

Special Report

## Infrastructure for charging electric vehicles:

more charging stations but uneven deployment makes travel across the EU complicated



EUROPEAN  
COURT  
OF AUDITORS

# Contents

	Paragraph
<b>Executive summary</b>	I-IX
<b>Introduction</b>	01-13
<b>Electricity at the forefront of alternative fuels in road transport</b>	01-07
<b>The EU's response to the 'chicken-and-egg' problem</b>	08-13
<b>Audit scope and approach</b>	14-18
<b>Observations</b>	19-69
<b>Despite more charging stations and harmonised plugs, the uneven deployment of charging infrastructure means travel across the EU in electric vehicles is not easy</b>	19-41
There are no clear and coherent EU-wide charging infrastructure targets	20-24
The Commission has been unable to ensure that national plans are consistent and coherent from an EU perspective	25-28
The charging network is growing, but there are significant differences in deployment across the EU	29-34
Common EU plug standards are being widely adopted	35-37
However, travel across the EU is still complicated by the absence of minimum requirements for harmonised payment systems and user information	38-41
<b>CEF funding is promoting deployment, but the Commission has been unable to ensure that it goes where it is most needed</b>	42-69
There has been no comprehensive infrastructure gap analysis to support the setting of CEF priorities and project selection	43-56
The CEF is promoting deployment, but the projects we audited are not fully delivering on their objectives	57-69
<b>Conclusions and recommendations</b>	70-80

## **Annexes**

**Annex I – Share of EVs in total passenger vehicle fleet, EU-27 and UK**

**Annex II – EV charging standards**

**Acronyms and abbreviations**

**Glossary**

**Replies of the Commission**

**Audit team**

**Timeline**

## Executive summary

**I** With the European Green Deal announced in December 2019, the EU is now aiming to reduce greenhouse gas emissions from transport by 90 % by 2050 compared with 1990, as part of a larger effort to become a climate-neutral economy. An essential part of reducing emissions from road transport is the transition to alternative, lower-carbon fuels. Of these, the most common new source is electricity, particularly for passenger vehicles.

**II** The deployment of charging infrastructure in line with electric vehicle uptake is a key enabler of the switch to alternative fuels and to a largely zero-emission vehicle fleet by 2050. The ultimate policy objective is to make electric vehicle charging as easy as filling a conventional vehicle tank, so that electric vehicles can travel without difficulty right across the EU. To reach that aim, the EU faces the following interlinked problem: on the one hand, vehicle uptake will be constrained until charging infrastructure is available, while on the other, investments in infrastructure require more certainty of vehicle uptake levels.

**III** The Commission has the role of steering the EU's overall alternative fuels policy. The added value of EU action in this field is that alternative fuels infrastructure is a trans-national challenge, but individual Member States do not have the necessary tools to achieve pan-European coordination. What the Commission can do is adopt common standards to ensure interoperability, coordinate and support Member States' deployment of electrical charging infrastructure, and monitor progress. Through the Connecting Europe Facility, moreover, it provides financial support for electrical charging infrastructure.

**IV** This report will contribute to the forthcoming revisions of key EU legislation in this area and to the work of planning and implementing the 2021-2027 programme period. It will help the Commission to support more effectively the deployment of publicly accessible charging infrastructure across the EU, particularly in the context of the Green Deal objectives and the expected significant growth of electro-mobility (the use of electric vehicles) in the next few years.

**V** The objective of our audit was to determine the effectiveness of the Commission's support for the deployment of an EU-wide publicly accessible infrastructure for charging electric vehicles during the 2014-2020 period. We looked at the way in which the Commission adopts standards, and coordinates and supports Member States' deployment of electrical charging infrastructure, and at how it manages CEF funding for electrical charging infrastructure.

**VI** We obtained information from several sources, including the Commission, national authorities, beneficiaries of EU funding and other stakeholders. To gain first-hand experience as users of charging infrastructure, we used an electric vehicle to visit and test a number of EU co-funded charging stations.

**VII** We found that the Commission has succeeded in promoting a common EU plug standard for charging electric vehicles, and that users are gradually gaining more harmonised access to different charging networks. However, obstacles to travel across the EU in electric vehicles remain. Although the charging network is growing across the EU, deployment is patchy, as there are no clear and consistent minimum infrastructure requirements to ensure EU-wide electro-mobility. The EU is still a long way off its ambitious Green Deal target of 1 million charging points by 2025, and it lacks an overall strategic roadmap for electro-mobility. Travel across the EU is further complicated by the absence of harmonised payment systems with minimum requirements and adequate user information on real-time availability and billing details of charging stations.

**VIII** EU financial support from the Connecting Europe Facility has been used widely to promote the deployment of interoperable charging stations across the EU. However, in the absence of a comprehensive infrastructure gap analysis, the Commission has been unable to ensure that EU funding goes where it is most needed. Moreover, it has not been making funding for charging stations conditional on a minimum period of operation, or on assurances of equitable access for all electric vehicle users. Every one of the projects we reviewed was affected by implementation delays and some delivered only partial outputs. Finally, we noted that the current rates of use of co-funded stations are generally low, which increases the sustainability risks associated with these investments.

**IX** On the basis of these conclusions, we recommend that the Commission should:

- Propose minimum electrical charging infrastructure requirements across the TEN-T network.
- Prepare a strategic and integrated EU electro-mobility roadmap.
- Develop an infrastructure and funding gap analyses.
- Use the infrastructure and funding gap analyses and clarified criteria to strengthen its selection of projects.
- Include clauses in project grant agreements to ensure sustainable and equitable access to co-funded infrastructure.

# Introduction

## Electricity at the forefront of alternative fuels in road transport

**01** With the European Green Deal<sup>1</sup> announced in December 2019, the EU is now aiming to reduce greenhouse gas emissions from transport by 90 % by 2050 compared with 1990, as part of a larger effort to become a climate-neutral economy. Transport accounts for approximately one quarter of all greenhouse gas emissions in the EU, predominantly (72 %) through road transport<sup>2</sup>.

**02** An essential part of reducing greenhouse gas emissions from road transport is the transition to alternative, lower-carbon fuels, such as electricity, hydrogen, biofuels or biogas. However, road transport continues to be almost entirely dependent on fossil fuels, with around 95 % of all road vehicles still conventionally fuelled<sup>3</sup>. On top of higher vehicle purchase costs, the lack of charging and refuelling stations is holding back the market development of alternative fuels.

**03** The EU maintains technological neutrality in the sense that it does not favour any one type of alternative fuel, but considers that there should be common technical specifications as well as EU-wide availability (i.e. infrastructure) for all fuels. In practice, however, electricity is at the forefront of the deployment of alternative fuels in road transport, particularly for passenger cars and light-duty vehicles.

**04** According to the European Automobile Manufacturers Association, 89.4 % of all new vehicles registered in the EU in 2019 ran on petrol or diesel, while hybrid electric vehicles accounted for 6 %, electrically chargeable vehicles (EVs) for 3 %, and all other non-electric (e.g. gas or hydrogen) alternatively fuelled vehicles for just 1.6 %. In 2020, the electrically chargeable segment (battery and plug-in hybrid electric vehicles) significantly increased its market share against the backdrop of an overall decline in new passenger vehicle registrations due to the COVID-19 outbreak. EVs were 10.5 % of new registrations in 2020. In other words, every tenth passenger car sold in the EU in

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<sup>1</sup> COM(2019) 640 final.

<sup>2</sup> SWD(2020) 331 final, accompanying the document COM(2020) 789 final: 'Sustainable and Smart Mobility Strategy – putting European transport on track for the future'.

<sup>3</sup> COM(2017) 652 final: 'Towards the broadest use of alternative fuels - an Action Plan on Alternative Fuels Infrastructure'.

2020 was electrically chargeable<sup>4</sup>. Carmakers forecast that the production of EVs in Europe will multiply six-fold between 2019 and 2025, reaching more than 4 million cars and vans annually - or more than a fifth of EU car production volumes<sup>5</sup>.

**05** The Green Deal refers to an estimated 13 million zero and low-emission vehicles on European roads by 2025. In its 2020 Sustainable and Smart Mobility Strategy<sup>6</sup>, the Commission set a milestone of at least 30 million zero-emission vehicles by 2030 and to a largely zero-emission vehicle fleet by 2050, a significant increase on the roughly 2 million EVs currently registered in the EU. Moreover, a growing number of Member States (among them Denmark, Ireland, Netherlands, Slovenia and Sweden) have announced plans to ban sales of fossil-fuel cars from 2030. Outside the EU, in Norway, the world's leading electro-mobility market, EVs account for 15 % of all passenger cars<sup>7</sup> (*Annex I* shows how this compares with the share of EVs in the EU and the UK). Norway has set the most ambitious target of all, requiring all new passenger cars and light vans sold to be zero-emission as early as 2025.

**06** According to the EU's 2016 low-emission mobility strategy, the ultimate policy objective is to make EV charging as easy as filling a conventional vehicle tank, so that EVs can travel without obstacle across the EU. Unlike with conventional vehicles, most EV charging is done at home or at work, so public charging points<sup>8</sup> are needed to serve drivers without access to private charging, and those travelling longer distances. Moreover, a recent analysis has shown that charging will probably shift towards public options, and away from the home (accounting for around 75 % in 2020), as more people without access to home charging start to buy EVs<sup>9</sup>.

**07** As the range of EVs' is still generally lower - around 380 km, averaged over 10 EV passenger cars currently on the market - than that of conventional vehicles, they have to be charged more frequently. Charging time depends on the vehicle's battery and charging point capacity (see *Table 1*). While 'slow' and 'normal' chargers are more adequate for home and office charging cycles, 'fast' and 'ultra-fast' chargers are more

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<sup>4</sup> <https://www.acea.be/statistics/tag/category/electric-and-alternative-vehicle-registrations>

<sup>5</sup> 'Electric surge: Carmakers' electric car plans across Europe 2019-2025', Transport & Environment, July 2019.

<sup>6</sup> COM(2020) 789 final.

<sup>7</sup> European Alternative Fuels Observatory (EAFO) data as of September 2020.

<sup>8</sup> A charging *point* is capable of handling just one vehicle at a time. A charging *station* consists of multiple charging points.

<sup>9</sup> McKinsey & Company, Charging ahead: Electric-vehicle infrastructure demand, 8.8.2018.

suitable for highways and main road networks. Range constraints and worry about the availability of charging stations along their route can lead to ‘range and queuing anxieties’ among EV users: the fear that their vehicle will have insufficient range to reach their destination and that charging may mean lengthy queues if a station is already occupied.

**Table 1 – What charging technology is available?**

Charger speed and type	Power rating	Approximate time to charge*
Slow (single-phase AC)	3-7 kW	7-16 hours
Normal (three-phase AC)	11-22 kW	2-4 hours
Fast (DC)	50-100 kW	30-40 minutes
Ultra-fast (DC)	> 100 kW	< 20 minutes

\* Also depends on the battery capacity and other variables.

