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Towards the broadest use of alternative fuels - an Action Plan on
Alternative Fuels Infrastructure under Article 10(6) of Directive 2014/94/EU,
including the assessment of national policy frameworks under Article 10(2)
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**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Towards the broadest use of alternative fuels - an Action Plan on Alternative Fuels
Infrastructure under Article 10(6) of Directive 2014/94/EU, including the assessment of
national policy frameworks under Article 10(2) of Directive 2014/94/EU**

{SWD(2017) 365 final}

1. INTRODUCTION: MAKING EUROPE A WORLD LEADER ON DECARBONISATION

As called for by the President of the Commission in his 2017 State of the Union Address in September 2017 the European Union (EU) needs to become a **world leader on decarbonisation**. In order to meet the EU's commitments at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change held in Paris, the decarbonisation of the transport sector must be accelerated to ensure that greenhouse gas emissions and air pollutant emissions are firmly on the path towards zero-emission by mid-century.

With its Strategy for low emission mobility¹ the Commission has already set out how the EU can reach this goal. Following this strategy the Commission's Communication "*Europe on the Move: an agenda for a socially fair transition towards clean, competitive and connected mobility for all*" notes that the EU's ambition must be to make rapid progress towards a cleaner, more competitive and seamlessly connected mobility system by 2025².

This action plan forms part of a second package of proposals and initiatives, essential to decarbonising the transport sector. Presented in the Commission's Communication "*Delivering on low-emission mobility - A European Union that protects the planet, empowers its consumers, and defends its industry and workers*" - COM(2017) 675 final, the second mobility package includes a combination of supply- and demand-oriented measures to speed up the transition towards low and zero emission mobility and strengthen the competitiveness of the European mobility and transport sector³.

With around 95% of road vehicles still conventionally fuelled, including renewable biofuels blends, the number of vehicles, and vessels, running on alternative energies⁴ in the EU is too low. Persistent problems continue creating **market barriers** to their use. These include a lack of infrastructure for recharging and refuelling vehicles and vessels, insufficient smart grid development and difficulties for consumers to easily use the infrastructure. For the EU to successfully make the transition to low and zero emission mobility, an **integrated approach is needed**. It requires a common policy framework for vehicles, infrastructures, electricity grids, economic incentives and digital services working across EU, national, regional and local levels.

This action plan highlights actions to complement and better implement national policy frameworks (NPFs) under Directive 2014/94/EU on alternative fuels infrastructure to help create an **interoperable EU backbone infrastructure by 2025**, particularly for the trans-European transport network (TEN-T) Core Network corridors so that vehicles and vessels can be easily used across borders and for long distances. Swift agreement between all relevant public and private actors on a common approach to interoperability of services is critical to this.

¹ COM(2016) 501 final.

² COM (2017) 283 final.

³ COM(2017) 675 final.

⁴ Referring particularly to electricity, natural gas (compressed natural gas (CNG), liquefied natural gas (LNG), hydrogen and liquefied petroleum gas (LPG) that require specific infrastructure solutions.

Future deployment of infrastructure will require **significant public and private investment**. Blending of non-repayable grants with repayable debt finance needs to become a standard, where feasible. Different support instruments at EU level need to effectively work together. To this end the Commission will strengthen coordination of EU funding instruments and strive for synergies with action at national and local levels to increase the impact of EU funding. It will also address other issues critical for the deployment of alternative fuels infrastructure such as the integration of transport and energy systems.

2. WHERE DO WE STAND?

2.1. Current situation and needs estimates

Deployment of **infrastructure for alternative fuels has recently gained momentum**. Important progress has been made in past years, also thanks to EU funding. According to the European Alternative Fuels Observatory, 118.000 publically accessible recharging points for electric vehicles, 3458 refuelling points for compressed natural gas (CNG) or liquefied natural gas (LNG) vehicles and vessels and 82 refuelling points for hydrogen vehicles were available by the end of September 2017.

The EU must now **accelerate deployment in two areas**: first in the TEN-T core and comprehensive network. To this end, the Communication 'Europe on Move' of May 2017 has set a target for a **backbone infrastructure to be in place for the core network by 2025 the latest**.

Secondly, infrastructure needs to be ramped up in **urban and sub-urban areas**, where vehicles are being used for most of the time. The Commission expects that, investing into these two areas will produce also knock-on effects for the deployment of infrastructure in other areas.

Creating the backbone infrastructure in the TEN-T core network corridors appears least challenging. It is estimated that **EUR 1.5 billion will be needed by 2025 to equip the corridors**⁵. Gaps particularly concern recharging points for electric vehicles, but in some areas also refuelling points for heavy-duty vehicles using liquefied natural gas (LNG).

Addressing the broader transportation network requires greater efforts.

The level of ambition between different Member States varies significantly.

For example, only two Member State provide more than 100 recharging points for *electric vehicles* per 100.000 city inhabitants⁶.

As regards *natural gas*, the actions planned by Member States in their NPFs envisage adding 2599 to 2634 additional CNG refuelling points and 256 to 431 LNG refuelling points in 2025, though additional capacity planned under the NPFs will be concentrated in a few Member States only.

For *hydrogen*, following the Impact Assessment for the proposal for the CO₂ standards for cars and vans post-2020, the possible market share of hydrogen vehicles in 2025 is

⁵ Wainwright, S. and Peters, J. (2016) Clean Power for Transport Infrastructure Deployment. Final Report for the European Commission. Brussels.

⁶ These are Netherlands and Denmark, according to the European Alternative Fuels Observatory.

estimated to be between 0.3-0.4% of the total vehicle stock. The 820-842 refuelling stations planned under the NPFs are expected to accommodate the refuelling needs of 0.9-1.1 million vehicles in this scenario⁷.

