

European Green Deal and Green Recovery: time to focus on Electromobility

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Summary

On 11 December 2019, the European Commission unveiled the EU strategy on climate neutral Europe, or the European Green Deal. The strategy promises to ensure that there are no net greenhouse gas (GHG) emissions by 2050, including increasing the EU's 2030 GHG reduction target to at least 50%, and towards 55% in a responsible way. This clear shift towards sustainable and zero emissions technologies and economy-wide change is urgently needed if the EU is to meet the ambition of the Paris Agreement. Electro-mobility is already ubiquitous in our lives, from road vehicles to rail, as it is key to clean cities, affordable mobility of all Europeans and our industrial competitiveness.

In March 2020 the COVID-19 pandemic swept across Europe and confined Europeans to their homes, halting business activity and closing factories for months. As Europe slowly goes back to life, the deepest economic recession since the 1930s heralds a new normal. But the relevance of the Green Deal or the urgency of climate action have not disappeared - the twin challenges of economic and climate crises must be tackled together. **Electrification is the strong basis to relaunch the economy and create future-proof jobs fast.** The Green Deal should be the basis of the economic recovery, starting with today.

This policy paper outlines the Green Deal vision and green recovery recommendations of the European Platform for Electro-mobility, representing almost 40 companies, associations and civil society across the electro-mobility ecosystem. Notably:

- **Electromobility remains the best solution to achieve the climate and industrial ambition of the European Green Deal for transport. This ecosystem is crucial to Europe's economic relaunch in the aftermath of COVID-19 and will create over 1 million jobs in vehicle and rail manufacturing, charging infrastructure deployment and supply chains such as batteries by 2030.**
- The EU Recovery Package must **support the e-mobility ecosystem**, including the continued **demand for zero emission vehicles**, **green investments into e-mobility supply chains** and stimulus to accelerate the **roll-out of charging infrastructure** across Europe, notably workplace & residential schemes.
- The Commission should **not delay the enabling policies** key to e-mobility's success, including the urgently needed review of the Alternative Fuels Infrastructure law, the Sustainable Battery package and the revision of the Energy Taxation Directive.

1. Electromobility is the best solution to achieve climate & industrial ambition of the European Green Deal for transport

With steadily growing transport emissions, ambitious policies and decisive action in the sector are required to reverse this trend. In all European Commission's 2050 scenarios developed in its Long Term Strategy¹ aiming at reducing GHG emissions by -80% to -100% by 2050, **electro-mobility stands as the most promising solution to decarbonise passenger and freight transport**. In the same scenarios, the share of renewable electricity will range from 81% to 85%², electric vehicles will therefore be powered by clean electricity. Rail - the most energy-efficient land transport mode by far³ - will become greener still: four trains out of five already run on electricity⁴, and this share is set to rise thanks to further electrification (catenaries⁵ and innovative battery-electric or hydrogen trains⁶).

Electrification is the most flexible and sustainable way to decarbonise the economy, while also bringing significant co-benefits such as better air quality, lower import dependency and higher energy-efficiency. Direct electrification is also the **most efficient** way to bring transport to zero emissions, as it would require 2-3 times less electricity to decarbonise the same technology than hydrogen via electrolysis, and 4-5 times more efficiency than developing electro-fuels. Electrification is today the **most cost-efficient** solution to bring transport to zero emissions. Driven by more efficient and affordable batteries, the total cost of ownership (TCO) of passenger cars is decreasing fast: the 4-year cost of running an electric car in most of the EU Member States is currently lower of a petrol car⁷, while the purchase parity of an average model is expected in the mid-2020s aided by the hundreds of new models coming to market as a result of EU CO₂ standards. For electric buses, the TCO parity is already there today. For trucks, as soon as 2030, the 5-year running cost for an electrified truck could be more than 30% lower than even the most efficient diesel truck⁸.