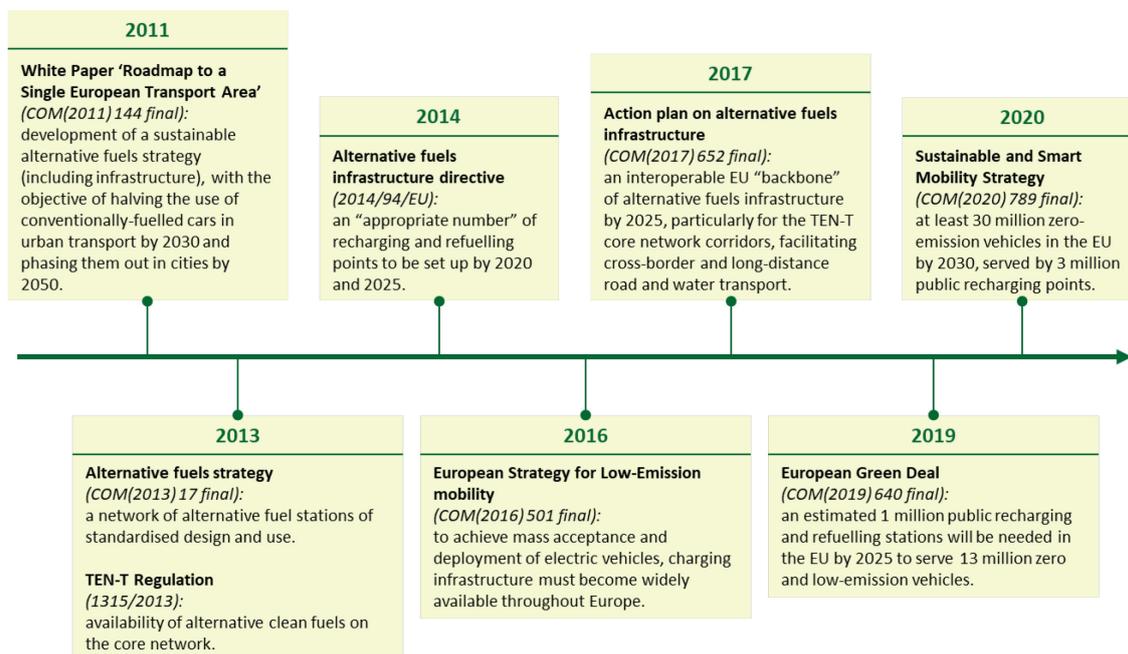
Source: ‘Recharge EU: How many charge points will Europe and its Member States need in the 2020s’, T&E, January 2020.

## The EU’s response to the ‘chicken-and-egg’ problem

**08** Each Member State is responsible for preparing and implementing its own domestic alternative fuels policy under the framework set by the EU legislation. This may include measures such as tax breaks or subsidies for the purchase of electric vehicles and the construction of charging infrastructure.

**09** However, the Commission has the role of steering the EU’s overall alternative fuels policy. Its responsibilities include drafting and negotiating legislative proposals. The Green Deal is the latest in a series of EU policy documents on the development of alternative fuels infrastructure (see [Figure 1](#)). The added value of EU action in this field is that alternative fuels infrastructure is a trans-national challenge, but individual Member States do not have the necessary tools for pan-European coordination. What the Commission can do is adopt common standards to ensure interoperability, coordinate and support Member States’ deployment of electrical charging infrastructure, and monitor progress.

**Figure 1 – EU policy documents on alternative fuel infrastructure**



Source: ECA.

**10** The 2014 directive on alternative fuels infrastructure (AFID)<sup>10</sup> is a key policy tool within the overall EU strategy to develop publicly accessible electrical charging infrastructure. It aims to overcome a market failure best described as the 'chicken-and-egg' problem: on the one hand, vehicle uptake will be constrained until charging infrastructure is available, while on the other, investments in infrastructure require more certainty of vehicle uptake levels. The deployment of charging infrastructure in step with EV uptake patterns is an essential part of the switch to alternative fuels.

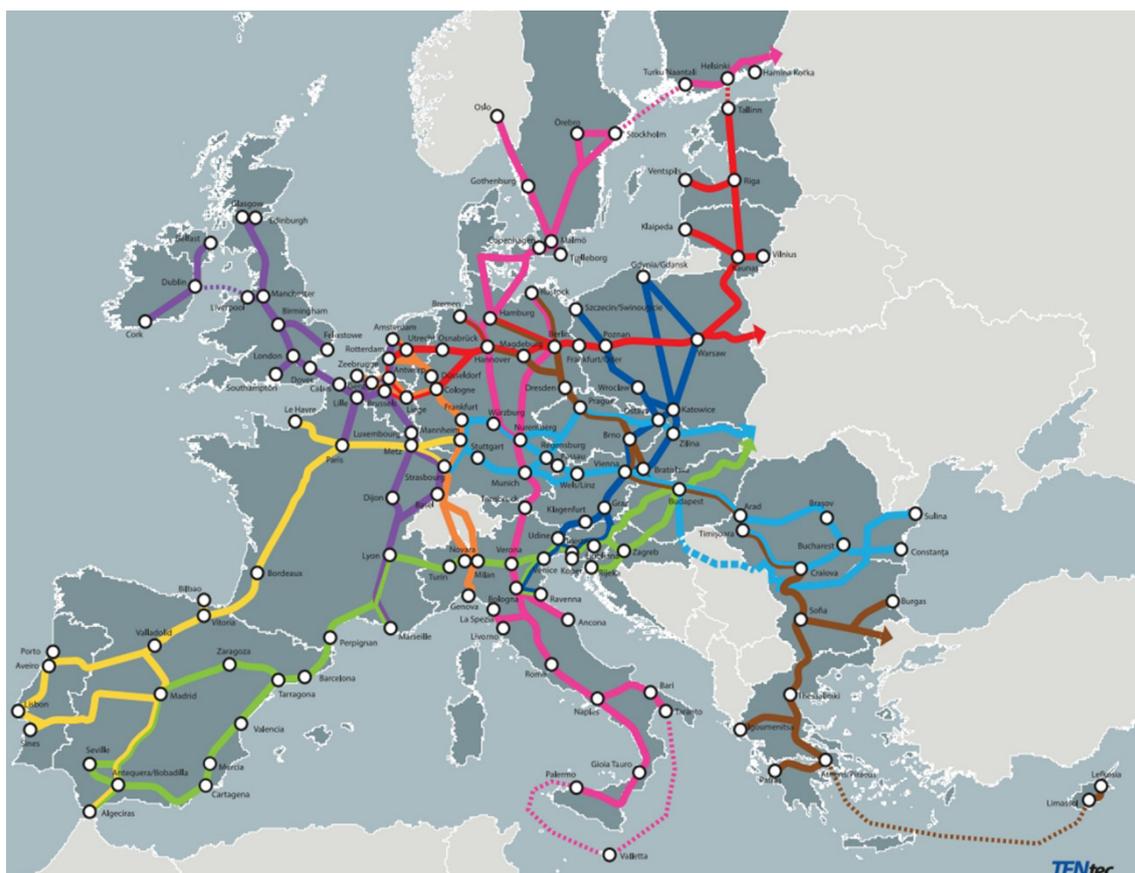
**11** Article 39(2)(c) of the 2013 trans-European transport network (TEN-T) regulation<sup>11</sup>, a key tool of EU policy for infrastructure development, includes the 'availability of alternative clean fuels' as an infrastructure requirement for road transport in particular across the 'core' network, which is to be completed by 2030. The 'comprehensive' network, to be completed by 2050, aims to ensure the accessibility and connectivity of all EU regions. The core network consists of those parts of the comprehensive network, which are of the highest strategic importance for achieving the TEN-T objectives. Within the nearly 50 000 km of roads on the core

<sup>10</sup> Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure.

<sup>11</sup> Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network.

network, there are nine multimodal corridors covering the most important traffic routes traversing the EU (see [Picture 1](#)). In order to facilitate coordinated implementation of the corridors, there are nine European core network corridor coordinators (each of whom oversees implementation of one corridor) appointed by the Commission.

**Picture 1 – TEN-T core network corridors**



Atlantic, Baltic-Adriatic, Mediterranean, North Sea-Baltic, North Sea-Mediterranean, Orient-East Mediterranean, Rhine-Alpine, Rhine-Danube, Scandinavian Mediterranean.

Source: European Commission.

**12** In its 2017 action plan on alternative fuels infrastructure, the Commission estimated that up to €3.9 billion would be required for electrical charging infrastructure by 2020 and possibly an additional €2.7 to €3.8 billion per year, as of 2021 depending on the share of fast-charging infrastructure. The Connecting Europe Facility (CEF), directly managed by the Commission, provides financial support for alternative fuels infrastructure<sup>12</sup>. Between 2014 and December 2020, CEF grants of approximately €698 million were awarded for alternative fuels in road transport (see

<sup>12</sup> Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility.

**Table 2).** Of this amount, approximately €343 million went to electrical charging infrastructure projects or projects combining electricity with other alternative fuels (compressed natural gas, liquefied natural gas or hydrogen). Further CEF calls to support the deployment of public charging infrastructure are expected after 2020, as part of the Green Deal. Moreover, one highlight of planning under the Recovery and Resilience Facility for the 2021-2027 multiannual financial framework is EU support for building of 1 million public charging points by 2025<sup>13</sup>.

**Table 2 – CEF grants allocated for alternative fuels infrastructure for road transport, 2014-2020 (millions of euros)**

Type of Fuel	Projects	Estimated cost	EU contribution	Share of total EU contribution
Electricity	38	1 215	280	40 %
Compressed natural gas / Liquefied natural gas	32	606	235	34 %
Hydrogen	11	416	120	17 %
Combined electricity / other alternative fuels	6	307	63	9 %
Liquefied petroleum gas	2	3	1	0 %
<b>Total</b>	<b>89</b>	<b>2 547</b>	<b>698<sup>1</sup></b>	<b>100 %</b>

<sup>1</sup> Total includes approximately €38 million for four projects, which, although already selected by the Commission, were still at the grant preparation stage as of December 2020.

Source: ECA analysis based on data provided by INEA, December 2020.

<sup>13</sup> COM(2020) 575 final, 'Annual Sustainable Growth Strategy 2021'.

**13** On the vehicle side, the electro-mobility market has been helped along by EU legislation on CO<sub>2</sub> emission performance standards for new passenger cars and vans. The 2015 target of 130 g CO<sub>2</sub>/km has gradually been tightened to 95 g CO<sub>2</sub>/km from 2020 onwards, with further reductions due in 2025 and 2030<sup>14</sup>. Along with a system of incentives and penalties for car manufacturers, this legislation is expected to be a key catalyst for increase in EV numbers, itself the main driver of the need for additional charging infrastructure. The Commission has announced a revision of the CO<sub>2</sub> emission standards for cars for mid-2021<sup>15</sup>.

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<sup>14</sup> Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO<sub>2</sub> emission performance standards for new passenger cars and for new light commercial vehicles.

<sup>15</sup> COM(2020) 789 final.

## Audit scope and approach

**14** The objective of our audit was to determine the effectiveness of the Commission's support for the deployment across the EU of publicly accessible infrastructure for charging electric vehicles (battery and plug-in hybrid). We examined two main aspects of the Commission's support:

- the way in which it adopts standards, and coordinates and supports Member States' deployment of electrical charging infrastructure.
- how it manages CEF funding for electrical charging infrastructure.

**15** The audit focussed on EU action, during the 2014-2020 period, in an area of great public and institutional relevance. Our report provides input for the forthcoming revisions of key legislation in this area (the AFID and the TEN-T regulation) and for the work of planning and implementing the 2021-2027 multiannual financial framework. It will help the Commission to support more effectively the deployment of public charging infrastructure across the EU, particularly in the context of the Green Deal objectives and the expected significant growth of electro-mobility in the next few years.

**16** Our main auditee was the Commission's Directorate-General for Mobility and Transport (DG MOVE), which is responsible for the EU's alternative fuels infrastructure policy, including the allocation of CEF funding in that area with the support of the Innovation and Networks Executive Agency (INEA). We obtained information for our audit from several sources- the Commission, national authorities, beneficiaries of CEF funding and other relevant stakeholders. We analysed the Commission's procedures for assessing infrastructure needs and directing funding to charging infrastructure projects, and tested the functioning of those procedures and the implementation of a sample of 11 projects worth approximately €130 million, or 46 % of all CEF grants for charging infrastructure. We used criteria of materiality, relevance, implementation status and geographical distribution to select projects coordinated by six beneficiaries in Germany, Italy, Netherlands, Portugal, Slovakia and Spain. In addition to those project beneficiaries, we interviewed national authorities in the six Member States which, although not our auditees, provided information relevant to our assessment of the Commission's work.