Analysis of the NPFs under Directive 2014/94/EU results in the following **estimates of infrastructure investment needs by Member States**, including the TEN-T core network corridors⁸:

- *Electricity*: up to EUR 904 million by 2020⁹.
- *CNG*: up to EUR 357 million by 2020 and up to EUR 600 million by 2025 for CNG road vehicles¹⁰.
- *LNG*: up to EUR 257 million by 2025 for LNG road vehicles. For LNG for waterborne transport, up to EUR 945 million in the TEN-T Core Network Corridor seaports by 2025 and up to EUR 1 billion in the TEN-T Core Network Corridor inland ports by 2030.
- *Hydrogen*: up to EUR 707 million by 2025.

For **electricity** these national plans fall short of the Commission's estimates of infrastructure. For electric vehicles, the Impact Assessment for Directive 2014/94/EU considered a conservative benchmark of 4 million electric vehicles on the road by 2020. This represents a strong increase compared to today, but still corresponds to approximately 1.5 percent of today's vehicle stock only.

A more rapid increase of electric vehicles, leading to a share of 7 percent in 2025, as assumed by the Impact Assessment for the proposal for CO₂ emission performance standards for cars and vans post 2020¹¹, leads to even higher investment needs:

- By 2020, 440.000 public accessible recharging points would be needed - a significant increase compared to today.¹² This could require investment into publicly accessible recharging points of up to EUR 3.9 billion.
- By 2025, around five times more or some 2 million publicly-accessible recharging points would be needed. If the share of fast-charging infrastructure increases to 5-15% of the overall charging infrastructure, investments in the order of in between EUR 2.7 to 3.8 billion could be required per year, as of 2021.¹³ The majority of these investment needs would fall into in *urban areas*¹⁴.

⁷ Considering that each station serves around 1200 vehicles. In comparison, the 256 million vehicles on the roads in the EU are currently served by 115.700 conventional fuel stations.

⁸ SWD(2017) 365.

⁹ NPFs require targets for 2020 only.

¹⁰ Following the total cost for the 937 (2020 versus today) and 1575 (2025 vs today) new CNG refuelling points planned to be built according to the national policy frameworks.

¹¹ SWD (2017) 650.

¹² It is based on the assumption that 1.1 recharging points are needed for each vehicle. Moreover, 1 out of 10 recharging points will be publicly accessible. In addition to the publicly accessible recharging points, roughly 4 million private recharging points would be needed in such a scenario.

¹³ Cost estimates assume cost of EUR 5,000 for regular charging stations and EUR 30,000- for fast-charging stations, on average.

¹⁴ Assuming that 70% of infrastructure needs accrue in urban areas (alongside the fact that more than 70 percent of the EU population lives in urban areas) leads to an investment need of EUR 2.7 billion in 2020. After 2020 and up to 2025, annual investment in urban areas between EUR 1.9 billion and EUR 2.7 billion could be required.

For **national gas and hydrogen**, the actions planned by Member States in their NPFs and the Commission estimates are congruent.

Taken together, the **total estimated investment needs** for publicly-accessible alternative fuels infrastructure in the EU amount to about **EUR 5.2 billion by 2020** and additional **EUR 16 billion to EUR 22 billion by 2025**.

To address these significant needs, the public financial support should be used to trigger significant private investment, including through innovative financing.

It has to be noted that any estimate of investment needs is affected by **considerable uncertainties** regarding the density of future slow- and fast-charging infrastructure, vehicle demand and technology developments (e.g. battery power).

The Commission therefore welcomes that major European automakers have recently pledged to bring a greater number of battery-electric vehicles into the market by 2020¹⁵. It creates greater certainty for investments into infrastructure. The Commission calls upon the automotive sector to maintain and step up investment into other relevant low- and zero-emission technologies too.

In view of the considerable uncertainties, lowering the risks for private investors with targeted mitigation instruments such dedicated loans or guarantees underwritten by the public sector is crucially important. Furthermore, clear long-term policy orientation is needed. NPFs under Directive 2014/94/EU have a central role to play in this respect.

2.2. National policy frameworks for alternative fuels infrastructure

Directive 2014/94/EU requires Member States to set up national policy frameworks (NPFs) providing for minimum infrastructure coverage by 2020, 2025 and 2030, depending on the fuel, and to notify the NPFs to the Commission by 18 November 2016.¹⁶ Pursuant to Article 3(1) of the Directive the NPFs shall **set clear long-term targets and objectives as well as stipulate adequate support measures**, to provide long-term policy certainty for markets.

As required by Article 10(2) of the Directive, the Commission has assessed the NPFs and their coherence at Union level. It has evaluated if the NPFs enable the Member State in question to attain the targets and objectives it has set itself as required by Article 3(1). This Communication reports on this assessment in the parts below.

The **completeness, coherence and ambition of the NPFs vary greatly**.¹⁷ By 6 November 2017, only 8 out of 25 NPFs¹⁸ fully meet the NPF requirements¹⁹. 2 Member States have not submitted their NPF until today²⁰. The NPFs are not coherent from an EU perspective in terms of the priorities they set and how ambitious they are with regard to

¹⁵ SWD(2017) 366

¹⁶ In accordance with Article 3(7) of Directive 2014/94/EU and observing the conditions laid down in Articles 5, 6 and 7 of Directive 2014/94/EU.

¹⁷ More information on NPFs is available in SWD (2017) 365.

¹⁸ In relevant cases the Commission has started infringement procedures for non-compliance with Article 3 of Directive 2014/94/EU. It will continue such procedures for notification failures.

¹⁹ Austria, Belgium, Finland, France, Germany, Italy, the Netherlands, the United Kingdom.

²⁰ These are Malta and Romania.

different alternative fuels. Member States' ambition to change the current state of affairs varies a lot, both in terms of projected deployment of vehicles and vessels running on alternative energy and the related infrastructure. Most importantly, only a few NPFs set clear and sufficient targets and objectives and suggest support measures.²¹ 1 NPF contains no targets.

