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EasTnT
Eastern Partnership for Trade and Transport

Project "Strengthening sustainable and digital trade routes and logistics concepts between the Eastern Partnership countries and with the EU" (EasTnT)

ANALYTICAL REPORT

COMPARATIVE ANALYSIS OF UKRAINIAN AND EUROPEAN UNION LEGISLATION ON ELECTRIC VEHICLE CHARGING INFRASTRUCTURE ALONG TEN-N MOTORWAYS

2025

CONTENTS

ABBREVIATIONS AND ACRONYMS

EU	European Union
Acquis	Rules, standards, policies and practices of the European Union
Ukraine Facility	Regulation (EU) 2024/792 of 29 February 2024, adopted by the European Parliament and the Council, establishing the Ukraine Facility
TEN-T	Trans-European Transport Network
DG MOVE	Directorate-General for Mobility and Transport
CINEA	European Climate, Infrastructure and Environment Executive Agency
Fit for 55	The EU's Fit for 55 package is a set of proposals to revise and update EU legislation and introduce new initiatives to ensure that EU policy is in line with climate objectives.
Eurovignette Directive	DIRECTIVE 1999/62/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 June 1999 on the charging of vehicles for the use of road infrastructure
Core Network	Core network TEN-T
Extended Core Network	Extended core network TEN-T
Comprehensive Network	Comprehensive Network TEN-T
ETC	European Transport Corridor (European Transport Corridor)
PCI	Projects of Common Interest
CEF	Connecting Europe Facility
AFIF	Alternative Fuels Infrastructure Facility
NPF	National Policy Framework
Blending	Blending Facility
Direct Management	Direct Management Mode
AFI	Alternative Fuels Infrastructure
AFIR	Alternative Fuels Infrastructure Regulation
ECS	ECS — Electric Charging Stations
EV	Electric Vehicle
BEV	Battery Electric Vehicle
PHEV	Plug-in hybrid electric vehicle
ZEV	Zero-emission vehicle
LDV	Light-duty vehicle
HDV	Heavy-duty vehicle
MCS	Megawatt Charging System
CCS	Combined Charging System
LNG	Liquefied Natural Gas
RES	Renewable Energy Sources
PV	Photovoltaic (solar) panels
H	Hydrogen
H_2 ICEs	Hydrogen internal combustion engines
MTOW	Maximum Take-Off Weight
ITS	Intelligent Transport Systems
ERS	Electric Road Systems
ERTMS	European Rail Traffic Management System
NAP	National Access Point
DATEX II	European Standard for Traffic and AFI Data Exchange
CEN/TS	European Committee for Standardisation / Technical Specification (CEN/Technical Specification)

Uptime	Uninterrupted operating time / infrastructure availability
RTTI	Real-Time Traffic Information
CPO	Charging Point Operator
MSP	Mobility Service Provider
TSO	Transmission System Operator
DSO	Distribution System Operator
HPC	High Power Charging
ZEVI	Zero Emission Vehicles Ireland, a special office in Ireland, which is an example of a central body responsible for public policy in the field of electromobility and the development of AFI.
ISO 15118-20	Plug-and-Charge and V2G Standard Plug-and-Charge / V2G Standard
SSPA	Safe and Secure Parking Areas
SSTPA	Safe and secure parking areas for lorries
Bronze/Silver/Gold/Platinum	Security Levels
ISO 17021	ISO/IEC 17021-1:2017 Certification Standard Conformity assessment. Requirements for bodies providing audit and certification of management systems. Certification Standard
Designated Authority	Single Permit Authority
One-Stop Shop	One-Stop Shop
Streamlining Directive	Directive (EU) 2021/1187 of the European Parliament and of the Council of 7 July 2021 on streamlining measures for advancing the realisation of the trans-European transport network (TEN-T)
Permit-Granting	Permit-Granting Procedure
SUMP	Sustainable Urban Mobility Plan
Urban Nodes	Urban Nodes
User Pays	User Pays Principle
Polluter Pays	Polluter Pays Principle
CO_2 Class	CO_2 emissions class
DNSH	DNSH — Do No Significant Harm Principle
CBA	Cost-Benefit Analysis
Distance-Based Charging	A distance-based road pricing system, i.e. charging based on the actual distance travelled rather than the time spent on the road.
EIA	Environmental Impact Assessment
IRI	International Roughness Index
RSIA	Road Safety Impact Assessment
RSA	Road Safety Audit
TRSI	Traffic Safety Related Inspection
eFTI	Electronic Freight Transport Information
V2G	Vehicle-to-Grid technology
LPR	License Plate Recognition technology using cameras, software and databases
Military Mobility	Military Mobility Package
NUTS	Nomenclature of Territorial Units for Statistics
GHG	Greenhouse Gases
IDRO	Identification Registration Organisation (IDRO)
NBB2	Ukraine's updated nationally determined contribution to the Paris Agreement
NECP	National Energy and Climate Plan
WIM	Weigh-in-Motion systems
M1, M2/M3, N1–N3	Vehicle category codes in accordance with the EU classification system established by Annex II to Regulation (EU) No 2018/858
TF3, TF4, TF5	Target groups (Task Force) of the Sustainable Transport Forum Working Group