**17** In addition, to perform direct testing of EU co-funded charging infrastructure, we drove in an electric vehicle to charging stations in Germany, France and Italy (see [Box 2](#)). The COVID-19 travel restrictions prevented us from similarly testing stations on the spot in Netherlands, Spain, Portugal and Slovakia.

**18** Our audit did not address emissions and renewable energy targets, battery development and research, and generation and distribution of electricity needed for charging stations.

## Observations

### Despite more charging stations and harmonised plugs, the uneven deployment of charging infrastructure means travel across the EU in electric vehicles is not easy

**19** In this section, we assessed the effectiveness of the Commission's action to set common standards, coordinate and support Member States' deployment of electrical charging infrastructure and monitor progress.

#### There are no clear and coherent EU-wide charging infrastructure targets

**20** The Commission's initial proposal for AFID<sup>16</sup> included a minimum number of charging points in each Member State and a total of 800 000 across the EU by 2020. Moreover, the impact assessment<sup>17</sup> accompanying the proposal noted that not setting binding infrastructure targets would impede policy effectiveness, and that leaving a large margin of discretion to the Member States might prevent satisfactory delivery of the specific and overarching objectives.

**21** However, the Commission's initial proposal was not retained by the co-legislators: as adopted in 2014, the AFID does not specify a minimum number of charging points. Member States were instead expected to deploy an 'appropriate' number of points (see [Box 1](#)). The preamble mentions only an indicative recommended ratio of one publicly accessible charging point for every 10 EVs, with no requirement to take account of geographical distribution, population density or network coverage. This is in contrast to the recommended average distance in the directive between charging points in the TEN-T core network for compressed natural gas and liquefied natural gas refuelling (respectively 150 and 400 km).

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<sup>16</sup> COM(2013) 18 final of 24.1.2013.

<sup>17</sup> SWD(2013) 5 final of 24.1.2013.

## Box 1

### AFID objectives for electricity (articles 4.1 and 4.2)

- (1) Member States shall ensure, by means of their national policy frameworks, that an appropriate number of charging points accessible to the public are put in place by 31 December 2020, in order to ensure that electric vehicles can circulate at least in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States. The number of such charging points shall be established taking into consideration, inter alia, the number of electric vehicles estimated to be registered by the end of 2020, as indicated in their national policy frameworks, as well as best practices and recommendations issued by the Commission. Particular needs related to the installation of charging points accessible to the public at public transport stations shall be taken into account, where appropriate.
- (2) The Commission shall assess the application of the requirements in (1) and, as appropriate, submit a proposal to amend this Directive, taking into account the development of the market for electric vehicles, in order to ensure that an additional number of charging points accessible to the public are put in place in each Member State by 31 December 2025, at least on the TEN-T core network, in urban/suburban agglomerations and other densely populated areas.

**22** The AFID leaves it to the Member States to define criteria for public accessibility and the power rating of charging points, and does not distinguish between different EV types. This makes it difficult to estimate precise infrastructure needs, assess the accuracy of the reported figures and compare countries:

- (a) In the AFID a ‘charging point accessible to the public’ provides non-discriminatory access to users across the EU, with possible differences in authentication, terms of use and payment. As a result of the general nature of this definition, some Member States define public charging points as being located in public spaces and accessible 24 hours a day, seven days a week, and ‘semi-public’ charging points as being accessible only at certain times and subject to restrictions on use (such as the requirement to make use of an associated car park, hotel, or shopping centre). Others make no such distinction and deem public charging points to be all those that are not private.
- (b) The AFID only differentiates between normal (< 22 kW) and fast (> 22 kW) charging points, although many other power categories are in use. In effect, it

deems charging points rated below 22 kW to be equivalent to those rated 350 kW, despite a substantial difference in charging speed.

- (c) The AFID does not distinguish between battery electric vehicles and plug-in hybrid electric vehicles, which have very different charging patterns. According to a recent study, battery electric vehicles charge almost four times more energy than plug-in hybrids in a typical week<sup>18</sup>.

**23** The TEN-T regulation does not include any specific provisions for alternative fuels infrastructure. The regulation refers to the general ‘availability of alternative clean fuels’ on the core network and indicates that road infrastructure may include equipment for refuelling or charging of vehicles with alternative propulsion on the comprehensive network. It does not distinguish between different types of alternative fuels or define availability. In a recent audit on EU roads<sup>19</sup>, we concluded that the TEN-T regulation does not set clear requirements for alternative fuels infrastructure.

**24** The Commission’s 2017 alternative fuels action plan<sup>20</sup> recognised that ‘effective use of the TEN-T approach should be made to build up the backbone of EU-wide charging infrastructure by 2025 at the latest. The corridor concept makes it possible to identify gaps in terms of cross-border long-distance mobility and to involve all relevant stakeholders [...]’. However, neither the AFID nor the TEN-T regulation gives any specific role to the European core network corridor coordinators in the planning and deployment of alternative fuels infrastructure along their corridors. Our analysis of the coordinators’ 2020 corridor work plans showed that they do not include comparable information, data and assessments on the availability of alternative fuels infrastructure.

### **The Commission has been unable to ensure that national plans are consistent and coherent from an EU perspective**

**25** The AFID required Member States to set up national policy frameworks (NPFs) for development of the market for alternative fuels. NPFs were to be notified to the Commission by 18 November 2016 and must include planning for the deployment of

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<sup>18</sup> ‘Recharge EU: How many charge points will Europe and its Member States need in the 2020s’, T&E, January 2020.

<sup>19</sup> Special report 09/2020: ‘The EU core road network: shorter travel times but network not yet fully functional’, paragraph 42.

<sup>20</sup> COM(2017) 652 final.

infrastructure. While the Commission is responsible for assessing the coherence among the various NPFs at EU level, the directive does not give it a specific mandate or clear powers of enforcement in that regard, merely stating that it is to assist Member States in the reporting of NPFs and in areas they need to cooperate. The Commission exchanges with Member States through the Alternative Fuels Committee and the Sustainable Transport Forum (an expert group of Commission and Member State representatives and 32 expert associations).

**26** The Commission provided Member States with detailed guidance for their NPF preparation. It completed its assessment of most NPFs in November 2017, with a follow-up in February 2019<sup>21</sup>. Overall, the Commission concluded that the NPFs' completeness, coherence and ambition varied greatly, which could lead to a market fragmentation in the EU. The Commission found that:

- (a) two Member States (Spain and Sweden) had not set a 2020 target for charging points and they provided estimates only in their 2019 NPF implementation reports that were prepared subsequently;
- (b) although the Commission's guidance had suggested identifying infrastructure and vehicle needs for 2020, 2025 and 2030, only 11 NPFs presented targets and estimates for 2025 and 2030;
- (c) NPF ambition levels varied greatly, with estimated total market shares for EVs in the total fleet by 2020 ranging from 0.02 % to 9.22 %;
- (d) only ten NPFs had set targets that would ensure at least one publicly accessible charging point for every 10 EVs by 2020.

**27** Although, in its guidance, the Commission asked Member States to report on the geographical distribution of their charging points, indicating to what extent they covered the TEN-T core and comprehensive networks, only seven Member States had provided sufficient and complete information. Despite the limited information in this regard, the Commission concluded that, applying the 60 km criterion assessed by the Joint Research Centre to be the maximum range between charging points, coverage of the TEN-T network core network by 2025 seemed to be progressing. However, parts of the core network might remain without minimal charging infrastructure if additional action was not taken. The Commission pointed to significant differences in the density

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<sup>21</sup> SWD(2017) 365 final of 8.11.2017; SWD(2019) 29 final of 13.2.2019 including the NPFs of four Member States (Greece, Malta, Romania, Slovenia), which had not made the initial deadline for notification of 1 October 2017.

of charging points between neighbouring countries and identified cross-border continuity issues between 14 pairs of Member States.

**28** The AFID requires the Commission to publish and regularly update information on the national targets and objectives submitted by the Member States in their NPFs. Member States were to report on progress towards their targets by November 2019, and the Commission was to assess those reports by November 2020. One purpose of this assessment was to provide input for a review of the AFID that was required by the end of 2020. However, the Commission's assessment was still ongoing at the time of our audit, as several Member States had significantly delayed submitting their reports. According to the Commission, the AFID review (evaluation and impact assessment) is still underway, and a proposal for a revision of the directive could be adopted by June 2021.

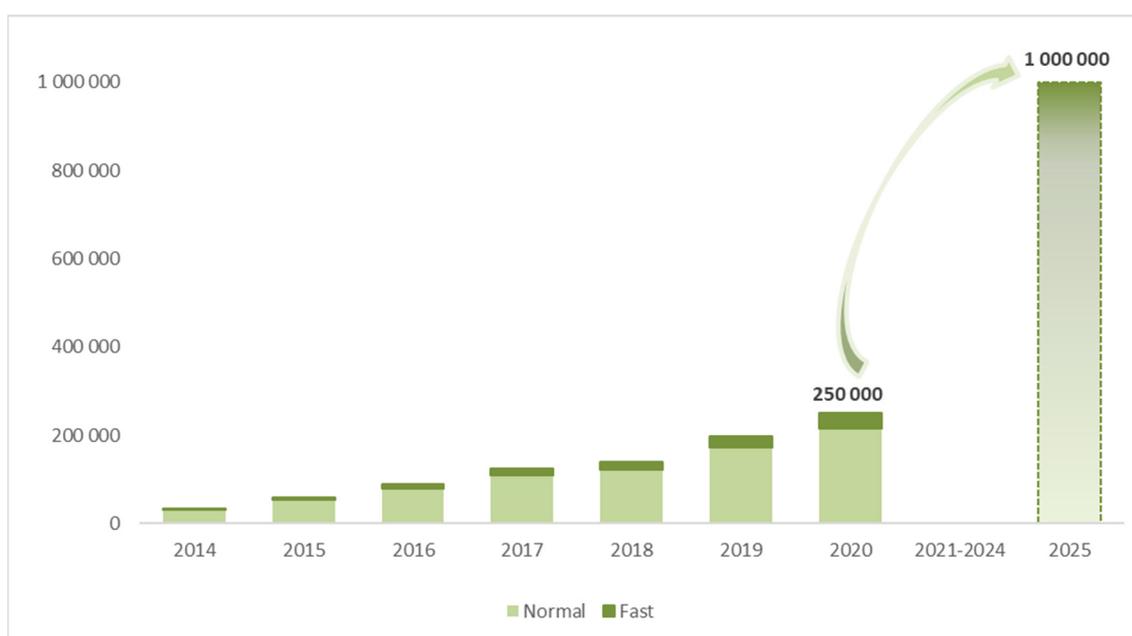
### **The charging network is growing, but there are significant differences in deployment across the EU**

**29** In its 2017 action plan on alternative fuels infrastructure, the Commission estimated that the number of publicly accessible charging points would have to increase from the 118 000 available at the time to 440 000 in 2020, and to about 2 million in 2025. The 2019 Green Deal updated the estimate for 2025 to 1 million public charging points. The 2020 Sustainable and Smart Mobility Strategy identified a need for 3 million public charging points by 2030.

**30** However, considerable uncertainty remains over these estimates and what needs to be done to reach the set targets. The EU does not have an overall strategic roadmap for electro-mobility and an integrated policy on vehicles, infrastructure, grids, batteries, economic incentives, raw materials and digital services. We would expect such document to include estimates of the required number, type and density of public charging points, and the overall cost. These estimates would take account of factors such as the estimated share of battery and plug-in hybrid electric vehicles, as they have different charging needs, the grid capacity, and developments in batteries' capacities that affect driving ranges.