Electricity

All NPFs set targets for recharging infrastructure for electric vehicles. **However, the level of ambition and detail varies considerably among Member States.** In planning for far less than 200 000 publicly accessible recharging points by 2020, NPFs fall short of the Commission's need assessment presented in section 2.1. Not very ambitiously, 6 NPFs set targets that have already nearly been reached. Others set ambitious targets that will, however, be difficult to reach with the planned policy measures.

All NPFs set out a **broad range of support measures, but uncertainties remain.** Either the measures have not yet been adopted or they seem too limited to have tangible market impacts. All but 2 NPFs set targets for publicly accessible recharging points and 10 Member States do not consider any measures to increase the number of publicly accessible recharging points. Coverage of the TEN-T core network is progressing, but parts of it could remain without minimal recharging infrastructure if no additional action is taken.²² The roll-out of high-power recharging points at each recharging station along the TEN-T core network is a vital need. NPFs scarcely cover shore-side electricity and electricity supply for stationary airplanes.

The Polish NPF is a good example of an analysis of the needs of agglomerations, densely populated areas and the full TEN-T network relative to alternative fuels infrastructure needs — including market needs. In Germany, the main motorway service area provider will install high-power recharging points in all its service stations by the end of this year. In the UK, Highways England has undertaken to ensure that there are high-power recharging points at least every 32 km along 95 % of England's strategic road network.

Natural gas

A **majority of Member States do not set targets for CNG vehicles.** However, a few NPFs²³ do prioritise the roll-out. Most NPFs lack estimates for future vehicle uptake. The availability of infrastructure could be a problem in the future in Member States that currently have a high number of CNG refuelling points compared to CNG vehicles on the road but state that they have no plans to support a further increase in infrastructure.²⁴

There are LNG targets for heavy-duty road vehicles in 19 NPFs, but target-setting and planning of action is not always appropriate and will not result in the necessary coverage of the core TEN-T road network. Only 5 NPFs set estimates for future LNG heavy-duty vehicles deployment.

²¹ Moreover, several Member States maintain low taxes on conventional motor fuels, in particular diesel (gas oil), compared to the taxes on many alternative fuels, considering the higher external costs which weaken the incentive to switch towards alternative fuels.

²² For more details see the SWD (2017) 365.

²³ Belgium, the Czech Republic, Hungary, Italy.

²⁴ Austria, Germany, Luxembourg, the Netherlands.

A few NPFs²⁵ set ambitious **targets for future LNG infrastructure deployment in maritime and inland ports**. However, several of these do not address LNG refuelling point needs in maritime ports by 2025 and inland ports by 2030. A number of ports in the TEN-T core network risk being left without any solution for LNG refuelling. For none of the inland waterway TEN-T corridors LNG refuelling infrastructure sufficient to enable the EU wide circulation of LNG inland waterway vessels is planned.

The Italian NPF considers it critical to develop an LNG infrastructure for maritime applications. The plan to develop it, including designing storage quantities in all 14 TEN-T core network maritime ports and beyond, is an example of good policy planning. Several NPFs note the significant part the Connecting Europe Facility (CEF) and other EU funds have to play in supporting the deployment of LNG refuelling for heavy-duty vehicles and ships.

Hydrogen

Deployment of **refuelling infrastructure for hydrogen-powered fuel cell electric vehicles** is optional under Directive 2014/94/EU. 14 Member States address hydrogen infrastructure in their NPFs. In some cases, NPFs contain ambitious targets for the deployment of infrastructure.²⁶ Planning of this kind underlines the importance to deliver reliable forecasts for the market deployment of fuel-cell electric vehicles.

Support measures

Member States are required to put **support measures** in place to ensure that the targets and objectives contained in the NPFs are reached. NPFs contain a very diverse set of measures that inter alia vary in terms of maturity and priority setting (one or several alternative fuels). NPFs also target different modes of transport, for example, trains, buses, taxis, bikes and shared cars. Most NPFs focus on public transport, underlining the role that public procurement can play in supporting market uptake.

The French NPF lists a comprehensive set of electro-mobility support measures. The combined effect of measures like the CO₂ bonus-malus system for vehicles and the promotion of recharging infrastructure are expected to boost the market for electric road transport. The French 'Energy Transition to a Green Economy Act' sets clear targets and minimum procurement mandates for the public procurement of low- and zero-emission vehicles. The Dutch NPF provides a good practice example for stakeholder dialogue, directly involving relevant stakeholders in implementing the 'Green Deals' approach.

2.3. Are we on the right track?

The analysis of NPFs shows that infrastructure gaps will remain in the EU if no additional action is taken. This concerns in particular all types of electric light- and heavy-duty vehicles. Relative to the estimates presented in section 2.1. for the NPFs, commitment to roll out publically accessible recharging points in urban and suburban agglomerations in the EU needs to strongly increase. Gaps also remain on the TEN-T core network corridors for recharging points.

Another gap in planning concerns LNG refuelling points for heavy-duty vehicles. The NPF targets for the coverage of ports with LNG refuelling points are also not sufficient

²⁵ Finland, Hungary, Italy.

²⁶ Austria, Belgium, Bulgaria, the Czech Republic, Germany, Estonia, Spain, Finland, France, Hungary, Italy, the Netherlands, Sweden, the UK. The Danish NPF discusses hydrogen but does not set infrastructure targets. Germany, Italy and the UK have set themselves ambitious targets.

for enabling the circulation of inland waterway vessels and seagoing ships throughout the TEN-T core network as required under Directive 2014/94/EU. There are similar risks for hydrogen: optional under Directive 2014/94/EU and divergently addressed by Member States, there is still a patchwork of infrastructure. To allow vehicles to easily travel throughout the EU ('continuity of service') infrastructure must be spread wider.

