commission, 2025.

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