**31** *Figure 2* shows that the number of publicly accessible charging points in the EU-27 and the UK increased from approximately 34 000 in 2014 to 250 000 as of September 2020 (14 % of which are ‘fast’ as defined in the AFID, i.e. rated above 22 kW ). This is significantly lower than the estimated 440 000 charging points in the 2017 action plan. If the deployment of infrastructure continues to follow the 2014-2020 trend, there will be a significant risk that the target of 1 million public charging points by 2025 will be missed. To make up the gap, something like 150 000 new points will be needed each year, or roughly 3 000 per week.

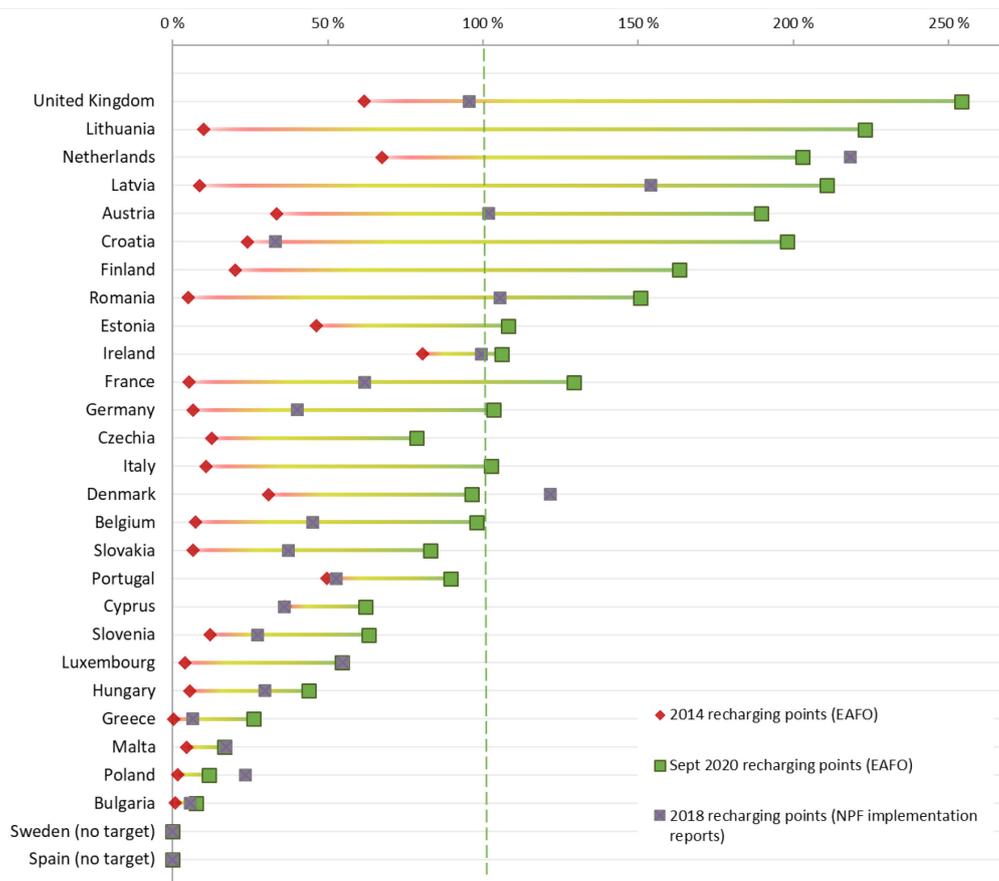
**Figure 2 – Charging points (EU-27 and the UK) and Green Deal target**



Source: ECA based on EAFO data as of September 2020 (excluding around 4 100 Tesla chargers).

**32** According to their 2019 NPF implementation reports to the Commission, by 2018, five Member States had already achieved their NPF 2020 charging point targets initially set for them. This contrasts with the situation in the 12 Member States which were still below 50 % of target. To expand this data and obtain as recent as possible a view of the deployment of charging points, we analysed the European Alternative Fuels Observatory (EAFO) data from September 2020 (see *Figure 3*). The data shows significant differences in the deployment of charging infrastructure by Member States, with some overachieving the NPF targets initially set by a wide margin and others lagging significantly behind. The completion rates for individual Member States as of September 2020 vary from 7 % (Bulgaria) and 12 % (Poland) to over 200 % (Lithuania, Latvia and Netherlands). Overall, three months before the deadline of December 2020, 12 Member States had achieved their targets and eight were below 75 % attainment. 13 Member States had not reached the AFID indicative ratio of at least one publicly accessible charging point for every 10 EVs.

**Figure 3 – Charging points and NPF 2020 targets (EU-27 and the UK)**

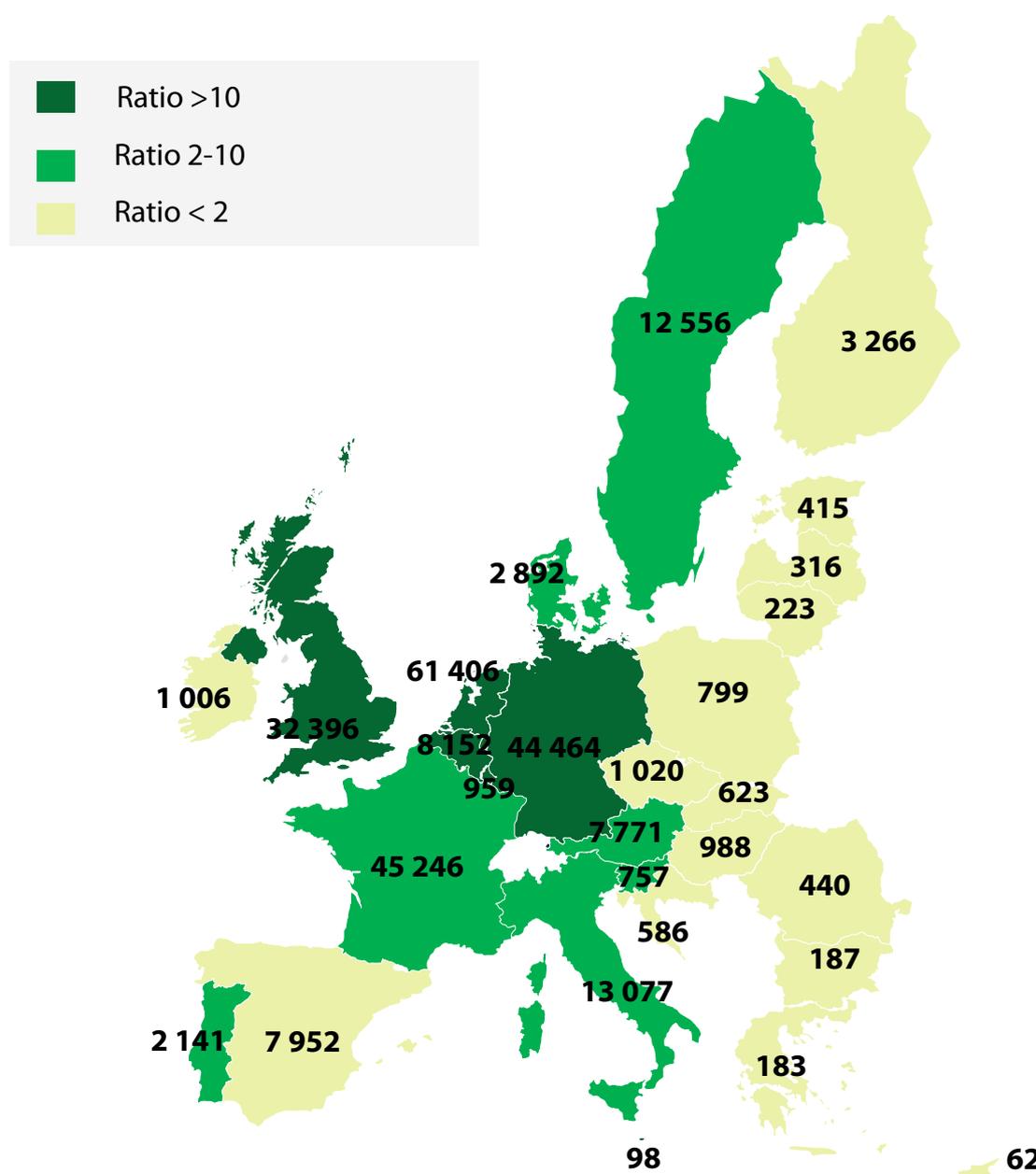


Source: EAFO for 2014 charging points, NPF implementation reports for 2018 charging points (no data for Czechia, Estonia, Finland, Italy, Lithuania ); EAFO for September 2020 charging points (data for Netherlands from the Netherlands Enterprise Agency).

**33** We found some discrepancies between the data presented in the NPF implementation reports and that of the EAFO, mainly because the definition and counting of publicly accessible charging points is unclear (see paragraph 22). For example, the EAFO data includes both public and semi-public charging points, but this is not consistently the case of Member States' reports. In the Netherlands, the EAFO reports 61 534 charging points, but only 36 187 of these were fully public and the remaining semi-public. We also noted inconsistencies for Denmark, Luxembourg and Poland, whose NPF implementation reports with reference to 2018 tally indicate more charging points than were reported by the EAFO in September 2020.

**34** The uneven deployment of charging infrastructure is also illustrated in [Figure 4](#), which shows total numbers of charging points and figures for their density in each Member State. There are substantial differences between Member States, with the highest density in the western and the lowest in central and eastern European countries. In the EU-27, Germany, France, and Netherlands together account for a large majority (69 %) of all charging points. Such uneven deployment of charging infrastructure does not facilitate EV travel across the EU.

**Figure 4 – Number of public charging points and ratio of charging points to 100 km<sup>2</sup> land area (EU-27 and the UK)**



Source: ECA based on EAFO (number of charging points as of September 2020) and Eurostat (land area).

## Common EU plug standards are being widely adopted

**35** Different charging standards/plugs exist around the world (see [Annex II](#) for more details). In an effort to establish common EU plug standards, the AFID prescribed that, to ensure interoperability, charging points in the EU should be equipped with at least the Type 2 standard (AC) and the Combined Charging System (CCS) standard (DC).

**36** Since the adoption of the AFID in 2014, most charging stations in the EU have adopted the Type 2 standard for AC charging, and the CCS standard is increasingly common for DC charging. Gradually, therefore, EV users are obtaining more harmonised access to different charging networks (see also [Box 2](#) on our own EV charging experience). According to EAFO data, the share of DC charging points using the CCS standard doubled since the adoption of the AFID, increasing from 26 % in 2014 to 51 % in 2020. To reach more customers, many charging point operators are investing in multi-standard chargers with CCS, CHAdeMO and Type 2 plugs, and these investments qualify for CEF funding (see [Picture 2](#)). The CEF does not support Tesla stations, which are part of an exclusive proprietary charging network that, currently, only Tesla drivers can use.

**37** On the vehicles side, all EV manufacturers have adopted the Type 2 standard for AC charging in the European market. For DC charging, most have already switched or are switching to the CCS standard, but some models still use other standards.

**Picture 2 – Multi-standard charger (CHAdeMO, CCS, Type 2) funded by the CEF**



Source: ECA.

However, travel across the EU is still complicated by the absence of minimum requirements for harmonised payment systems and user information

**38** The electro-mobility charging system involves multiple actors that need to communicate with each other. As well as charging point operators (responsible for installing and maintaining charging points) and mobility service providers (providing consumers with a range of mobility product or services), they include EV users, vehicle manufacturers and grid operators. The AFID stipulates that the charging point operators must be allowed to provide EV charging services to customers on a

contractual basis, including on behalf of other service providers. This requires 'roaming' technology between charging point operators and mobility service providers to allow drivers to charge using a single identification or payment method, and stations to communicate equally with all EVs. It involves at least the following: a contractual agreement among all the entities concerned, either direct (bilateral) or indirect (via a roaming hub), the charging points to be equipped with an internet connection, a card reader or a remote activation function, and interoperable communication protocols.