Overall, the analysis of the situation shows that the NPFs combined do not add up to a conclusive picture that provides the long-term market certainty that is needed. In addition, there is a risk that many of NPF targets and objectives may not be reached, even where ambition is low. The Commission Staff Working Document (SWD) accompanying this Communication illustrates the limited impact of NPFs on key EU policy objectives if no additional action is taken.

While higher emission reductions are expected for some Member States with ambitious NPFs, marginal impacts on the displacement of fossil oil-based fuels are expected at EU level: 0.4 % of these fuels could be displaced by alternative fuels by 2020, compared to a scenario without NPFs,²⁷ and 1.4 % by 2030. CO₂ emissions from transport could be reduced by 0.4 % (or around 3.2 Mt) by 2020 and 1.4 % by 2030 (or around 11.5 Mt) compared to a scenario without NPFs. The reduction in NO_x emissions from transport as a result of NPFs is estimated to be around 0.37 % by 2020 and 1.5 % by 2030 compared to a scenario without NPFs. For PM_{2.5}, the NPFs would result in 0.44 % lower PM_{2.5} emissions by 2020 and 1.9 % by 2030.²⁸ These improvements could lead to up to a 5.8 % reduction in NO₂ concentrations and a 2.1 % reduction in PM_{2.5} concentrations in certain areas by 2030. The creation of jobs building, operating and maintaining the infrastructure is expected to slightly increase under current NPF planning.

To accelerate the transition to low and zero emission mobility, decisive action to speed up the roll out of infrastructure for alternative fuels in all Member States is needed now.

This requires a greater willingness of public and private actors to invest into an easily accessible infrastructure for different types of vehicles and vessels. The Commission stands ready to support these efforts, and therefore proposes this action plan.

3. ACHIEVING THE BROADEST USE OF ALTERNATIVE FUELS: ACTION PLAN

Actions proposed under this plan can have significant benefits for consumers, industries and public authorities, if coordinated well across all relevant levels. **Public authorities and the private sector must understand that they share responsibility.** Public investment in infrastructure needs to be accompanied by a **reliable offering of vehicles and vessels** to reduce uncertainty about future supply and demand.

3.1. Spurring completion and implementation of the NPFs

Member States that have not yet submitted their NPFs to the Commission should do so as soon as possible. Member States that have submitted their NPFs are encouraged to take

²⁷ The scenario without NPFs builds on the baseline scenario of the Impact Assessment accompanying the Proposal for a Directive amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures (SWD (2017) 180), thus on the EU 2016 reference scenario. However, it excludes Member State incentives for alternative fuels. ICCS-E3M Lab has developed it, using the PRIMES-TREMOVE model (the same model used for the EU 2016 reference scenario).

²⁸ For the most ambitious Member States (Austria and Ireland), NO₂ emission reductions can reach 7-10 % and PM_{2.5} emission reductions 8-12 % by 2030, compared to a scenario without an NPF.

into consideration the conclusions of the assessment and the findings of the evaluation set out in the accompanying Staff Working Document.

Those few NPFs that set ambitious targets and objectives, coupled with a comprehensive mix of policy support measures, provide an adequate response; others should follow suit, as these examples show the largest socio-economic and environmental benefits.

All Member States are encouraged to collaborate and make use of the Commission's **support for an effective implementation of the NPFs**:

- The Commission has set up the **Sustainable Transport Forum (STF)**²⁹ to bring together representatives of Member States, the transport sector and civil society. Work in the STF on the implementation of Directive 2014/94/EU seeks to ensure the effective implementation of NPFs. The Commission invites Member States to actively participate in this process. The outcome of its work will be reviewed at an **annual European conference on clean transport and alternative fuels infrastructure**, starting with a first one in late autumn 2018.
- The **European Sustainable Shipping Forum (ESSF)**,³⁰ the Commission expert group created in 2013, plays a role similar to the STF but for the maritime transport sector. It is a platform for structured dialogue, the sharing of technical knowledge as well as for cooperation and coordination amongst relevant authorities and maritime stakeholders to better address the sustainability challenges confronting the sector, including the use of LNG.
- Under the auspices of the European Maritime Safety Agency, the Commission will put together an **EU-wide non-binding LNG bunkering guidance document**. The latter should help harmonise the approach of authorities in Member States to ensure that LNG bunkering operations are safe.

Member States are also invited to consider the following:

- If support measures in NPFs are classified as being under consideration or under adoption, the Commission urges Member States to create clarity by swiftly adopting or removing the measures.
- Member States should actively involve all relevant stakeholders in adapting and implementing the NPFs, to ensure synchronised roll out of vehicle and infrastructure, integration of transport and energy systems and consumer buy-in.
- Cooperation between Member States should be intensified to guarantee cross-border continuity for all types of alternative fuelled vehicles and vessels.
- For long-term motorway service provision contracts, Member States are reminded to factor the need for alternative infrastructure provision into new service provision contracts. Together with service providers, they should look into conditions for installing and operating, wherever possible, infrastructure under existing contracts.

²⁹ https://ec.europa.eu/transport/themes/urban/cpt/stf_en.

³⁰ <http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2869>.

- To enable the full circulation of LNG-fuelled vessels and ships, Member States are urged to set or refine targets and objectives as well as to adopt financial and non-financial measures for the provision of LNG refuelling points in maritime and inland ports.
- Member States are encouraged to step up their efforts to ensure shore-side electricity and electricity supply for use by stationary airplanes, by removing market barriers to these alternative energy supply sources and supporting the deployment of the related infrastructure.

The Commission invites **manufacturers of vehicles and vessels** to share information on future vehicle and vessel development as well as market forecasts.