Electrification is also fast becoming the industrial bet of many companies across Europe from electric car production, investments into battery and green hydrogen supply chains and above all, charging infrastructure and grids. Electric vehicle production is expected to rise six-fold between 2019 and 2025⁹, and around a dozen battery gigafactories are planned to start producing European lithium battery cells from 2023 onwards. The European Battery Alliance has paved the way for building a sustainable battery

¹ European Commission, 2018, retrieved from:

https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

² Eurelectric, Decarbonisation pathways, 2018, retrieved from: <https://www.eurelectric.org/policy-areas/electrification/>

³ See the section "Energy-efficient rail" of Carbonbrief's [2019 article on possible emission cuts from rail expansion](#).

⁴ An electrification share of 77% of train-km has been determined for European rail networks included in the [PRIME benchmarking](#) on 2017 data; see [executive summary](#) (slide 7) or [full report](#) (slide 34). Switzerland's railway lines are 100% electrified, while Luxembourg (95%), Belgium (86%), the Netherlands, Sweden, Italy, Bulgaria and Austria are all above 70%; see "EU transport in figures": [Statistical pocketbook 2019](#), p. 81.

⁵ For example, the German government is [planning to increase](#) rail network electrification from 61% today (allowing around 80% of trains to run on electricity) to 70% in 2025.

⁶ For example, from 2023, eleven battery-electric passenger trains [will bridge](#) the 80 km of non-electrified line between the German cities of Chemnitz and Leipzig.

⁷ UBS, 2017, retrieved from: [UBS Evidence Lab Electric Car Teardown – Disruption Ahead?](#); LeasePlan, 2019, retrieved from: [The total cost of ownership of EVs vs traditional vehicles](#).

⁸ [Trucking into a Greener Future, Cambridge Econometrics](#), Element Energy, 2018.

⁹ Transport & Environment, *Electric Surge*, 2019, <https://www.transportenvironment.org/publications/electric-surge-carmakers-electric-car-plans-across-europe-2019-2025>

industry that could create up to 4 million jobs in the EU¹⁰. Just as COVID-19 hit, the EU electric car market was finally closing the gap with China,¹¹ so now is not the time to slow down. **Supporting a recovery rooted in zero-emission mobility and electrification is also smart industrial policy.**

Connecting individual mobility segments will lead to **new digital ecosystems** where cooperation between soft- and hardware, car and train manufacturers, energy utilities, telecoms, insurance and financial service providers and public institutions will happen on digital platforms. Integrating sensors, transponders and smart applications on vehicles and road/rail infrastructure will create moving digital information for improved traffic flows, optimised industry supply chain management or increased safety. At the same time intelligent charging carries the enormous potential to transform the way we run our future power system, with clean energy stored and fed back to the grid in the most economically efficient way. Recent analysis¹² shows that smartly integrating battery-electric road vehicles with the power system can save billions in grid upgrades and effectively integrate renewables into the system, eliminating the need for curtailment.

2. Electromobility will bring over 1 million jobs to Europe by 2030

Deep transport decarbonisation also comes with great potential for industrial and business development. European industry can benefit from an increased demand for the production, installation, operation & maintenance of charging points, public transport systems, batteries and other related infrastructure, resulting in a net increase in employment in the construction, electricity, services and most manufacturing sectors¹³. With the right enabling policies, e-mobility can also gradually replace the decreasing jobs in manufacturing of diesel and petrol engines with new jobs and new skills required in electric powertrain manufacturing and key supply chains such as batteries. European companies already design and produce state-of-the-art electric motors, electric powertrains, substations and infrastructure as well as energy management systems and chargers.

¹⁰ EIT InnoEnergy assessed that the European Battery Alliance have a potential of 400GWh of battery production per year by 2025.