STF	Sustainable Transport Forum
EAFO	European Alternative Fuels Observatory
Gap Analysis	Gap Analysis
EU	European Union
EC	European Commission
ISE	Electric vehicle charging infrastructure
EZS	Electric charging station
CMU	Cabinet of Ministers of Ukraine
NKREKP	National Commission for State Regulation in Energy and Utilities
NTS	National Transport Strategy (of Ukraine until 2030)
PG	Greenhouse gases
DBN	State Building Standards
GBN	Industry building standards
EIA	Environmental impact assessment
Regulation (EU) No 1315/2013	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 and repealing Decision No 661/2010/EU
Regulation (EU) 2024/1679	Regulation (EU) 2024/1679 of the European Parliament and of the Council of 13 June 2024 on Union guidelines for the development of the trans-European Transport Network, amending Regulation (EU) 2021/1153 and Regulation (EU) 913/2010 and repealing Regulation (EU) No 1315/2013
Regulation (EU) 2023/1804 (AFIR)	Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU
Regulation (EU) 2021/1153	Regulation (EU) 2021/1153 of the EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2021 on the establishment of the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014
Regulation (EU) 2022/1012	DELEGATED REGULATION (EU) (EU) 2022/1012 of 7 April 2022 supplementing Regulation (EC) No 561/2006 of the European Parliament and of the Council as regards standards governing the level of service and reliability of safe and secure parking areas and the procedures for their certification
Regulation (EC) No 561/2006	Regulation of the EUROPEAN PARLIAMENT AND OF THE COUNCIL (EC) No 561/2006 of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85
Regulation (EU) 2020/852	Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088
Regulation (EU) 2025/655	Commission Implementing Regulation (EU) 2025/655 of 2 April 2025 laying down rules for the application of Regulation (EU) 2023/1804 of the European Parliament and of the Council as regards specifications and procedures relating to the availability and accessibility of data on alternative fuel infrastructure
Regulation (EU) 2022/670	Commission Delegated Regulation (EU) 2022/670 of 2 February 2022 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide real-time traffic services (
Regulation (EU) 2019/631	Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission standards for new passenger cars