Key actions

- Member States that have not yet submitted their NPFs are urged do so as soon as possible.
- Where necessary, Member States should reinforce their NPFs. The Commission will support information exchange and mutual learning about implementing NPFs, starting with a STF expert group discussion in March 2018 and annual policy conferences, with a first edition in late autumn 2018
- The Commission will consider how to best reflect priorities of NPFs in the allocation of EU project funding and in European Semester reporting.
- Member States are invited to closely involve all relevant public and private stakeholders in a dialogue to discuss adaptations of NPFs, where appropriate.

3.2. Investment support

Making full use of the TEN-T network corridor approach

The TEN-T core and comprehensive networks are crucial for the implementation of EU transport policy objectives. **Effective use of the TEN-T approach should be made** to build up the backbone of EU-wide recharging and refuelling 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 in the planning and execution of projects.

In this context, this action plan underlines the relevance of the Member States providing **TEN-T core network corridors with a full backbone of alternative fuels infrastructure by 2025**. Related needs and requirements should be taken into account in location planning and related authorisation procedures. Equipping at least the urban nodes of the TEN-T core and comprehensive networks with enough publicly accessible recharging and refuelling points is expected to boost investor and consumer confidence. Recharging and refuelling infrastructure also need digital infrastructure for the development of open and interoperable services for the benefit of the consumer.

The Commission is therefore facilitating the work of key public and private stakeholders to develop **flagship actions on the TEN-T networks, including alternative fuels infrastructure**. These actions will seek to bundle projects and mobilise a wider range of actors. The Commission intends to announce these flagship actions in the context of the third TEN-T corridor work plans by spring 2018. Implementation will benefit from

collaboration between public authorities and other actors in the TEN-T corridor fora. Capacity building on the TEN-T network will be supported through appropriate mechanisms under the CEF.

Key issues need to be addressed:

- **Maximising synergies** between transport, energy and information and communication technologies in relation to both long-distance and urban mobility. It is essential to integrate the decarbonisation of transport and energy supply, smart grids and innovative energy storage solutions.
- **Fleet solutions should be promoted** in conjunction with alternative fuel infrastructure on TEN-T and its urban nodes.
- In urban nodes, **electrifying railway lines** could be promoted; where this not viable the opportunity to switch from Diesel to LNG or hydrogen could be assessed.
- Private market actors should go further in the action they take. This includes **commercialising LNG trucks** by means of fleet solutions with refuelling stations, for which the TEN-T could provide the test-bed for scaling up solutions.
- Given the **low market uptake of LNG vessels** in the EU, LNG operators could benefit from jointly procuring LNG vessels, with a possible extension to LNG refuelling points. Authorities could also consider setting up SO_x emission control areas following the International Maritime Organisation (IMO) process under Annex VI to MARPOL, as stated in Directive 2012/33/EU.³¹
- New engines for **inland waterway vessels** will have to respect new pollutant limits from 2019.³² It is crucial to adopt the use of LNG engines. Swiftly putting the necessary LNG infrastructure in place along the TEN-T core network corridors would help. Synergies with other modes of transport should be examined, for example LNG infrastructure in maritime ports or for heavy-duty vehicles.

Member States and regions are also encouraged **to reinforce their use of cohesion policy support** and, in particular, the European Territorial Cooperation ("Interreg") Programmes to ensure good coordination and coherence in the deployment of alternative fuels infrastructure – not only along the TEN-T, but also at regional and local level.

³¹ New provisions for sulphur caps due to enter into force on 1 January 2020 will also have an impact on the uptake of alternative fuels, LNG in particular. The Commission recommends that LNG bunkering infrastructure be provided in TEN-T core network ports before 2025.

³² Regulation (EU) 2016/1628.

Increasing the scale and impact of finance

Increasing the **scale and impact of financing** is a key priority. Support from the EU should leverage additional public and private finance to the extent possible. The assessment of financial needs and opportunities related to innovative financing will also feed into the preparation of the post-2020 multi-annual financial framework.

Support to alternative fuels is increasingly about deployment of solutions, not only about innovation. **Public money needs to be used efficiently.** In some cases, grants are still needed to accelerate the deployment of alternative fuels infrastructure, especially for cross-border and inter-urban projects and for less mature technologies. In most cases private finance should be blended with a public grant where the projects will be financed mainly by other funds, coming for example from public banks or the private sector, and where the grant covers a smaller part.

Investments need policy certainty. The proposal for the post-2020 CO₂ emission performance standards for cars and vans,³³ published alongside this action plan, tackles this key market barrier, together with other policy proposals such as the revision of the Clean Vehicles Directive.³⁴

As a rule, **projects supported by EU funds should fulfil the requirements of Directive 2014/94/EU and should reflect the priorities set out in the NPFs.** The Commission will use findings of the assessment of NPFs to inform funding decisions under the Connecting Europe Facility (CEF), the Cohesion Fund (CF) and the European Regional Development Fund (ERDF).

The Commission will launch a **roadshow in Member States** to review in a comprehensive way the ambition of the NPFs and the investment needs for low and zero emission mobility as well as assess the opportunities offered by different EU funding and financial instruments, including in the context of TEN-T flagship actions for alternative fuels infrastructure. It will involve all Commission services managing relevant funds, as well as the European Investment Bank (EIB) and national promotional banks, where appropriate.

The Commission will propose an action plan on sustainable finance, providing incentives to investors and improving the legal framework and enabling conditions, to attract more private investments into green and sustainable projects. The deployment of alternative fuels infrastructure should benefit from such plan.

Making better use of EU financing support

Considerable support for alternative fuels infrastructure is available under various funding instruments supported by EU budget.

The **Investment Plan for Europe** is increasingly driving investment in the transport sector and in innovation, including in low and zero-emission vehicles and related infrastructure.³⁵ **Horizon 2020** provides continued investment in research and development for clean transport, which includes alternative fuels infrastructure and

³³ COM(2017) 676 final.