¹¹ ACEA, 2020, retrieved from: <https://www.acea.be/press-releases/article/fuel-types-of-new-cars-petrol-52.3-diesel-29.9-electric-6.8-market-share-fi>

¹² Element Energy, *Batteries on wheels report*, 2019, retrieved from: https://www.transportenvironment.org/sites/te/files/publications/2019_06_Element_Energy_Batteries_on_wheels_Public_report.pdf; IRENA, *Innovation Outlook EV smart charging*, 2019, retrieved from: https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/May/IRENA_Innovation_Outlook_EV_smart_charging_2019.pdf

¹³ EuropeOn, *Powering a new value chain in the automotive sector*, 2018, retrieved from: <https://europe-on.org/wp-content/uploads/2020/02/EuropeOn-Powering-a-new-value-chain-in-the-automotive-sector-the-job-potential-of-transport-electrification.pdf>

1.1 million jobs created in e-mobility in 2030

Sector	Jobs created
Charging equipment manufacturing	31,000
Charging installation and connection	65,500
Charging infrastructure operation	141,500
Charging infrastructure maintenance	94,000
Electricity generation	35,000
Grid reinforcement	27,500
Battery manufacturing	72,000
Battery end-of-life	6,500
Electric powertrain manufacturing	48,500
Rail expansion	552,000
Total	1,073,500

Source: Analysis from members of the Platform for Electro-mobility

Additional jobs can thus be created in the industrial value chain and lead to net economic benefits in battery and charger manufacturing, installation and operation, maintenance of recharging points, rail vehicle manufacturing, zero-emissions public transport systems, grid connection, grid reinforcement and increased electricity generation. The platform has undertaken an analysis to update the existing job

estimates in the e-mobility ecosystem - summarised in the table above - to show that an additional 1.1 million jobs will be created in Europe by 2030.

The head start taken by China and South Korea in lithium-ion battery manufacturing is not definitive and can be challenged: following the efforts of the European Battery Alliance, a number of gigafactories by Swedish, German and French companies are already committed to be built in Europe and produce battery cells by 2023. Overall, with a strong focus on e-mobility more than 200,000 net additional jobs by 2030 can be created in the European economy¹⁴.

3. Green recovery needed to accelerate electro-mobility

Since the European Green Deal Strategy was announced pre-COVID-19, the pandemic that has swept the world and has confined Europeans to their homes, halting business activity and closing factories. As Europe slowly goes back to life, a much bigger gloom is entering our lives, the deepest economic recession since the 1930s. But the relevance of the Green Deal has not disappeared - the twin challenges of economic and climate crises should be tackled together. **Electrification is the strong basis to relaunch the economy and create future-proof jobs fast.**

The upcoming **EU Recovery Package (and MFF+)** must take the Green Deal strategy as a reference to stimulate growth. As regards electro-mobility, the Platform recommends the following:

- **The recovery measures should balance economic relief of workers and long- term decarbonisation of the transport sector, which is key to achieve Europe's overarching Green Deal objectives, namely carbon neutrality by 2050.** The current crisis should thus not hinder or delay the transition towards clean mobility but rather incentivise national governments to boost the demand for decarbonised transport, through an EU-wide and coherent approach.
- In the short and medium term, measures should be undertaken to **revive the demand for clean mobility & zero emission technologies**. For instance, allowing Member States to temporarily waive VAT on low and zero emission vehicles as defined in the revised Clean Vehicles Directive (2019/1161) would be very effective. An EU-wide scrappage scheme could be established to support the sales of zero-emission vehicles or a switch to other clean mobility solutions like electric car sharing or public transport.
- Green stimulus to accelerate the **uptake of electric cars, vans and trucks by public and business fleets** across Europe.
- **Long-term targets and internal combustion engine phase-out plans should be kept in place and enforced by national governments and local administrations alike**, subsidising green investments in clean mobility and energy efficiency plans.
- A well-functioning Trans-European Network for Transport (TEN-T) is crucial for rail. Massive infrastructure **investment programmes into rail** should be part of the EU recovery plan, including a shift to rail freight in line with the Commission's Green Deal strategy.