	and new light commercial vehicles and repealing Regulations (EC) No 443/2009 and (EC) No 510/2011
Regulation (EU) 2020/1056	REGULATION (EU) No 2020/1056 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 July 2020 on electronic information on freight transport operations
Regulation (EU) No 886/2013	Commission Delegated Regulation (EU) No 886/2013 of 15 May 2013 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to data and procedures for the free provision to users, where possible, of minimum universal traffic information related to road safety
Regulation (EU) 2017/352	REGULATION (EU) 2017/352 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 February 2017 establishing a framework for the provision of port services and on common rules for financial transparency of ports
Directive (EU) 2021/1187	DIRECTIVE (EU) 2021/1187 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2021 on the organisation of measures to support the implementation of the trans-European transport network (TEN-T)
Directive 1999/62/EC	DIRECTIVE 1999/62/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 June 1999 on the charging of vehicles for the use of road infrastructure
Directive 2014/94/EU	DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 October 2014 on the deployment of alternative fuels infrastructure
Directive (EU) 2022/362	Directive (EU) 2022/362 of the European Parliament and of the Council of 24 February 2022 amending Directives 1999/62/EC, 1999/37/EC and (EU) 2019/520 as regards the charging of vehicles for the use of certain infrastructures
Directive (EU) 2024/1275	Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings
Directive (EU) 2019/882	Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services
Directive 2010/40/EU	Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport
Directive 96/53/EC	COUNCIL DIRECTIVE 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic

CONTEXT AND SCOPE OF RESEARCH

Despite ongoing Russian aggression, Ukraine has demonstrated exceptional resilience, capacity for recovery and unwavering commitment to its European choice. The process of EU accession requires in-depth harmonisation of national legislation with the EU acquis, particularly in the areas of sustainable transport, energy, digitalisation and climate policy. The development of a modern, safe and climate-neutral transport infrastructure has been identified as one of the key areas of European integration and post-war reconstruction of the country.

The global transport system, and that of Europe in particular, is undergoing a profound transformation: it is becoming energy-efficient, green, safe and consumer-oriented. EU countries have already committed to gradually replacing internal combustion engine vehicles with electric or zero-carbon technologies – the vast majority of passenger cars are to be electrified by 2030. This is part of a broader climate strategy aimed at reducing greenhouse gas emissions, as transport is currently the second largest source of CO_2 emissions in the EU.

As part of the European Green Deal and the Fit for 55 legislative package, AFI — primarily electric and hydrogen — is seen as one of the key tools for achieving climate neutrality, enhancing energy security and technological autonomy in the EU. Its development not only reduces emissions but also shapes a new mobility economy based on the principles of sustainability, innovation and digitalisation.

The foundations of the pan-European TEN-T transport corridors were laid back in the 1990s as a political and infrastructural concept for the economic and transport integration of the continent. Since then, TEN-T has evolved into a multimodal, integrated and high-tech system covering railways, motorways, inland waterways, sea routes, airports, logistics terminals and urban nodes.

Today, TEN-T is a key strategic instrument of EU policy aimed at creating a standardised, high-quality transport network that ensures the seamless mobility of people and goods, efficient cross-border connections and the reduction of bottlenecks in logistics chains. Its current version, enshrined in Regulation (EU) 2024/1679, defines a three-level network architecture **(Core, Extended Core and Comprehensive)**, sets clear time horizons for modernisation **(2030 / 2040 / 2050)** and integrates requirements for alternative fuels, digital technologies, climate resilience and military mobility.

Historical background to Ukraine's integration into TEN-T

The Ukrainian road network is a key component of the country's transport system, performing a vital function in ensuring the connectivity of regions, international trade flows and the mobility of the population. Its integration into TEN-T determines the strategic direction of transport infrastructure development in line with European standards of safety, quality and environmental sustainability.

On 21 June 2016, in Rotterdam, the transport ministers of the EU countries, the Eastern Partnership countries and representatives of the European Commission decided to extend the TEN-T network to countries neighbouring the EU, including Ukraine. This was an important step towards the inclusion of our country in the European transport area.

On 24 November 2017, a high-level memorandum was signed between Ukraine and the EU on the extension of TEN-T indicative maps to the territory of Ukraine, which officially confirmed Ukraine's participation in the development of a common transport infrastructure.

In accordance with Delegated Regulation (EU) 2019/254 of the European Commission of 9 November 2018, Annex III to Regulation (EU) 1315/2013 (which established the guiding principles for the development of TEN-T) was amended to extend the network to the Eastern Partnership countries. As a result, two Ukrainian facilities were added to the list of TEN-T projects, symbolising the official recognition of Ukraine's role in the development of European transport architecture.