³⁴ COM(2017) 653 final.

³⁵ https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan_en.

For examples see SWD(2017) 177 final.

advanced biofuels. Initiatives such as the European Green Vehicles Initiative or the Fuel Cells and Hydrogen Joint Undertaking are part of this support.

The approximate investment mobilised by CEF grant support into alternative fuels for road transport to date is more than EUR 600 million supporting almost 60 projects³⁶. The CEF has also provided almost EUR 150 million grant support for shore-side electricity supply and LNG terminals and innovative technology for greener vessels.

For the 2014-2020 period, **cohesion policy** support for investment in sustainable mobility and transport is envisaged in 209 operational and European territorial cooperation programmes, with a part programmed specifically for alternative fuels infrastructure. Around EUR 70 billion have been programmed in CF and ERDF support for transport, including EUR 35 billion for the TEN-T network and EUR 12 billion for low-carbon, multimodal, sustainable urban mobility. Several Member States and regions are already making good use of cohesion policy support to implement their NPFs and deploy alternative fuels infrastructure.

For example, EU co-funding from CF will help realise procurement of 177 battery-electric buses in Warsaw, Zielona Góra and Świnoujście in Poland or installation of up to 150 recharging stations in Latvia until 2020.

Blending grants and loans is a great opportunity to leverage public and private investment. The first **CEF blending call** launched in 2017 provided EUR 150 million for the deployment of alternative fuels infrastructures along TEN-T core network corridors. Given the positive response to the call, the Commission has decided **to top up its budget by an additional EUR 350 million** for proposals to be submitted by spring 2018, anticipating leverage of additional investment of at least EUR 1.75 billion.

This investment can be combined with additional support provided under the CEF Debt instrument, where **up to EUR 450 million** are being made available through the redeployment of the undisbursed revenues from the **New Entrant's Reserve (NER 300)** programme under the EU Emissions Trading System, to support innovative projects on renewable energy in the energy and transport sector.

As a result, an additional EU financial support of up to EUR 800 million from CEF and NER300 is being made available with this action plan for investments into alternative fuels infrastructure.

³⁶ See TENtec maps at <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html>.

The first projects backed by EFSI and the CEF concerned investments into cleaner public transport buses in Riga, Las Palmas, Palma de Mallorca and the Pas-de-Calais Department in northern France. As part of the Bulles project in Pas-de-Calais, the transport company in question will overhaul its bus fleet, shifting from conventional fuels to hybrid power. One line will be operated exclusively using hydrogen-powered electric buses.

The development of innovative financing mechanisms such as the Green Shipping Guarantee Programme (GSGP), supporting the European shipping industry in accelerating investments in sustainable technologies. It aims to provide guarantees for green shipping investments of up to EUR 3 billion. It can be used to support investments in enabling the use of LNG for example. The EIB implements the programme under specific arrangements with the Commission. To date, two framework agreements have been signed with commercial banks in France and the Netherlands.

Capacity building

The Commission will further **support capacity building** in public authorities, companies and financing institutions. It has broadened its **technical assistance** schemes such as JASPERS and ELENA³⁷ and experience so far demonstrates the relevance of this form of capacity building.

Better collaboration and coordination of projects is needed to **create a suitable project pipeline** in the TEN-T and beyond, with a particular focus on urban areas. The Commission encourages public authorities, private actors and promotional and private banks to make use of existing opportunities, particularly in the context of the TEN-T flagship actions. For this reason, the Commission will support **platforms for sharing knowledge** about alternative fuels infrastructures, tying into the work of the Sustainable Transport Forum (STF).

³⁷ JASPERS: <http://www.eib.org/products/advising/jaspers/index.htm?f=search&media=search>. ELENA: <http://www.eib.org/products/advising/elena/index.htm?f=search&media=search>.

Key actions

- Public and private stakeholders are invited to finalise flagship actions for alternative fuels infrastructure on the TEN-T network by early 2018.
- The Commission will organise roadshows in Member States starting in November 2017 to review in a comprehensive way the ambition of the NPFs and the investment needs for low and zero emission mobility as well as assess the opportunities offered by different EU funding and financial instruments.
- Together with industry, public authorities are invited to accelerate the roll-out of alternative fuels vehicles and infrastructure on the TEN-T network, including all urban nodes, aiming for coverage by 2025, with visible impact of action by 2020. This will be included in the next TEN-T work plans.
- Manufacturers, infrastructure operators and public authorities are encouraged to make use of opportunities for joined-up projects and innovative financing.
- The Commission will scale up its financial support by up to **EUR 800 million** by : (i) topping up the second CEF blending call by EUR 350 million for proposals submitted by spring 2018; (ii) enabling rapid deployment of unspent NER300 revenues through the InnovFin EDP and CEF debt facilities.

3.3. Enabling actions in urban areas

Many European cities and regions are **frontrunners in the transition to low and zero emission mobility**. A significant proportion of public procurement is undertaken by municipal and local authorities. But cities also face **unique challenges**. Space limitations mean that alternative fuels infrastructure needs to be aligned with the infrastructure needs of other modes of transport. It is not possible for all users to charge electric vehicles at home. It is therefore necessary to come up with solutions for residential and non-residential buildings or combine charging facilities with other infrastructure (e.g. lampposts). Also, the grid impacts of slow and fast-charging infrastructure have to be assessed.

Comprehensive analysis of needs and planning of policy, financial and informational levers at urban level is necessary. Many cities have implemented **sustainable urban mobility plans (SUMPs)**. The concept has proven its value in bringing together different public and private stakeholders in urban mobility planning. The Commission is committed to working with cities on adapting their SUMPs. It will also try to rethink the overall SUMP concept to reflect alternative fuels and infrastructure needs and discuss experiences with stakeholders in the next 2018 SUMP forum.