**39** However, currently, physical connections and information exchange among these actors go through a variety of communication protocols. There are no harmonised roaming systems with minimum requirements that would allow EV users to use all different charging networks of the EU under a single contractual agreement. Consequently, depending on their charging point operators and the mobility service providers they use, EV drivers may require multiple subscriptions and use different payment methods. This issue was highlighted in a recent Sustainable Transport Forum report<sup>22</sup> that noted that in certain cases EV users may require multiple contracts for their charging needs. The report also found that the AFID requirement that all public charging points must provide for the possibility of 'ad hoc' charging (without a contract) has been implemented in very diverse ways throughout the EU.

**40** Moreover, the use of different communication protocols also hampers the EU-wide collection and exchange of information on the real-time availability, charging data and billing details between the different networks. The Sustainable Transport Forum also found that while the geographical location of charging stations is generally available, real-time information on, for example, faulty chargers or queues is not. Finally, it may be difficult to obtain full information about the cost of a charging session, and there is no standard for displaying prices at charging points (see [Box 2](#)).

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<sup>22</sup> 'Analysis of stakeholder views on key policy needs and opinions for action in Alternative Fuels Infrastructure deployment and consumer services', November 2019.

**41** To improve the situation, the Commission is currently preparing a request to the European Standardisation Organisations to develop new standards and complete existing ones to support full interoperable communication (including roaming) in the area of EV charging. It is hoped that most of the standards will be finalised by 2023 for subsequent adoption in the framework of the revised AFID. The Commission has also supported<sup>23</sup> a group of 15 Member States in the overall process of data gathering and analysis so that specific data on charging point location and availability can be made available in line with the EU's intelligent transport legislation<sup>24</sup>.

### **CEF funding is promoting deployment, but the Commission has been unable to ensure that it goes where it is most needed**

**42** In this section, we examined the Commission's procedures for assessing charging infrastructure needs and providing CEF project support where it can add value and address market failures. We tested how those procedures are applied and assessed the implementation of a sample of 11 infrastructure projects.

#### **There has been no comprehensive infrastructure gap analysis to support the setting of CEF priorities and project selection**

**43** DG MOVE prepares the CEF Transport annual and multi-annual work programmes. It sets programme priorities by taking into consideration the TEN-T policy and geographical and modal balance, after consulting other Commission services involved and Member States.

**44** Most CEF funding is delivered in the form of grants following competitive calls for proposals. This process is managed by INEA, which takes into account the priorities, funding conditions and indicative budget outlined in multi-annual work programmes. As of December 2020, there have been eight CEF calls supporting electrical charging infrastructure, under the 'Innovation and New Technologies' funding priority.

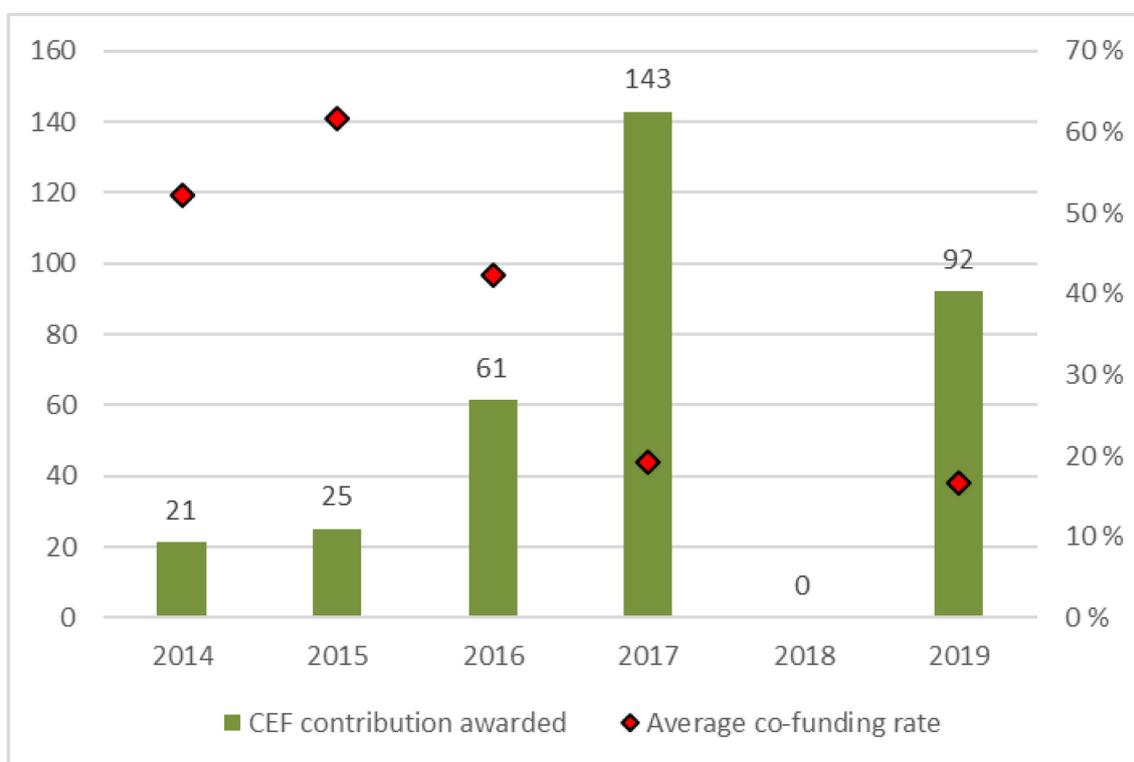
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<sup>23</sup> Programme Support Action on ID and Data collection for Sustainable fuels in Europe (IDACS). Supported under Commission Decision C(2018) 146 final.

<sup>24</sup> Directive 2010/40/EU of the European Parliament and of the Council on the framework for the deployment of Intelligent Transport Systems in the field of road transport, and the associated regulations, which should feed into National or Common Access Points that are established under that Directive.

**45** The policy priorities, and the form and indicative budget of CEF support, have evolved over time to mirror the technological and market developments (see [Figure 5](#)). From 2014 to 2016, almost 85 % of support went to studies with pilot deployment of infrastructure - at co-funding rates of 50 % in the general envelope and up to 85 % in Cohesion regions. Since 2017, with markets becoming more mature, the focus has shifted to works projects, and to ‘blending’ CEF grants with loans. The latest blending calls have lower co-financing rates (no more than 20 % in 2017 and 15 % in 2019), with no Cohesion envelope and no scope for studies.

**Figure 5 – Evolution of CEF contribution to electrification of road transport 2014-2019 (millions of euros)**



Source: INEA, December 2020. No allocations for alternative fuels infrastructure in the 2018 call.

**46** CEF support for electrical charging infrastructure has focused on the TEN-T core network. The calls in first years of CEF programme (2014-2016) prioritised the core network and the 2017 call made this an eligibility criterion. The 2019 ‘blending facility’ call, by way of derogation, allows up to 20 % of the budget allocated to infrastructure for a given action to be used for works located on the comprehensive network.

## No comprehensive infrastructure gap analysis

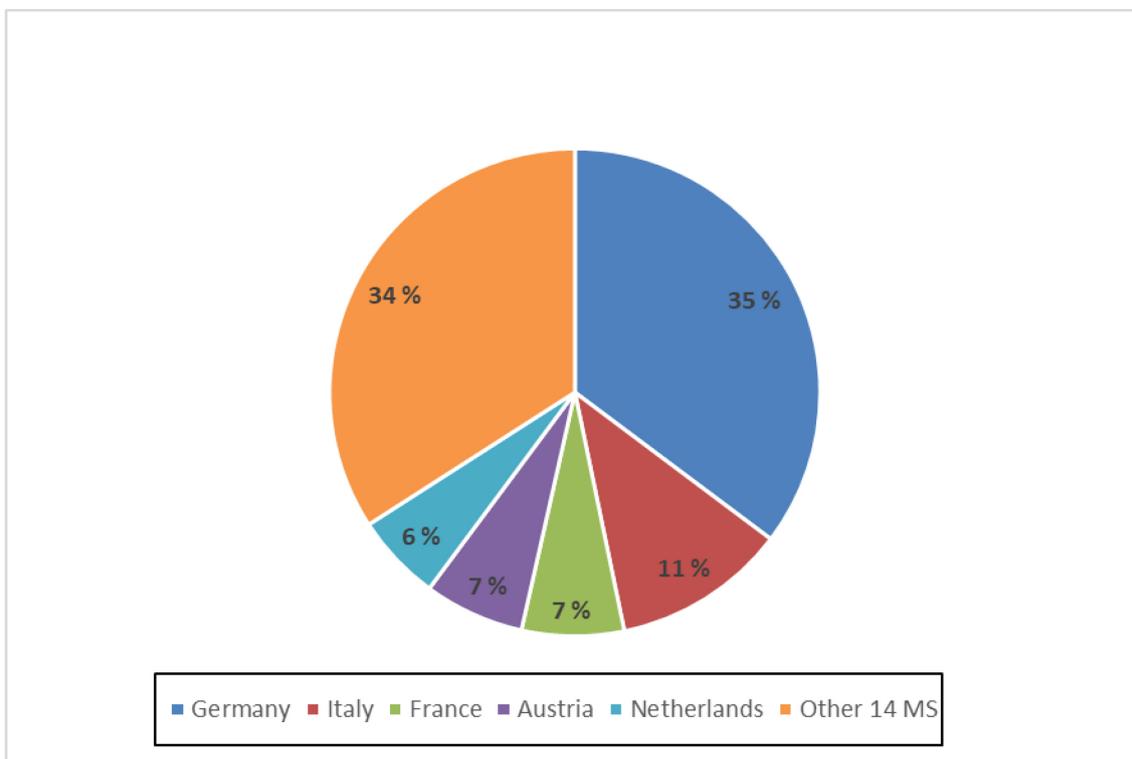
**47** Throughout the 2014-2019 period, the setting of funding priorities and the selection of projects for funding did not benefit from a comprehensive infrastructure gap analysis to identify how many charging stations would be needed, where they should be located and what power they should supply. The single most important eligibility criterion has been location on the TEN-T core network, which comprises close to 50 000 km of roads in all Member States, plus the urban agglomerations located on that network.

**48** Focusing CEF funding on the core network is in line with the AFID requirement to deploy charging infrastructure at least on the TEN-T core network by 2025. However, in the absence of other criteria, this broad scope cannot prevent overlaps between competing charging stations, nor does it ensure EU-wide electro-mobility (in particular the coverage of less populated areas with low rates of EV use).

**49** The lack of a comprehensive gap analysis also weakens INEA's project selection procedure, since it means the agency is unable to assess the need for infrastructure proposed by applicants in terms of the number, type and location of stations.

**50** In the absence of a comprehensive gap analysis, it is difficult to take an EU level view of needs. Beneficiaries have their own deployment strategies, which naturally tend to prioritise areas where demand is higher and the business case is most favourable i.e. areas where the risk of market failure is lower. *Figure 6* shows that, based on our sample of 11 projects, CEF funding was concentrated in a relatively small number of electro-mobility markets such as Germany, Italy, France and Austria (see also our comments on fragmentation in paragraph *34*). This could increase the risk of funding overlapping charging stations while neglecting more barren sections of the network.

**Figure 6 – Geographical distribution of CEF funding per Member State, as measured by charging stations already deployed by the sampled projects**



Source: ECA, based on number and locations of deployed stations within the 11 sampled projects as of July 2020, together with the CEF funding allocated to the action.

**51** It was not until it analysed the Member States' NPFs in 2017 and 2019 that the Commission was able to obtain an initial idea of regions with comparatively little charging infrastructure (see also paragraph 27). However, such initial analysis has not been used, as yet, to redirect EU funding towards those regions. We found in particular that the Commission's evaluation of applications for funding does not include a check that the proposed infrastructure is aligned with the corresponding national policy framework, or the work plans of the TEN-T core network corridor coordinators.