Updating and expanding cooperation

At the same time, the EC, in cooperation with the World Bank, developed an Indicative TEN-T Investment Action Plan for the Eastern Partnership, which identified priority projects, potential sources of funding and indicative investment volumes for infrastructure development on Europe's eastern flank.

In May 2022, Ukraine and the EC agreed on updated TEN-T maps that take into account the consequences of the war and new logistical realities.

On 22 December 2023, the European Commission and the Government of Ukraine signed an updated Memorandum of Understanding reflecting the updated TEN-T indicative maps (road and rail). The changes provide for:

- lowering the status of routes leading to borders with aggressor countries;
- the addition of new sections that provide critical links between regions and EU corridors;
- upgrading the status of key connections with Poland and Moldova.

New stage - Regulation (EU) 2024/1679

These updates are reflected in Regulation (EU) 2024/1679, which formally extended four European transport corridors to the territory of Ukraine. The document established new technical requirements for motorways that are part of the TEN-T and defined the obligations of Member States and partners to develop a high-quality, safe, environmentally sustainable and energy-integrated transport network.

For Ukraine, this means a transition to a new stage of integration, where road infrastructure is not considered in isolation, but as part of a single European energy transport

framework that combines roads, charging infrastructure, digital management systems and financing mechanisms, in particular through the Connecting Europe Facility (CEF).

Ukraine considers the development of transport infrastructure to be one of the priorities for European integration, economic growth and post-war recovery. Component I of the Ukraine Facility Programme provides for Reform 1 - *"Comprehensive planning for the development of the transport sector"*, which is directly focused on Ukraine's integration into the TEN-T network and alignment with European Union standards.

In accordance with Ukraine's Plan, approved by Order of the Cabinet of Ministers of Ukraine No. 244-r of 18 March 2024, implementing Regulation (EU) 2024/792, introduced on 29 February 2024, it was determined that the National Transport Strategy until 2030 needed to be updated by the fourth quarter of 2024.

In pursuance of this, the Cabinet of Ministers of Ukraine (Order of the Cabinet of Ministers of Ukraine No. 1550 of 27 December 2024) updated the National Transport Strategy of Ukraine until 2030, which became the basic document defining the integration of European approaches to the development of the transport industry and mechanisms for its implementation.

Regulation (EU) 2023/1804 (AFIR) as a catalyst for systemic change

The adoption of Regulation (EU) 2023/1804 (AFIR) in 2023 was a turning point for EU transport policy: the development of charging infrastructure from a voluntary initiative became a clearly regulated obligation of Member States. Whereas previously countries deployed infrastructure at their own pace, a single, standardised and interoperable network is now being formed along all TEN-T corridors, based on common requirements for accessibility, capacity, open data and tariff transparency.

This means a transition from piecemeal construction to systematic infrastructure planning, where the charging network is seen as a strategic component of sustainable development, digital integration and energy security in Europe.

Ukraine's climate commitments

In accordance with the Paris Agreement to the UN Framework Convention on Climate Change, ratified by the Law of Ukraine "On Ratification of the Paris Agreement", Ukraine has committed to making a nationally determined contribution (NDC) to achieve the goals of sustainable low-carbon development and increasing adaptive capacity to climate change.

In its updated Nationally Determined Contribution (NDC2, 2021), Ukraine has set a target of reducing greenhouse gas emissions by 35% by 2030 from 1990 levels.

According to the National Energy and Climate Plan (NECP), approved by the Cabinet of Ministers of Ukraine on 25 June 2024 No. 587-r, the national indicative target for renewable energy sources in gross final energy consumption in the transport sector should be 17.2% by 2030.