¹⁴ Harrison P. 2018, Fueling Europe's Future : How the transition from oil strengthens the economy, retrieved from: <https://www.camecon.com/what/our-work/fuelling-europes-future/>

- In the short term, ongoing and upcoming public tenders for EU-funded rail projects must be supported and maintained. In the long run, the next **MTF** - the Connecting Europe Facility (CEF 2), the next generation of Structural Funds and the Horizon Europe Framework Programme - need to **support long-distance, high-speed rail and direct city to city rail connections**.
- In the long run, **green debt instruments could be launched by the European Investment Bank** to grant bonus loans on reduced rates when green performance criteria are met.
- EU money should **support green investments into the electromobility ecosystem**, e.g. into battery production and recycling facilities. This should be done by loan guarantees and other risk sharing mechanisms so that bank loans and private capital can continue to be accessed.
- **The EU should accelerate the roll-out of charging infrastructure as a green stimulus measure.** The crisis has put a brutal stop to both its deployment and use and will affect the sector's financing capacities. Instruments to steer private/commercial investments into charge points should be introduced, notably via **InvestEU**. At the same time, support should be extended to the development and integration of clean energy technologies such as EV batteries and smart charging infrastructure.
- EU funding should also promote **successful residential or workplace charging schemes** providing financial support toward some of the up-front grid, cabling and installation costs. These should be subject to simple permitting procedures and **streamlined to cut red tape** and therefore indirectly save costs for companies.

The Platform fully supports the EU Taxonomy and Green EU Bond Standard initiatives. Both will work to redefine financial investments and reorient capital towards truly green projects. We expect that these initiatives will also impact EIB investment and loans schemes. The taxonomy list should be used as the basis of sustainable investments in the future, to ensure they are all compatible with the European Green Deal.

4. Enabling policies needed on e-mobility for the Green Deal ambition

The post-COVID-19 recession is not a reason to delay the important legislative proposals to underpin the Green Deal. An ambitious set of enabling policies is needed to accelerate the transformation of the EU industry and wider society, and to relaunch the economy sustainably.

The Platform for Electro-mobility therefore calls on European and national policy-makers to support the following **policy recommendations**:

a) Just transition & industry transformation

A socially fair transition and distribution of costs is vital for getting the necessary popular support for decarbonising the transport sector. In order to be successful, it will be key to develop well-balanced policies which enhance the societal acceptance and involvement of citizens in this major task, cutting across all parts of society. The Platform therefore supports the Commission's **Climate Pact initiative**, and calls on the Commission to turn it into the impactful pledge-style tool where **businesses, cities and individuals are encouraged to showcase their actions in support of the Green Deal**.

We need European leaders to effectively link political climate ambitions to a coherent industrial strategy. We welcome the recently proposed EU **industrial strategy**, and call on the Commission to **put e-mobility as the climate and industrial priority across all policy areas in 2020-2024**. This should propose measures that will help the electromobility ecosystem succeed in Europe, such as making **Europe a leader in advanced rechargeable battery technology**. We must create an environment where Europe in 2050 has an innovative net-zero emissions industry with circular business models, which competes on the global stage.

Horizon Europe and the public-private partnerships dedicated to zero-emission transport modes and technologies will be key to enhance the competitiveness of the European industry in zero emission mobility.

Transforming mobility creates new job opportunities. EU funding will be needed to support investment in regions that rely heavily on fossil fuel industries, by e.g. helping **diesel and petrol supply chain transition and retool factories** to produce electro-chemical components of the future. Companies and governments should work together to identify the new skills necessary and appropriate retraining programs needed to achieve the carbon neutrality transition to ensure the **workforce has enough software, electronics & chemistry specialists**.