This action plan further identifies the following actions:

- Where feasible, local and regional public authorities should increasingly use the **possibilities of CF and ERDF co-funding for sustainable urban mobility**. Projects on alternative fuels and infrastructure offer significant benefits in terms of quick market absorption and immediate impact on local air quality.
- **Information on urban access regulation schemes** should be made **more transparent**. This includes digital solutions, such as apps, for citizens and businesses. The Commission will continue to closely monitor the situation.

- Charging infrastructure in cities should be made available for **all types of vehicles**, including solutions for fleets of shared vehicles, for electrical bikes and motorised two wheelers.
- Local and regional authorities under the **Covenant of Mayors for Climate and Energy** should strive to include in their Sustainable Energy and Climate Plans measures aiming at cutting GHG emissions from transport and deliver on the collective estimated reduction of CO2 emissions by 19% by 2020.
- The European Parliament and the Council are currently examining the Commission's proposal for a review of the Energy Performance of Buildings Directive. Ambitious requirements for **pre-cabling and charging points in non-residential and residential buildings** provided for in this text should encourage more widespread deployment than at present.
- The Commission will continue to facilitate the sharing of information in key fora such as the **Civitas Forum** and the **European Innovation Partnership for Smart Cities**,³⁸ to promote integrated approaches to clean transport and energy.
- The Commission is looking into opportunities to **promote fleet solutions** for alternative fuels in urban areas, including the financing of urban projects with a focus on alternative fuels under the innovation part of the CEF blending call.

Key actions

- The Commission will use the next annual SUMP forum to work with public authorities on adapting SUMPS by spring 2018.
- It will also look into and adapt, where feasible, funding for alternative fuels in urban nodes, including for fleet solutions, by the end of 2017.

3.4. Increasing consumer buy-in

The uptake of low-emission mobility depends a lot on consumer buy-in, which is facilitated by smooth access to the infrastructure and its affordability. Enabling consumers to **experience mobility in a seamless way**, as they are used to doing with conventionally fuelled vehicles, is therefore a key requirement.

This is why **greater collaboration between public and private actors** is needed. This concerns access to timely, reliable information about the location and availability of recharging or refuelling points. Seamless, interoperable payment services will have a major impact too. However, such services are far from being a reality across the EU, and sometimes even within single Member States. Progress on e-mobility services is particularly needed, for which an increasing number of recharging points is being rolled out.

In the end **all parts of the necessary infrastructure need to be digitally connected** (i.e. remotely and in real time for charging stations). This will not only make it possible to monitor the charging point itself. It will also make a variety of charging options using

³⁸ See <http://civitas.eu/> and <http://beta.eu-smartcities.eu/>.

smartphones possible, as well as (future) value-added services (e.g. reservation) that may create the business case for the investors and operators of the infrastructure.

A number of requirements for **accessing, sharing and re-using data** have already been agreed as part of the implementation of the Intelligent Transport Systems (ITS) Directive³⁹ and its subsequent delegated regulations, where existing information on the location and availability of recharging stations have to be provided through national access points. Member States, road authorities and service providers must now ensure that the relevant delegated regulations⁴⁰ under the ITS Directive are swiftly implemented. However, in many cases, **data is still not available** and would need to be collected and processed in Member States. Addressing these shortcomings should be a priority for Member States authorities.

But to create an open and competitive market — delivering the best possible outcomes for consumers — a **broader range of industry-supported standards, data formats and communications protocols** is needed. Public and private market actors have made progress on this in the Sustainable Transport Forum, resulting in a Memorandum of Understanding (MoU) that contains important recommendations for interoperable payment services.

These include the following:

- To ensure that e-mobility services are interoperable EU-wide there is a need to uniquely **identify e-mobility actors**.⁴¹ A registration process based on international standards should therefore be put in place at EU level. It will require Member States to designate an authority competent to register unique e-mobility identification codes. The Commission will consider what mechanism (e.g. the CEF) is appropriate for helping to set up of this process. It will provide support for the collection of missing information related to the implementation of the delegated regulations referred to above. It could also look into the need to support the development of different roaming solutions.
- Consumers need **seamless, interoperable e-mobility payment services that should be based on standards which are open** and free from intellectual property rights and royalties. The Commission will carefully follow developments in this area. It will launch a public consultation on this topic before the end of 2017. If fragmentation of payment services prevails, it will consider adopting a legislative approach to ensure that services are interoperable.
- **Predictability of cost** is a major factor. This means having access to transparent, easily understandable and timely price information. Roaming fees should be reasonable and limited. The Commission expects that besides working through a centralised hub to enable roaming, competing mechanisms (e.g. blockchain) will allow the market to develop the best possible outcome. The Commission will

³⁹ Directive 2010/40/EU.

⁴⁰ Commission Delegated Regulation (EU) 2015/962 of 18 December 2014 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide real-time traffic information services (Text with EEA relevance), OJ L 157, 23.6.2015.
Commission delegated Regulation (EU) .../... of 31.5.2017 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services.

⁴¹ E.g. charging points, charging points pools and accounts of e-mobility end-users.

closely monitor market developments, in particular access to price information and roaming fees, and review the state of play at the annual conference on clean transport and alternative fuels infrastructure to take place in late autumn 2018.

The Commission will continue to gather expert input and facilitate the sharing of

The Commission is also working with Member States on a **methodology to let consumers compare the prices** of conventional and alternative fuels in a common unit, allowing them to estimate the total cost of ownership of different types of vehicles. It will also support Member States in making this information via digital tools.

The recent evaluation of Directive 1999/94/EC⁴² on car labelling, that seeks to improve consumer information on fuel economy and CO2 emissions, highlighted the lack of specific requirements for alternatively-fuelled vehicles, an issue which needs further attention.

The Commission will also support Member States in the collection of data related to location and availability of alternative fuels stations.⁴³ This data will then have to be accessible in the national access points referred to under Directive 2010/40/EU.