In addition, Ukraine's Energy Strategy for the period up to 2050 , approved by the Order of the Cabinet of Ministers of Ukraine No. 373 of 21 April 2023, defines Goal 3 *"Energy Efficiency"* as a strategic goal, the measures for achieving which include, in particular, the development of infrastructure and the installation of electric charging stations for electric vehicles. The NEPEC identifies the policy *of "Promoting the development of electric charging infrastructure"* as one of the three key policies in the context of electric transport development.

The implementation of this commitment is impossible without a profound decarbonisation of the transport sector, in particular through the transition to electric mobility and the development of modern charging infrastructure. In this context, the policy based on Regulation (EU) 2023/1804 (AFIR) takes on a dual significance – not only in terms of transport, but also in terms of climate, as it directly contributes to the implementation of the Paris Agreement, the European Green Deal and Ukraine's preparation for participation in the European Emissions Trading System (EU ETS-2).

Legal basis for European integration in the transport sector

The Association Agreement between Ukraine and the EU has set a course for gradual approximation to the EU acquis in the transport sector, including elements of the TEN-T policy. The document provides for:

- the gradual approximation of legislation,
- institutional convergence in the areas of planning, safety and supervision,
- the development of trans-European connections,
- dynamic updating of the list of EU acts for implementation by decisions of joint Ukraine-EU bodies.

This created the legal basis for preparing for integration into TEN-T even before the start of official accession negotiations.

Transition to the membership negotiation phase

Granting Ukraine the status of a candidate country for EU membership (European Council decision of 23 June 2022) moved the convergence process into a new phase — from associative approximation to negotiation implementation. After screening the acquis, in particular Chapter 21 *"Trans-European Networks"*, Ukraine is moving from adapting its legislation to the actual implementation of the rules in practice — in construction standards, engineering, technical regulation, digitalisation, open data and service interoperability.

Transition to the implementation phase of the acquis in the field of TEN-T and AFIR

In June 2025, Ukraine completed the screening of Chapter 21 of EU law, which covers TEN-T issues. This marked the transition to a new, practical stage of adapting the acquis communautaire — not only at the legislative level, but also in the areas of engineering design, technical regulation, standardisation and digitalisation of transport infrastructure.

The sections *on transport* and *trans-European transport networks* are among the most voluminous and complex to analyse, as they cover not only regulatory and legal parameters, but also the physical and technical parameters of infrastructure, traffic safety requirements, environmental sustainability, digital interoperability and technical standards. Together, these chapters include more than 3,000 EU legal acts, of which approximately 400 are subject to implementation into Ukrainian national legislation.

On 30 September 2025, the EC officially announced the completion of bilateral screening with Ukraine on all chapters of the negotiation process. This decision marks the formal completion of the acquis analytical comparison phase, although *the* main *"conformity assessments"* for each chapter have not yet been published. Thus, Ukraine is entering a phase of synchronising its legislation, institutions and technical practices with EU requirements.

At the same time, legal, institutional and procedural gaps remain, which may slow down Ukraine's integration into the single European transport area and limit investment in the development of road, energy and digital infrastructure. In particular, insufficient harmonisation of standards in the areas of traffic safety, energy efficiency, sustainability and alternative fuels complicates the certification of projects applying for funding through the Connecting Europe Facility (CEF) or other European instruments.

According to the European Commission's Ukraine 2025 Report for 2025, published on 5 November 2025 (Ukraine) , Ukraine needs to speed up its alignment with the updated EU TEN-T and TEN-E Regulations, focusing on modernising critical transport and energy infrastructure and improving connections with neighbouring EU Member States.

The EC recommends prioritising investments in these areas within the Single Project Pipeline.

It is separately emphasised that Ukraine should focus on implementing strategies for decarbonising road transport and deploying alternative fuel infrastructure.

The key task remains the implementation of EU legislation in the field of transport policy, in particular regarding road transport infrastructure, traffic safety, and market and social rules.