### Project selection

**52** Eight of the 11 projects in our sample (worth €47 million in CEF funding) were submitted by the applicants as studies, and accepted as such by the Commission, although they included the actual deployment of infrastructure as the largest single component of the total project costs (between 34 % and 72 %). In some cases the studies included the deployment of more than 200 charging points. Being classified as studies, these projects were eligible to receive a higher co-funding rate (50 %) and were exempted from the need to submit a cost-benefit analysis (the usual requirement for commercial, revenue-generating infrastructure).

**53** We found that the criteria to determine whether the activities constituted a study or works in the text of the calls and in INEA's evaluation procedure to be unclear. For example, we noted that INEA did not limit the number of eligible stations that could be included in a study, or obtain adequate justification for the number proposed by applicants. In the absence of such criteria, the Commission is not in a position to prevent that such projects go beyond the definition of studies in Article 2(6) of the CEF regulation<sup>25</sup>.

**54** The legal framework applicable to CEF co-funded investments requires them to be accompanied by a cost-benefit analysis (CBA), which serves as a basis for the demonstration of their economic viability and for the modulation of the EU's financial assistance<sup>26</sup>. These requirements are reflected in CEF calls for proposals.

**55** According to guidance provided by the Commission<sup>27</sup>, the CBAs for co-funded investments in the Innovation sector should project expected cash flows over a reference period between 15 and 25 years, discounted at a rate of 4 %. Although the guidance is not binding, departures from it should be duly justified and substantiated. Additional guidance recommending a 15-year reference period for charging stations was included in the frequently asked questions to the 2017 CEF Transport Blending Call. Since 2016, INEA has commissioned independent expert assessments of CBAs.

**56** In two of the three projects in our sample that were classified as works, we noted departures from the guidance without proper justification. In both cases, the projections covered a shorter period than recommended (10 years instead of 15) and applied higher discount rates (10 %-12 % instead of 4 %). Both practices tend to underestimate the cash flows in the projects' later years, when revenues can be expected to be greatest in a growing EV market. They therefore inflate the estimated

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<sup>25</sup> Activities needed to prepare project implementation, such as preparatory, mapping, feasibility, evaluation, testing and validation studies, including in the form of software, and any other technical support measure, including prior action to define and develop a project and decide on its financing, such as reconnaissance of the sites concerned and preparation of the financial package.

<sup>26</sup> Article 7(2)(c) of the TEN-T regulation and article 10(6) of the CEF regulation.

<sup>27</sup> Since 2015, INEA has referred applicants to the Commission's 'Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020', issued in December 2014.

funding gap. Without adequate justifications for these departures from the guidance, the need for EU funding in the covering of that gap was not fully demonstrated.

### **The CEF is promoting deployment, but the projects we audited are not fully delivering on their objectives**

**57** The CEF has been co-funding the deployment of charging infrastructure since 2014. In total, the grant agreements signed by INEA between 2015 and 2020<sup>28</sup> provide for close to 19 000 charging points to be deployed in the EU and the UK. The grant agreements also include key qualitative requirements: beneficiaries must install the standard connectors prescribed by the AFID, ensure open access 24 hours per day and allow the possibility of subscription-free ad hoc charging. In this way, EU funding has effectively promoted interoperability and the implementation of the requirements of the directive.

**58** To test directly EU-funded charging infrastructure, we made two EV journeys to charging stations located in Germany, Italy and France (see [Box 2](#)).

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<sup>28</sup> Resulting from calls issued between 2014 and 2019.

## Box 2

### Auditors on the road: e-mobility tested

We drove around 2 500 km from Luxembourg in the course of two EV journeys to visit and test 10 co-funded charging stations operated by three beneficiaries of CEF funding in Germany, France and Italy. We were able to confirm that interoperability worked across the borders, with stations accessible to third party mobility service providers, as we were able to charge with our mobility service provider card from Luxembourg. All the stations we visited featured an ad hoc payment option. This could be initiated (at all stations) via an app or website and (at several stations) by means of a contactless credit/debit card terminal. On one occasion we were unable to charge our vehicle, owing to an issue of communication between the car and the charging station- even though both used the CCS standard.



Source: ECA.

During our trips, we had real-time access to information on the location and availability of stations through websites and apps (e.g. Google Maps, charging point operators, mobility service providers). The ad hoc charging price was clearly indicated either at the station terminals or in the apps. However, we found that prices were shown in different ways (€/kWh, €/minutes or €/charge) which does not facilitate comparability as required by the AFID.

### Securing locations

**59** CEF funding applications and grant agreements do not specify exactly where the prospective infrastructure is to be located. Beneficiaries normally only enter into an overall commitment that refers to a given number of charging stations in specific Member States.

**60** However, during the actual implementation of the project, securing eligible locations can be a major challenge for beneficiaries. In addition to having to meet the key eligibility requirement of stations located on the TEN-T core network, they may face lengthy and varied permit procedures, limited number of available concessions along motorways and increasing competition with other charging point operators. In some cases, this situation is compounded by unfavourable terms offered by landowners and electrical grid operators, forcing beneficiaries to search for alternative locations.

**61** Primarily as a consequence of these challenges, all of the 11 projects we audited had faced or were facing delays in their execution ranging from 5 to 24 months compared to their initial plans. Four projects had been completed at the time of the audit, but with delays of between 5 and 12 months. Two of these projects were closed without having fully delivered on their initially agreed outputs— only 243 out of 303 (80 %) contracted stations entered into operation. Again, difficulties in securing suitable eligible locations largely explain the shortfall.

**62** In the case of co-funded studies, such delays and other difficulties meant not only that the related infrastructure was not deployed on schedule, but also that not all the data needed to inform future deployment - which was the studies' ultimate objective - could be collected and analysed as planned. Two of the six beneficiaries in our sample were engaged on studies involving the pilot deployment of infrastructure in response to calls during 2014-2016, but before they had concluded and reported on those studies they were also granted CEF support for a larger-scale rollout under the 2017 call.

**63** The Commission does not consolidate or assess the outputs of studies in a systematic manner with a view to using them as input for future projects and policy initiatives. In addition, during the audit we were given no indication of how stakeholders, in particular national policy makers and other market entrants, made use of the rollout plans produced by co-funded studies.

#### **Equitable access and sustainability of co-funded projects**

**64** In contrast to the common provisions for the European Structural and Investment funds<sup>29</sup>, the CEF rules do not require beneficiaries to maintain the infrastructure in operation for a minimum period. Grant agreements do not refer to the length of time the infrastructure funded should continue to operate (its durability) and this aspect is

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<sup>29</sup> Article 71 of Regulation (EU) 1303/2013.

not monitored by the Commission. We have highlighted risks in relation to the durability of EU-funded infrastructure, including problems with maintaining project outputs and results, in a previous audit report<sup>30</sup>. A lack of durability and a lack of attention to this aspect of project management, can reduce the effectiveness of public interventions (see **Box 3**).

### Box 3

#### Discontinued co-funded infrastructure

The CORRI-DOOR project<sup>31</sup> (launched prior to the CEF and outside our audited sample) was co-funded at 50 % to the amount of €4.3 million under the TEN-T annual programme between April 2014 and December 2015. The overall objective of the project was to foster EV deployment in France along the main TEN-T axes, inter alia by deploying, testing, operating and monitoring a pilot of initially 200 interoperable and multi-standard 50 kW fast charging stations. It has been publicly reported that, following technical difficulties and two incidents that were deemed to be security hazards for users, 189 stations (out of the project's 217 in total) were put out of use in 2020 as a preventive measure<sup>32</sup>.

**65** Moreover, grant agreements do not sufficiently prescribe how another requirement of the AFID - that of non-discriminatory access to all users - is to be applied. Article 2 (7) of the AFID defines a charging point accessible to the public as a point which provides EU-wide non-discriminatory access to users. Non-discriminatory access may include different terms of authentication, use and payment. The Commission does not evaluate applications on the basis of how exactly the beneficiary would ensure non-discriminatory access regarding pricing aspects nor does INEA monitor whether the requirement is upheld in practice once a co-funded station starts operating.

**66** Of particular concern are the commercial terms applied by beneficiaries to the different mobility service providers that intend to make the co-funded infrastructure available to their client base of EV drivers. We found that, in addition to common 'offer-to-all' terms offered through roaming platforms, some charging point operators also conclude direct bilateral contracts with selected mobility service providers on

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<sup>30</sup> Special report 08/2018 'EU support for productive investments in businesses - greater focus on durability needed'.

<sup>31</sup> TEN-T Action number 2013-EU-92055-S.

<sup>32</sup> <https://www.izivia.com/en/unavailability-on-corri-door>

favourable terms. This undermines the level playing field among mobility service providers and ultimately leads to unequal treatment of the end users of co-funded charging stations.

### Use of charging stations

**67** Grant agreements do not set any specific performance objectives for the co-funded infrastructure, and INEA does not systematically request, collect or analyse performance data once a charging station becomes operational.

**68** We asked the beneficiaries of the projects in our sample for data on the use of stations deployed until June 2020. The average monthly number and duration of charging sessions were as follows:

**Table 3 – Average monthly use**

Type	Number of sessions	Duration per session (minutes)
Ultra-fast stations	77	28
Fast stations	31	70
Normal stations	5	123

Source: Beneficiary data.

**69** These statistics are in line with the overall assessment made by the beneficiaries we contacted - current rates of use are below expectations. While we acknowledge that the EV market is still in an early stage and is bound to grow substantially in the next few years, we would note that the current low levels of use increase the sustainability risks associated with these investments and the EU budget allocated to them.

## Conclusions and recommendations

**70** We concluded that despite successes such as in promoting a common EU plug standard for charging electric vehicles, and improving access to different charging networks, obstacles to travel across the EU in electric vehicles remain. The availability of charging stations varies between countries, payment systems are not harmonised and there is not enough real-time information for users.

**71** There are no clear and consistent minimum infrastructure requirements to ensure EU-wide electric mobility. As a result, network coverage is patchy and features a number of inconsistencies. The Commission is charged with assisting Member States and ensuring coherence and consistency among the various national policy frameworks at EU level, but it only has a limited mandate and powers of enforcement. The Commission has itself concluded that national policy frameworks vary widely in their completeness, ambition and coherence (see paragraphs [20](#) to [28](#)).

**72** The Commission has succeeded in promoting common minimum EU plug standards (Type 2 and CCS/Combo 2) for charging EVs. These are being widely adopted throughout the EU, gradually giving EV users more harmonised access to different charging networks. However, travel across the EU is still complicated by the absence of harmonised payment systems and adequate user information (see paragraphs [35](#) to [41](#)).

### Recommendation 1 – Minimum charging infrastructure requirements across the TEN-T network

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To achieve the goal of EU-wide electro-mobility, when reviewing and revising the current legislation the Commission should propose minimum electrical charging infrastructure requirements to apply to the TEN-T network. These requirements should include a geographic dimension (e.g. average distance between charging points) and a better definition of public accessibility, types of charging station, payment methods and the provision of adequate user information.

**Timeframe: by the end of 2021 (when revising the AFID and TEN-T).**

**73** Despite the steady growth between 2014 and 2020, it will be a challenge to achieve the Green Deal target of 1 million charging points by 2025. The absence of an integrated strategic roadmap for electro-mobility in the EU means there is still

considerable uncertainty regarding precise infrastructure needs, which poses a risk to the successful and timely deployment of charging infrastructure.

**74** There are significant differences between Member States in the deployment of charging infrastructure. Some have already overachieved their targets, while others are lagging significantly behind. As of September 2020, eight Member States were still below 75 % of their targets for the end of that year. Fragmentation in electro-mobility persists across the EU, with significant differences in the density of charging infrastructure and the Member States' EV ownership rates (see paragraphs 29 to 34 and [Annex I](#))

## Recommendation 2 – Prepare a strategic EU electro-mobility roadmap

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The Commission should prepare a comprehensive and integrated EU strategic roadmap for electro-mobility to guide stakeholders and policymakers towards achieving the Green Deal objectives and charging infrastructure targets.