Key actions

- Member States should designate authorities for the registration of unique e-mobility identification codes. The Commission will consider a related support mechanism.
- The Commission will launch a public consultation on seamless, interoperable services, focusing on e-mobility, still in 2017, and will closely monitor market developments related to pricing for charging electric vehicles.
- The Commission will adopt an implementing act on fuel price comparison in 2018 the implementation of which will be fostered further by supporting measures.

3.5. Integrating electric vehicles into the electricity system

A wide uptake of electric vehicles will increase electricity **demand on an electricity network** that is already constrained at certain times of the day in certain areas. To avoid unnecessary costs and delays in the uptake of electric vehicles due to costly, time-consuming investments in upgrading electricity infrastructure, (slow) charging of vehicles should mostly happen when networks are not constrained and sufficient electricity is being generated.

The increasing digitalisation of infrastructure already enables **smart management of the grid**, hence the management of charging points. This makes ‘smart charging’ possible: charging at the most convenient time for the electricity grid and at the lowest cost for consumers. In the future batteries in electric vehicles will also be used for electricity system operations (vehicle to grid), helping to balance the electricity grid in a cost-

⁴² Directive 1999/94/EC of the European Parliament and of the Council of 13 December 1999 relating to the availability of consumer information on fuel economy and CO2 emissions in respect of the marketing of new passenger cars.

⁴³ Building also on the work carried out under the European Alternative Fuels' Observatory.

efficient way. Revenues from these services to network operators could be used to refinance investment cost for the infrastructure, especially for workplace charging.

In its proposal for a directive on **common rules for the internal market in electricity** (recast),⁴⁴ which builds upon provisions of the **Energy Efficiency Directive**⁴⁵, the Commission proposes a coherent framework for demand response that enables smart charging, gives consumers incentives to charge at off-peak times and gives distribution system operators the ability to actively manage the grid. Swift agreement to the proposed recast directives and its correct transposition will therefore be a prerequisite for smart charging and ultimately for the large-scale uptake of electric vehicles.

Use of **energy storage technologies** and devices (e.g. second-life use of car batteries in building stock as well as renewably generated hydrogen) should be more strongly promoted as a key enabling condition for zero-emission mobility.

Price transparency is needed to ensure that unnecessary cost and price increases (electricity) due to the update of electric vehicles, including for lower income households, are avoided.

Key actions

- Member States should fully enable demand response by swiftly transposing the respective provisions of the Energy Efficiency Directive and the related electricity market design, thereby adopting a supportive legislative framework for demand response and smart charging.
- Member States should promote the deployment of charging points and the pre-cabing of parking spaces in residential and non-residential buildings.
- Member States should ensure that the technologies that enable smart charging such as smart meters are rolled out and that already adopted and upcoming smart charging standards for electric vehicles (e.g. ISO 15118 and IEC 63110) are being applied.
- Electro-mobility related needs will be taken into account in the context of Horizon 2020 programming as well as in the context of the Strategic Energy Technology Plan (SET-Plan) process and other stakeholder fora.
- The Sustainable Transport Forum will further develop necessary recommendations to facilitate an effective implementation of the integration between charging stations and the electricity grid and to ensure interoperability across the EU.

3.6. Emerging issues

The **use of sustainable bio-methane for blending with natural gas or its substitution** in natural gas vehicles should be increased to strengthen the sustainability of natural gas vehicles. Manufacturers and operators could agree on aspirational blending objectives to give market certainty.

⁴⁴ COM(2016) 864 final of 30.11.2016.

⁴⁵ COM 2012/27/EU

Besides promoting airport electricity supply for stationary airplanes as part of NPFs under Directive 2014/94/EU, there is a need to further develop the use of **alternative fuels in aviation**. A key focus should be on drop-in biofuels, where use and production capacity is still limited, and in the longer-term also on carbon-free propulsion technologies. Multilateral action in this field is also fundamental. Working in ICAO towards further alignment of International Civil Aviation Organization and EU rules and standards on the sustainability of fuels will help create better market conditions.

The Commission will encourage further efforts to boost the use of alternative fuels such as hydrogen or other renewable fuels combined with fuel cells to broaden the range of clean **rail propulsion technologies**. Synergies also exist between hydrogen and LNG in the waterborne sector, alongside advanced biofuels as drop-in solutions in this sector.

4. CONCLUSIONS

With the Paris Agreement on Climate Change in force, the **transition to a modern and low-carbon economy has to be accelerated**. The June 2017 European Council recognised the Paris Agreement as a ‘key element for the modernisation of European industry and economy’.

It is spurring increasingly **intense global competition** for market shares, technology and the brains that will come up with the low-carbon innovations of the future. This is no time for complacency.

This action plan outlines a number of actions to support an accelerated roll-out of alternative fuels infrastructure in the EU. They are part of a **mobility policy package to tackle vehicles, infrastructures, the electricity grid and user services together**. By 2025, the EU should have completed the backbone of recharging and refuelling infrastructure, providing full coverage of the TEN-T core network corridors.

Europe can no longer afford a patchwork of infrastructure solutions for alternative fuels, which risks leaving some regions and consumers behind. The assessment of NPFs under the Alternative Fuels Infrastructure Directive shows that there is a lot to learn from the positive experiences of some Member States. What is needed now to step up action in this area is **serious cross-border and cross-sector collaboration of all public and private stakeholders**. The lock-in of technologies and markets needs to be prevented. For markets to grow, alternative fuels infrastructures and their services need to be open, transparent and interoperable. Users also need to be able to use the whole transport network in a smooth and easy way.

The Commission stands ready to support this process through both means of non-legislative and legislative action as noted in this action plan. It will make Europe's transport sector stronger and more competitive, ensure no consumers or regions are left behind while leading the fight against climate change.