The need for a systematic comparative analysis

In view of the above, conducting a comprehensive comparative legal analysis is a key task for further integration. Such an analysis should combine the legal, technical, environmental, energy and financial dimensions of the EU acquis, in particular the provisions of Regulation (EU) 2024/1679 (TEN-T), Regulation (EU) 2023/1804 (AFIR), Regulation (EU) 2021/1153 (CEF) and related acts.

Its purpose is to identify national legislative and institutional gaps, assess the level of compliance with technical standards, and prepare recommendations for amendments to Ukrainian legislation to ensure its full participation in the implementation of EU policy in the field of sustainable transport infrastructure.

GENERAL PROVISIONS

The EU regulatory framework for the deployment of electric charging station (ECS) infrastructure along the TEN-T road network is structured as a coherent system of interlinked regulations that provide a comprehensive approach to the decarbonisation of the transport sector. It covers the entire life cycle of the infrastructure, from planning the spatial architecture of the network and technical standards to rules on financing, pricing, digital integration and demand stimulation. Together, these instruments implement the provisions of the European Green Deal and the Sustainable and Smart Mobility Strategy, forming a legislative roadmap for harmonising Ukraine's national legislation with the EU acquis in the transport sector.

Regulation (EU) 2024/1679 defines the geography, architecture and timelines for the development of the TEN-T network. The document establishes a three-level network structure — Core, Extended Core and Comprehensive — with mandatory deadlines for completion of modernisation: by 2030 for the Core, by 2040 for the Extended Core and by 2050 for the Comprehensive network. The regulation sets out the technical parameters of multimodal infrastructure, criteria for urban nodes, and requirements for the integration of alternative fuels.

Unlike **the** previous **Regulation (EU) 1315/2013**, the updated act introduces mandatory and measurable obligations for Member States to complete key infrastructure elements within set deadlines, particularly with regard to safety, sustainability, digitalisation and climate neutrality. It also integrates provisions on military mobility and dual-use infrastructure, and requires systematic consideration of climate proofing in project planning and financing. Thus, Regulation (EU) 2024/1679 not only forms the spatial and temporal "framework" for all subsequent EU regulatory acts, but also sets a new standard for infrastructure management based on the mandatory integration of transport, energy and digital components into a single European mobility system.

Regulation (EU) 2023/1804 (AFIR) establishes the implementation architecture and operational requirements for alternative fuel infrastructure in the EU. Unlike the previous Directive 2014/94/EU, this Regulation has direct effect and sets binding national targets for each EU Member State for the deployment of charging and refuelling stations along the TEN-T network, in urban nodes and key transport corridors. The document defines minimum power parameters, placement intervals, equipment compatibility standards, rules for user access to infrastructure, as well as requirements for digital integration, open data and tariff transparency.

The main **goal** of AFIR is to ensure interoperability and user convenience, including through the possibility of ad-hoc payments without contracts, unified identification systems, transparent prices, and common data exchange formats between operators. For light-duty vehicles (LDVs), minimum intervals between electric charging stations (ECS) have been set: *every 60 km on the Core TEN-T* and *100 km on the Comprehensive TEN-T*, with a total capacity of at least 3,600 kW per pool by 2030, with the capacity of a single point not being less than 150 kW.

For heavy-duty vehicles (HDVs), the Regulation provides for phased network coverage, taking into account traffic intensity, route type and demand forecasts. Separate requirements

are set for Safe and Secure Parking Areas (SSPA), where at least **two** charging points with a capacity of ≥*100 kW* must be installed by 2027 and **four** such points by 2030, in line with the provisions of Delegated Regulation (EU) 2022/1012.

In addition to technical indicators, AFIR also forms a digital infrastructure management ecosystem, providing for the creation of **National Access Points (NAPs)**, the mandatory provision of dynamic and static data on the status of charging points, as well as mechanisms for monitoring network performance. This Regulation, closely linked to the TEN-T Regulation (2024/1679) and CEF/AFIF mechanisms, defines not only infrastructure requirements but also a model for data, payment and technical standards management, ensuring a unified approach to energy, transport and digital integration within the EU.