**Timeframe: by the end of 2021.**

**75** Although CEF funding priorities, budgets and rates have evolved over time (2014-2019), they have not been based on a comprehensive assessment of the infrastructure gap to identify how many charging stations were needed, where they should be located and what power they should supply. In the absence of such an analysis, the Commission has been unable to focus CEF funding on those areas with the lowest levels of charging infrastructure.

**76** Focusing CEF funding on the core network is in line with the AFID requirement to deploy charging infrastructure at least on the TEN-T core network by 2025. However, in the absence of other criteria, such a broad scope has not prevented the concentration of CEF funding in a limited number of Member States and does not ensure EU-wide electro-mobility, in particular the coverage of areas where the use of EVs is low.

**77** Studies co-funded during 2014-2016 could have supported the assessment of charging infrastructure needs. However, the Commission does not consolidate or assess the outputs of studies in a systematic manner with a view of using them as input for future projects and policy initiatives (see paragraph 63). As regards CBAs

accompanying applications for works, some of the assumptions used by beneficiaries were not sufficiently justified (see paragraphs 43 to 56).

### Recommendation 3 – Infrastructure and funding gap analysis

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With the support of the TEN-T core network corridor coordinators, the Commission should develop an infrastructure gap analysis to identify, in reference to the revised AFID and TEN-T requirements, where charging points are lacking on the TEN-T network, how many are needed and of what type. The Commission should complement this with a funding gap analysis to identify sections of the TEN-T network in which market forces alone cannot be expected to deliver the necessary infrastructure. The Commission should base its proposals for CEF budgets and priorities on these two analyses.

**Timeframe: by the end of 2021.**

### Recommendation 4 – Selection of projects

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When assessing and selecting applications for CEF funding, the Commission should:

- (a) compare the proposed infrastructure by the applicant with the overall infrastructure and funding gap analyses (see recommendation 3);
- (b) confirm the need for funding on the basis of a CBA for the project and obtain adequate justification for any departures from the Commission's CBA guidance;
- (c) if assessing applications concerning studies with the pilot deployment of infrastructure, set objective criteria for the number, type and location of charging stations that are acceptable for such studies.

**Timeframe: by the end of 2021.**

**78** Since 2014, CEF has been supporting the deployment of interoperable electric charging stations across the EU. However, all of the 11 projects in our sample were affected by implementation delays, ranging from 5 to 24 months. Two out of four completed projects delivered only partial outputs. The main factor contributing both to delays and to partial outputs was the difficulty in securing suitable locations.

**79** CEF grant agreements do not require a minimum period of operation after deployment and project closure and the Commission does not monitor the use and

performance of supported infrastructure. Grant agreements also do not define sufficiently the requirement for non-discriminatory access. In the absence of rules governing the relationship between charging point operators and mobility service providers, there is no assurance that co-funded charging stations will offer non-discriminatory access to all users.

**80** INEA does not systematically collect data on the use of co-funded stations. The statistics show that the current rates of use of these stations are generally low (see paragraphs 57 to 69).

### **Recommendation 5 – Sustainable and equitable access to co-funded infrastructure**

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The Commission should:

- (a) Ensure that grant agreements for the deployment of charging infrastructure include a sustainability clause requiring the co-funded infrastructure to remain in operation and available to users for a minimum period after deployment.
- (b) Ensure that grant agreements for the deployment of charging infrastructure include a requirement for charging point operators to ensure effective non-discriminatory access to all users. This could be achieved by, for example, requiring charging point operators to offer equitable commercial terms to all mobility service providers based on clear, objective and transparent criteria and for a minimum period of time.
- (c) Carry out ex post analysis on the use and performance of supported infrastructure on a sample/risk basis after deployment.

**Timeframe: for (a) and (b) by the end of 2021 and for (c) after the deployment.**

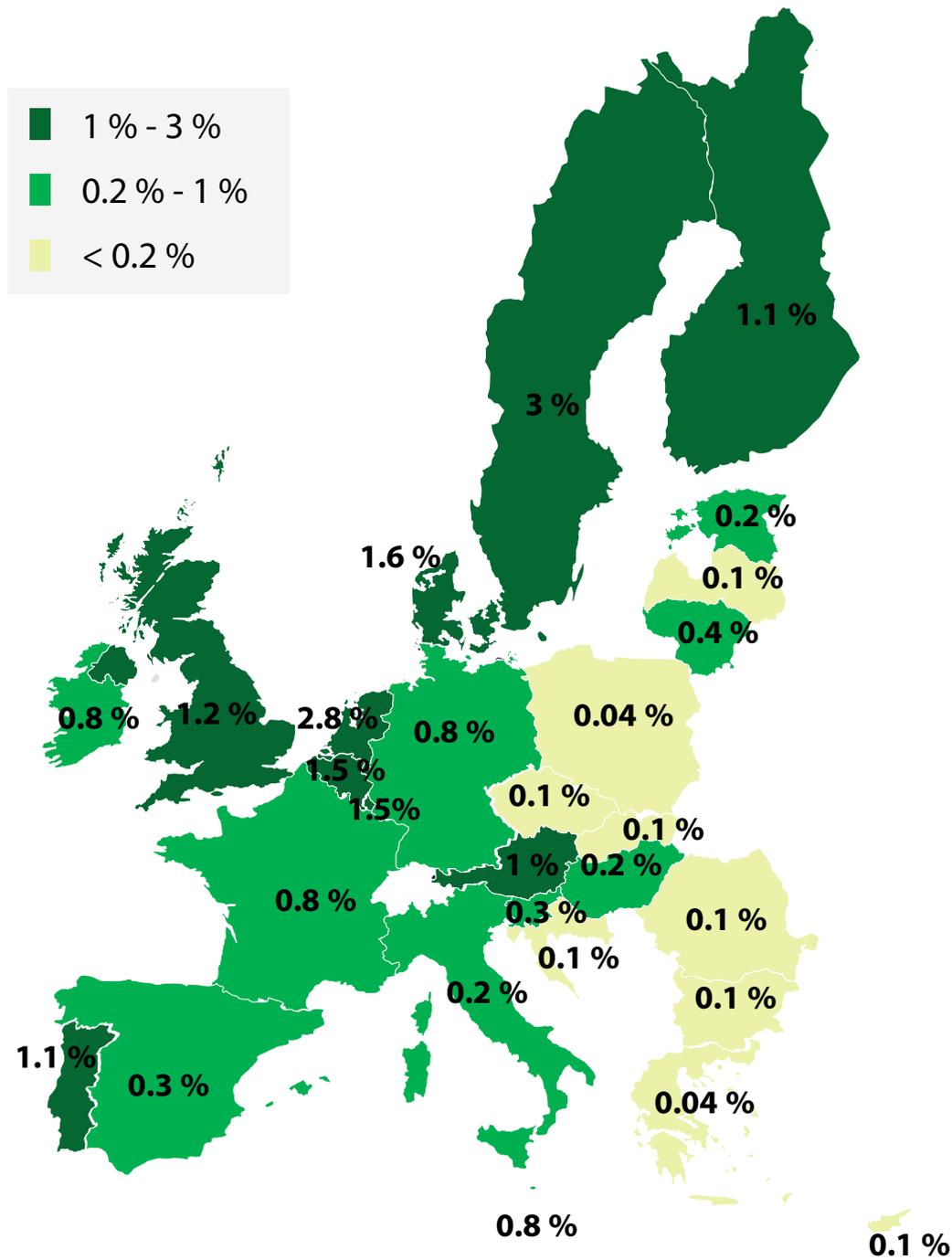
This Report was adopted by Chamber II, headed by Mrs Iliana Ivanova, Member of the Court of Auditors, in Luxembourg on 3 March 2021.

*For the Court of Auditors*

Klaus-Heiner Lehne  
*President*

## Annexes

### Annex I – Share of EVs in total passenger vehicle fleet, EU-27 and UK



Source: ECA based on EAFO data as of September 2020 for battery and plug-in hybrid electric vehicles.

## Annex II – EV charging standards

Charging standard	Notes
<b>Alternating current (AC)</b>	
Type 1	SAE J1772, mainly used in North America and Asia.
<b><u>Type 2 (EU standard)</u></b>	AFID Annex II requires that AC power charging points for electric vehicles to be equipped, for interoperability purposes, at least with socket outlets or vehicle connectors of Type 2 as described in standard EN 62196-2.
Type 3	Found in Italy and France, no longer installed since 2012.
<b>Direct current (DC)</b>	
Type 4 (CHAdeMO)	Used in Japan and Europe. For example, France has made it mandatory for all publicly accessible fast charging points to include a CHAdeMO connector by 31 December 2024. It is the standard on EV models such as: Citroën Berlingo Electric and C-Zero, Kia Soul, Mitsubishi Outlander PHEV and iMiEV, Nissan eNV-200 and Leaf and the Peugeot iOn.
<b><u>CCS (EU standard)</u></b>	AFID Annex II requires that DC high-power charging points to be equipped, for interoperability purposes, at least with connectors of the combined charging system CCS 'Combo 2' as described in standard EN 62196-3. It is the standard on EV models such as BMW i3 and iX3, Fiat 500e, Mercedes EQC, Jaguar I-Pace, Audi E-Tron, Volkswagen e-Golf and ID.3, Tesla Model 3, Porsche Taycan.

Source: ECA.

# Acronyms and abbreviations

**AFID:** Alternative Fuels Infrastructure Directive

**CBA:** Cost benefit analysis

**CCS:** Combined Charging System

**CEF:** Connecting Europe Facility

**DG MOVE:** Directorate-General for Mobility and Transport

**EAFO:** European Alternative Fuels Observatory

**EV:** Electric vehicle

**INEA:** Innovation and Networks Executive Agency

**NPF:** National Policy Framework

**TEN-T:** Trans-European Transport Networks

# Glossary

**Biofuel:** Fuel produced from dry organic matter or combustible plant oils.

**Biogas:** Naturally occurring gas generated by the breakdown of organic matter by anaerobic bacteria and used as a biofuel.

**Charging point operator:** A company responsible for installing and maintaining charging points for electric vehicles.

**Cohesion region:** A region where the gross national income per inhabitant is less than 90 % of the EU average, making it eligible for support from the Cohesion Fund.

**Connecting Europe Facility:** An instrument providing financial support for the creation of sustainable interconnected infrastructure in the energy, transport, and information and communication technology sectors.

**European Alternative Fuels Observatory:** The EU's online portal providing information and news about alternative fuels and the location of charging stations.

**European Green Deal:** EU growth strategy adopted in 2019, aiming to make the EU climate-neutral by 2050.

**Greenhouse gas:** A gas in the atmosphere - such as carbon dioxide or methane - that absorbs and emits radiation, trapping heat and so warming the Earth's surface through what is known as the greenhouse effect.

**Innovation and Networks Executive Agency:** EU agency responsible for the technical and financial implementation of the TEN-T programme and parts of the Connecting Europe Facility, Horizon 2020 and Marco Polo 2007-2013.

**Mobility service provider:** An entity providing consumers with a range of mobility product or services, such as charge cards and payment or navigation software.

**Multiannual financial framework:** The EU's spending plan setting priorities (based on policy objectives) and ceilings, under six main headings, generally for seven years. It provides the structure within which annual EU budgets are set, limiting spending for each category of expenditure. The current MFF covers 2021-2027.

**Recovery and Resilience Facility:** The EU's financial support mechanism to mitigate the economic and social impact of the COVID-19 pandemic and stimulate recovery, while promoting green and digital transformation.

**Sustainable and Smart Mobility Strategy:** The EU's strategy, proposed in 2020, for achieving a 90 % cut in transport-related emissions by 2050 through a more competitive, safe, accessible and affordable transport system.