European and national decision-makers should work with e-mobility stakeholders to identify and overcome non-technical barriers to market readiness for new technologies. This includes mechanisms to **support consumers' uptake of electro-mobility** innovations and ensure social inclusion of lower income households. Specifically on the demand side, the European Commission should consider expanding the Clean Vehicles Directive to also cover large private fleets, to create certainty of demand for producers of zero emissions technology.

b) Carbon pricing & taxation

All sectors must contribute to the unprecedented task of making the EU a climate-neutral economy by 2050. A prerequisite is that a corresponding CO₂ price incentive targets the GHG emissions coming from all sectors, whether covered by the EU Emissions Trading System ETS (like energy) or not, the so called non-ETS sectors of buildings, transport or agriculture.

In principle, the idea to **expand the EU ETS scope**, as announced by Commission's new president Ursula von der Leyen, is a step in the right direction. The sectors currently not exposed to any CO₂ price (e.g. **maritime**) or to an insufficient CO₂ price (i.e. **aviation**) should be prioritised and effectively included into the ETS as soon as possible. In contrast, **extension of the EU ETS to road transport should not be supported**, given that this sector is already exposed to a range of other EU and national policies, such as fuel taxes and CO₂ standards, which already constitute a form of carbon price and are better suited to the specificities of this non-elastic sector of the economy.¹⁵ Any extension of the EU ETS to other sectors shall be carefully assessed in order to ensure the well-functioning of the current EU ETS system.

¹⁵ This is not the position of Platform member CER, which is not opposed to extending the ETS to road transport. For CER, robust carbon pricing for all modes transport across the EU is crucial, for effective incentives to emit less and for fair competition between transport modes. That could be achieved with a reformed ETS with a minimum carbon price, ideally as a separate transport ETS until 2030 at least. Or it could be EU-coordinated taxes levied by Member States.

Taxation is a central driver for the decarbonisation of transport and it is essential that EU's taxation rules are aligned with its decarbonisation commitments, in particular through an ambitious Eurovignette Directive. Moreover, the Energy Taxation Directive should review EU minimum tax rates, so that they properly reflect CO₂-content, and should put an end to the tax exemptions on fuels used for air and maritime navigation.

c) Green Deal compatible infrastructure

To foster the electrification of road transport, for both passenger and freight transport, the European Commission should mandate and support the deployment of charging infrastructure for Light Duty Vehicles (LDV) and Heavy-Duty Vehicles (HDV). In this regard, the Platform considers that the Directive on the deployment of Alternative Fuels Infrastructure (AFI, 2014/94/EU) and TEN-T guidelines (regulation EU No 1315/2013) should quickly be revised to respond to the growth of electric vehicles (EV) in the coming years and align with climate objectives. The revision of the AFI Directive should clearly set **binding targets for the deployment of public charging infrastructure solely for zero emission transport technologies** in order to reach the 2050 climate neutrality goal. The Commission should look into the use of **new legislative tools to widen the scope of the AFID framework** to address commercial properties.

The Platform believes that the current target of at least one charging point every 60 km on the TEN-T Core Network should be brought forward as soon as possible as a prerequisite for the uptake of electric vehicles and become mandatory in the AFI Directive. It is cost-effective and feasible, e.g. to cover the Core Network of Spain 80 sites would be needed, with a unit cost of €650,000 each, so €52mIn in total. Local and regional authorities will play a key role in the planning and provision of charging points and therefore should be consulted¹⁶ in the deployment of infrastructure and supported with a clear policy framework, capacity, incentives and knowledge. This will ensure that infrastructure is inclusive and orientated towards user needs.

Public charging infrastructure should be interoperable and secure for consumers, and provide open, shared and secure data. EV charging across Europe should be seamless and easy to ensure consumer acceptance by **harmonising payment solutions**.

At the same time, with around 90% of charging currently taking place at home or work,¹⁷ the public offering is just a fraction of the total number of charging stations needed. The **Green Deal needs to also deliver ambitious charging targets in the private domain which includes residential, non-residential buildings, offices supermarkets, parking facilities and commercial spaces**. The existing European charging requirements for buildings are not sufficient in the short term, and do not give enough power to tenants or owners looking to install charging stations.