**Trans-European Transport Networks:** A set of road, rail, air and water infrastructure development projects implementing the trans-European transport network policy, including a high-speed rail network, a satellite navigation system and smart transport management systems.

# **REPLIES OF THE EUROPEAN COMMISSION TO THE EUROPEAN COURT OF AUDITORS SPECIAL REPORT: “INFRASTRUCTURE FOR CHARGING ELECTRIC VEHICLES: MORE CHARGING STATIONS BUT UNEVEN DEPLOYMENT MAKES TRAVEL ACROSS THE EU COMPLICATED”**

## EXECUTIVE SUMMARY

III. In the field of alternative fuels and vehicles, the European Standardisation Organisations are in charge of developing common standards. The Commission is taking those standards, when agreed, and transfers them into EU law by means of delegated acts under the Directive for Alternative Fuels Infrastructure Deployment (AFID).

V. The Commission under AFID directive is not entitled to coordinate the deployment of infrastructure in Member States. This is the sole responsibility of Member States.

VII. The Commission considers that there is a need for a certain flexibility for charge point operators and mobility service providers to ensure innovation for customer driven payment services. The Commission considers that setting a common minimum standard for ad-hoc payment by bank card would be necessary.

The Commission also points out that there is still no sufficient charging operators and mobility service providers across the EU offering dense networks under ‘roaming’ which cover significant geographical areas that satisfy user needs.

VIII. CEF funds to EV networks have been allocated from 2014 to 2016 essentially in the form of “pilot actions” with the aim to support front-runners in making the initial deployment on the network, particularly for fast-charging infrastructure, and testing the market in view of supporting the ramp up to mass market.

As from 2017, CEF actions targeted a large roll-out of infrastructure with a lower EU support rate.

Private companies decide to install a charging station in a given area in view of optimising the use of the stations. The EU funding enabled a quicker roll out of the EV infrastructure. In the absence of EU support, private companies would probably only have installed stations in the most “attractive” locations.

Similarly, the fact that the first runners suffered from some implementations delays justifies further the need for EU support.

The Commission is working on a strategic action plan for the rollout of alternative fuels infrastructure. It is also preparing legislative proposals for the review of AFID and TEN-T legislation. In its proposal for CEF2 regulation the Commission has proposed to target financial support for alternative fuels infrastructure under CEF2 towards gaps identified in the TEN-T network.

IX. The Commission accepts the recommendations and refers to its replies to recommendations 1 to 5.

## INTRODUCTION

02. The Commission notes that different alternative fuels qualify as lower-carbon fuels, but will not deliver the necessary reductions in emissions needed for the transition to a carbon-neutral economy. In line with the sustainable and smart mobility strategy, the main objective is to ensure the uptake of low- and zero-emission vehicles.

09. In the field of alternative fuels and vehicles, the European Standardisation Organisations are in charge of developing common standards. When agreed, the Commission translates those standards into EU law by means of delegated acts under the Directive for Alternative Fuels Infrastructure

Deployment. Moreover, the Commission proposes requirements for the deployment of charging infrastructure in Member States (following the Electricity Directive, availability of charging infrastructure is primarily a concern for private market actors) to be adopted by the co-legislators.

12. The Recovery and Resilience Facility financing depends on Member States plans that have to be discussed and approved by the Commission. The Commission cannot determine on its own the direction of financial support unilaterally but can promote its policy objectives setting, in agreement with co-legislators, targets, while relying on solid methodologies for climate tracking, alongside mechanisms for sustainability proofing and accounting for the do not significant harm principle.

13. The Commission notes that CO2 emission performance standards define an average value across the fleet of the manufacturer.

## OBSERVATIONS

21. The Commission notes that measures as suggested by the Court of Auditors are part of the measures being examined in the context of the ongoing Impact Assessment of AFID.

24. The Commission notes that the TEN-T regulation ascribes alternative fuels infrastructure the status of innovation that needs to be tested and demonstrated. This does not prescribe any specific coordination at the level of the Core network corridors.

The AFID directive and the TEN-T regulation did not pursue the objective to give a specific role in relation to alternative fuels to the European core network corridor coordinators.

27. The Commission notes that progress is indeed being made towards a better recharging infrastructure coverage along the TEN-T core network, at least in some Member States.

However, there are still large parts of the TEN-T network without any or without sufficient coverage that does not allow for seamless travel with an electric vehicle across the EU. In those parts of the EU, there is very little progress towards network coverage by 2025.

In addition, with the extended range of electric vehicles and batteries allowing for much higher charging power at the recharging stations, the demand for recharging services along TEN-T is changing. In order to allow for a similar travel experience as with an internal combustion engine (ICE) car, at least 150 kW chargers would need to be available along the TEN-T network, which would allow vehicles to be charged during a normal meal break.

29. The Commission points out that forecast of charging infrastructure requirements are subject to changes due to technical and market changes.

32. The Commission acknowledges the situation described by the Court, but adds that some Member States have revised their targets in the 2019 NPF implementation reports. Three Member States had already reached their 2020 recharging targets indicated in their NIRs. Nine Member States were still below 50% of the target. The Commission notes that based on the finalised assessment of the NIRs of 25 Member States (targets for 2020, 2025 and 2030 were revised in the NIRs in relation to those foreseen in the NPFs for a significant number of Member States). Twelve Member States have a ratio that is higher than one recharging point per ten vehicles.

39. The Commission considers that there is a need for a certain flexibility for charge point operators and mobility service providers to ensure innovation for customer driven payment services. The Commission considers that setting a common minimum standard for ad-hoc payment by bank card would be necessary.

The Commission also points out that there is still no sufficient charging operators and mobility service providers across the EU offering dense networks under 'roaming' which cover significant geographical areas that satisfy user needs.

#### 43. Common Commission reply to paragraphs 43 to 50

CEF funds to EV networks have been allocated from 2014 to 2016 essentially in the form of “pilot actions”, with the aim to support frontrunners in making the initial deployment on the network, particularly for fast-charging infrastructure, and testing the market in view of supporting the ramp up to mass market.

As from 2017, CEF actions targeted large roll-out of infrastructure with a lower EU support rate. Private companies decide to install a station in a given area in view of optimising the use of the stations. The EU funding enabled a quicker roll out of the EV infrastructure. In the absence of EU support, private companies would probably only have installed stations in the most “attractive” locations.

Similarly, the fact that the frontrunners suffered from some implementations delays justifies further the need for EU support.

All Grant Agreements contain provisions on non-discriminatory access, 24/7, ad hoc payment and interoperability. INEA monitors these projects by regular contacts, site visits and annual reporting.

The Commission is working on a strategic action plan for the rollout of alternative fuels infrastructure. It is also preparing legislative proposals for the revision of AFID and TEN-T legislation. In its proposal for CEF2 Regulation, the Commission has proposed to target financial support for alternative fuels infrastructure under CEF2 towards gaps identified in the TEN-T network.

52. The Commission highlights that as for any infrastructure projects it is useful to support the initial pilot study phases. These studies with pilot deployment allow to produce data for deployment of wider infrastructure later on.

53. The Commission decided that, in the absence of infrastructure, it was not relevant to limit the magnitude of pilot projects. The Commission considers that the definition of studies applied to this early phase of deployment independently from the number of stations included in a project, in particular in order to test cross-border interoperability with beneficiaries from several countries.

56. The Commission notes that the independent external CBA experts came to a different view and conclusion. In their assessment, the CBA experts who have analysed these proposals have noticed the departures from the guidance. However, they accepted the limited justification and concluded in their evaluation comments that the parameters chosen could still be considered acceptable and the funding gap calculation reliable.

59. The Commission recalls that CEF is supporting the TEN-T, and that the TEN-T provides a clear geographical scope.

65. The Commission considers that the provision on ad-hoc charging availability at each public accessible recharging point addresses the need for non-discriminatory access to all users; it should always be possible to charge without having to enter into a contract.

69. The Commission agrees on the fact that the overall usage of the infrastructure is not very high for the time being. The Commission considers that this relative low usage in the initial phase suggests that EU funding was really needed to speed up the deployment of this infrastructure and thereby encourage the overall uptake of electric vehicles in Europe.

#### CONCLUSIONS AND RECOMMENDATIONS

71. The Commission notes that AFID provides for a specific mandate to address Member States on their national policy frameworks and call for greater ambition and coherence. The Commission will shortly adopt its report on the assessment of national implementation reports under AFID, which will also include recommendations to Member States.

72. As noted in previous comments, the Commission is looking at establishing minimum requirements particularly for ad-hoc payment.

**Recommendation 1 – Minimum charging infrastructure requirements across the TEN-T network**

The Commission accepts the recommendation.

73. The Commission notes that any roadmap at EU level will find it difficult to make indications about precise infrastructure needs, as local implementation conditions vary considerably among Member States and Regions.

The preparation of a roadmap should also address other relevant fuels. Electric recharging infrastructure should be embedded in a broader approach. The Commission is working on a Strategic Action Plan for the rollout of alternative fuels infrastructure for summer 2021.

74. The Commission notes that targets in Member States vary considerably in terms of ambition. There are also Member States that lag behind in spite of the fact that their initially set target was not ambitious.

**Recommendation 2 – Prepare a strategic EU electro-mobility roadmap**

The Commission accepts the recommendation.

75. See common Commission reply to paragraphs 43-50

76. The Commission notes that the CEF funded projects have progressively spread to a growing number of Member States.

77. See common Commission reply to paragraphs 43-50.

**Recommendation 3 – Infrastructure and funding gap analysis**

The Commission accepts the recommendation.

**Recommendation 4 – Selection of projects**

The Commission accepts the recommendation.

**Recommendation 5 – Sustainable and equitable access to co-funded infrastructure**

a) The Commission accepts the recommendation.

b) The Commission accepts the recommendation.

c) The Commission accepts the recommendation and will do that as soon as there is a sufficient sample.

## Audit team

The ECA's special reports set out the results of its audits of EU policies and programmes, or of management-related topics from specific budgetary areas. The ECA selects and designs these audit tasks to be of maximum impact by considering the risks to performance or compliance, the level of income or spending involved, forthcoming developments and political and public interest.

This performance audit was carried out by Audit Chamber II Investment for cohesion, growth and inclusion spending areas, headed by ECA Member Iliana Ivanova. The audit was led by ECA Member Ladislav Balko, supported by Branislav Urbanič, Head of Private Office and Zuzana Franková, Private Office Attaché; Helder Faria Viegas, Principal Manager; Svetoslav Hristov, Head of Task; Afonso Malheiro, Rafal Gorajski, Francisco Carretero Llorente, Maria Pia Brizzi and Nils Westphal, Auditors. Thomas Everett provided linguistic support.



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# Timeline

Event	Date
Adoption of Audit Planning Memorandum (APM) / Start of audit	25.3.2020
Official sending of draft report to Commission (or other auditee)	21.1.2021
Adoption of the final report after the adversarial procedure	3.3.2021
Commission's (or other auditee's) official replies received in all languages	19.3.2021

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The objective of our audit was to determine the effectiveness of the Commission's support for the deployment of an EU-wide publicly accessible infrastructure for charging electric vehicles.

We found that despite successes such as in promoting a common EU plug standard, and improving access to different charging networks, obstacles to travel across the EU in electric vehicles remain. The availability of charging stations varies between countries, payment systems are not harmonised with minimum requirements and there is inadequate information for users. In the absence of a comprehensive infrastructure gap analysis, the Commission has been unable to ensure that EU funding goes where it is most needed. The EU is still a long way off its Green Deal target of 1 million charging points by 2025, and it lacks an overall strategic roadmap for electro-mobility.

We made a number of recommendations to the European Commission to help improve the deployment of publicly accessible charging infrastructure across the EU.

ECA special report pursuant to Article 287(4), second subparagraph, TFEU.



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