To decarbonise all modes of transport, freight modal shift towards railway, which is already largely electrified in Europe, should be fostered. That requires in particular the completion of the TEN-T rail network and ensures its interoperability thanks to its conformity with the technical criteria set in the TEN-T regulation. In parallel, the Green Deal should take into consideration the technological progress

¹⁶ Directive 2014/94/EU of 22 October 2014 on the deployment of alternative fuels infrastructure, Art.3(3)

¹⁷ Avere-France, 2020, retrieved from: <https://www.je-roule-en-electrique.fr/tout-savoir-pour-recharger-son-vehicule-electrique-8>

that has been made regarding alternatives to diesel propulsion for rail transport, such as Hydrogen and battery-powered trains. Regarding maritime transport, onshore power supply (OPS) should be deployed on a mandatory basis in all EU ferry and cruise passenger terminals and in cargo ships terminals to respond to ecological and environmental objectives. An electric mobility plan to ambitiously integrate public transport and ferry/boat electrification is also needed.

d) EU Battery Supply Chain

Batteries will underpin Europe's efforts to achieve a climate neutral economy and transport electrification. This will require great amounts of batteries on the European market to power the mass amounts of zero emission vehicles.

A responsible approach to this industrial and transportation revolution must ensure a sustainable model for battery manufacturing that also supports the European industry and incentivizes a responsible use of active materials. However, that approach cannot end with manufacturing. Instead, it must extend to incorporate raw and active materials, carbon footprint and efficiency, end of life of batteries and vehicle battery dismantling, and reuse and recycling as fundamental aspects of electromobility.

Within this context, the reuse and recycling of batteries materials should be addressed as part of the EU battery strategy. A circular economy approach, allowing at the same time the security of supply of raw materials, the reuse - (where adequate) - and recycling of batteries, and high environmental and social values in the manufacturing process should be guaranteed to promote a sustainable EU battery industry.

At the same time, ensuring sustainable sourcing is key to addressing the future development of the EV sector and will help EU battery companies differentiate themselves globally. Furthermore it will build trust between the industry and the consumers and ensure that the energy transition will not compromise with sustainability aspects in the mining and raw materials industry. Requirement for the ethical and environmentally sustainable sourcing of raw materials (notably through a circular economy approach) must be supported at EU level to ensure that the battery industry brings social and environmental value along the entire value chain.

Finally, there should also be a consistent framework put into place to unlock the potential of second life EV batteries before an end of life management, according to the circular economy principles. Second and third life of batteries might offer interesting business opportunities depending on battery application and increase battery lifespan. Reuse should be facilitated, but not mandated over recycling.

5. Cities and the Green Deal

At the local level, the Green Deal should ensure that electromobility in cities is treated as a part of the overall sustainable urban mobility system, foster shared zero emission mobility and consider other clean modes, such as walking and cycling. The Green Deal should take this **systemic approach - and thus form a basis for the upcoming Strategy on Sustainable and Smart Mobility**, providing financial cross-sectoral schemes and the required policy framework.

Although cities' efforts for Low Emission Zones are increasingly recognised as one way to curb local air pollution¹⁸, meeting the EU Green Deal targets will require going beyond, to Zero Emission Zones (ZEZs) and considerably boosting the uptake of the electrification in cities¹⁹, notably public transport. This means that much more stringent limits for the EU emission standards are needed.

For electrifying public transport fleets, the European Commission should guarantee a detailed market monitoring (offer, demand and TCO evolution) in the framework of the implementation of the revised Clean Vehicles Directive.

Cities are living labs and testbeds for innovation, also in e-mobility. The European Commission should therefore provide stronger support for local authorities to participate in partnerships and R&I actions under Horizon Europe.

The Platform for Electro-mobility unites organisations from across civil society, industries, cities and transport modes. Its members are committed to promote electro-mobility and strive to collectively develop solutions to electrify European transport, and to promote those solutions to the EU institutions and Member States. The Platform is working to create a sustainable, multimodal transport system in which people and goods are predominantly moved across land in Europe using sustainable electricity.

The aim of the Platform is to drive the development and implementation of sustainable European Union policies, programmes and initiatives to move people and goods by electricity

<https://www.platformelectromobility.eu>

¹⁸ Eltis, 2019, *Linking transport and health in SUMPS*, retrieved from:

https://www.eltis.org/sites/default/files/linking_transport_and_health_in_sumps_0.pdf

¹⁹ T&E, *Low-Emission Zones are a success -but they must now move to zero-emission mobility*, 2019, retrieved from:

https://www.transportenvironment.org/sites/te/files/publications/2019_09_Briefing_LEZ-ZEZ_final.pdf

ANNEX: METHODOLOGY FOR ASSESSING JOB CREATION IN THE EMOBILITY VALUE CHAIN

The methodology is based on a bottom-up analysis which calculates the number of jobs created to meet the additional activity generated by the production or the use of the expected electric vehicle fleet, covering light duty, heavy duty and rail transport. This additional activity demand is induced by the production of parts of these vehicles (ie batteries or powertrains), or related to the infrastructure required for these vehicles (ie EV chargers, the electricity grid or the rail network). The methodology follows the three steps below:

1. **Scenario modelling:** The total number of electric cars on the road and the number of chargers (public and private) needed to recharge them is based on T&E's in-house modelling. In 2030 about 44 million EVs (BEVs + PHEVs) would be on the road in the EU27+UK. This is based on a Green Deal compatible scenario where 40% of new sales in 2030 would be battery electric. For rail, we assume the completion of the TEN-T Core network by 2030.
2. **Sub-sector revenue:** The total revenue generated by businesses in each sub-category is calculated for 2030 (see more details for each job category below).
3. **Job creation:** The number of jobs needed to fulfill the activity in each sub-sector is calculated with the 'labour intensity' of the sub-sector. The 'labour intensity' can be described as the amount of revenue generated by one employee in the specific sub-sector from a macroeconomic perspective at EU level. For example, for the installation of charging infrastructure, there's one job for every 171,000€ of revenue in the sector. The labour intensity is mainly based on Eurostat ('turnover per person employed') and has been validated by experts of the Platform membership.

The general approach is broadly the same for all sub-groups, but some variations can apply to have a more tailored approach or to account for data availability.

Charging infrastructure

The methodology is identical to the one from the 2017 [study](#) that T&E has carried out for EuropeOn. The study calculates the number of jobs based on the additional revenue generated in each sub-sector. Calculations are broken down per charger type: home, work, one-phase (3-7kW), three-phase (11-22kW), fast (50kW) and ultra-fast (+150kW). The cost of the charging equipment and the installation as well as the labour intensity of the operations and maintenance of the chargers (in hours per charger per year) were provided by platform experts (see below).

Equipment manufacturing: Based on equipment costs from T&E's RechargeEU report in 2030: home charger: €500, work charger: €800, public AC charger: €1,300-1,400, public DC charger: €15,000-€50,000; combined with Eurostat labour intensity for the category 'Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus' (about €200,000 of revenue per employee).

Installation and grid connection: Based on costs from T&E's RechargeEU report in 2030 for the following categories: installation, grid connection and civil engineering site work (fast DC charging only) and corresponding Eurostat labour intensities.

Operations: This category includes all centralised desk-jobs for infrastructure oversight: asset management, procurement, network development, customer support, management, IT, sales, planning, permitting, and supply. Industry experts of the Electromobility Platform have provided inputs for this subcategory and the following intensities were used (in number of hours of work per charger

per year in 2030): home: 2h/y, work: 5h/y, public AC: 16h/y and public DC: 33h/y. A 80% efficiency gain has been applied to today's values to take into account the effect of expected economies of scale, self servicing of the charging infrastructure as well as automation.

Maintenance: Industry experts of the Electromobility Platform have provided inputs for this subcategory and the following intensities were used (in number of hours of work per charger per year in 2030): home: 3h/y, work: 510/y, public AC: 13h/y and public DC: 19h/y. A 50% efficiency gain has been applied to today's values to take into account economies of scale.

Electricity generation and network

Additional electricity generation

The additional electrical energy needed to power the 44 million EVs on the road in 2030 was estimated at around 4% of the current total electricity produced in the EU. According to Eurostat, about 0.3 employees are needed to generate one GWh of electricity on average in Europe. We apply this same ratio to calculate the number of new jobs created for the additional energy required. This only includes jobs in electric power generation, transmission and distribution sectors.

Specific data on the labour intensity of generating renewable electricity was not available and could be higher than for traditional centralised electricity generation which would put our assessment on the conservative side. Many jobs created indirectly for the construction of decentralised renewable energy sources (and associated grid enhancement) were therefore not taken into account here. Similarly, installation and manufacturing of the equipment were not taken into account.

Grid upgrade

Low voltage and medium voltage grid reinforcements requirements are based on costs from Eurelectric (study [here](#) Table 4 p. 28). We assume the share of new EV buyers living in detached houses is expected to decrease to 58% in 2030 (EU average according to Eurostat). The low voltage grid upgrade costs for flats account for a majority of the costs (56%) with about 650€ per parking spot. Remaining costs are split between low voltage grid upgrade costs for detached houses and medium voltage grid upgrade costs.

We use Eurostat's labour intensity for construction of utility projects (turnover of about €144,000 per employee) to obtain a total number of jobs.

This analysis assumes that smart charging would not significantly reduce grid upgrade costs before 2030. Indeed, Platform members expect the use of smart charging will stay limited until EVs reach about 20% of the cars on the road (about 2030), at which point the distribution grid would reach wider capacity limitations and smart charging will be essential to limit the stress on the grid and reduce system costs.

Battery production and end-of-life

The number of battery cells produced in Europe is estimated to be around 400 GWh for LDVs in 2030 and about 100 GWh for heavy-duty and maritime applications according to Circular Energy Storage Online. The estimates for the number of battery manufacturing jobs are based on an assumption that an average of 146 jobs are supported per GWh per annum (for both cell production and module and pack assembly). For the end-of-life of batteries it is assumed that 15 jobs are created for the collection, dismantling and recycling of these batteries per thousand tonnes of lithium-ion battery waste. Jobs created in mining and refining of materials in the EU has not been accounted for.

Electric vehicle powertrain manufacturing

The number of jobs created in electric powertrain manufacturing is estimated based on the expected total European production of electric powertrains and the labour intensity of the production of the electric powertrain industry. The assumptions used are based on Cambridge Econometrics' study Fuelling Europe's Future, in particular for the cost of e-powertrains: €1,527 for BEVs and €670 for PHEVs in 2030.

Using Eurostat's labour intensity of the manufacturing of electric motors (about €220,000 of revenue per employee), we estimate about 50,000 jobs in e-powertrain manufacturing in 2030. We assume that all EVs sold in Europe have their powertrain produced in Europe, or in other words that imports and exports of e-powertrain balance each other.

Rail - network expansion

The approach for rail differs as it is based on the European Commission's estimate that an additional 800,000 European people will be employed in 2030 through the completion of the TEN-T Core network. Based on exchanges with the European Commission, it was estimated that 69% of the total investment in the TEN-T Core network in 2017-2030 would be attributed to rail. Finally we assume the same average labour intensity for infrastructure construction in each transport mode (rail and road in particular), which is supported by the fact that Eurostat classifies 'construction of roads and railways' under the same category for employment statistics.