3. Directive 1999/62/EC, as amended by Directive (EU) 2022/362 (Eurovignette) , establishes the principles of charging and economic incentives in the field of road infrastructure use. It regulates the methods for calculating tolls, guarantees non-discrimination and transparency in road pricing, and allows for differentiated tariffs based on the environmental characteristics of vehicles, creating additional incentives for the transition to low-carbon transport. The document provides for a gradual transition from time-based charges (vignettes) to distance-based payment modes on the main TEN-T network.

4. Delegated Regulation (EU) 2022/1012 establishes standards for *safe and secure parking areas (SSPAs)*. Among other things, it defines the levels of security, service and certification procedures for parking areas along the TEN-T, setting out requirements for lighting, video surveillance, sanitary infrastructure and information systems. As high-power EV charging stations for freight transport are integrated into such hubs, the SSPA requirements are key to harmonising national building codes and permitting procedures.

5. Regulation (EU) 2021/1153 (Connecting Europe Facility – CEF) is a financial instrument for the implementation of TEN-T. It provides grant and mixed financing for projects, giving priority to facilities on the main corridors. The Alternative Fuels Infrastructure Facility (AFIF) operates within the CEF, financing the deployment of charging and hydrogen infrastructure, as well as public-private partnership projects. For Ukraine, compliance with CEF requirements is a key condition for receiving EU co-financing.

6. Directive (EU) 2021/1187 (Streamlining Directive) aims to simplify permitting procedures for TEN-T projects. It obliges Member States to establish a single "authorised body" (One-Stop Shop) to coordinate all approvals, sets a deadline of 4 years for obtaining permits and requires transparent, digitised processes. This Directive applies to TEN-T core network projects and major infrastructure initiatives worth more than €300 million, ensuring a balance between environmental standards and speed of implementation.

The sequence of the above-mentioned EU acts forms an integrated legal architecture and a comprehensive implementation framework: Regulation (EU) 2024/1679 (TEN-T) - defines the spatial network; AFIR - sets technical requirements and operational parameters for AFI; **Directive 2022/362** establishes principles for charging and price incentives; **Delegated Regulation (EU) 2022/1012** defines standards for secure SSPA/SSTPA; CEF/AFIF - closes

financial gaps; CO_2 standards (Regulation 2019/631) shape predictable demand; **Directive (EU) 2021/1187 (Streamlining Directive)** accelerates coordination and permitting procedures.

The entire system of legal acts described above forms a single, coordinated regulatory ecosystem: from strategic planning to technical standards, from tariff policy and permitting procedures to financing and practical implementation of projects. This is not a set of separate documents, but an interconnected logic in which each regulatory act supports the other, ensuring a complete cycle of TEN-T and AFIR infrastructure development.

For Ukraine, harmonising national rules with this European logic is, above all, a practical key to moving forward.

Firstly, such harmonisation creates a predictable environment for investors: clear technical parameters, clear implementation deadlines, transparent licensing procedures and reduced regulatory risks all make infrastructure projects attractive to private and institutional capital.

Secondly, it aligns the Ukrainian market with the European one, ensuring technical and digital compatibility of services, transparency of tariffs and openness of data, thanks to which the national charging network is integrated into the common European space without barriers or duplication.

Thirdly, such compliance opens up real access to funding, in particular through the Connecting Europe Facility (CEF), the Alternative Fuels Infrastructure Facility (AFIF) and other international instruments that give priority to projects that meet TEN-T standards and AFIR requirements.

With this in mind, this study provides a comprehensive analysis of the European Union's regulatory framework for the development of the TEN-T road network infrastructure, with a focus on its structural, technical, functional and digital parameters. The study does not cover the rail, water and aviation segments, although it partially describes the mechanisms of interaction, and focuses exclusively on road transport infrastructure and related requirements of Regulation (EU) 2023/1804 (AFIR) on AFI, rest/parking areas, intelligent transport systems (ITS) and urban nodes, as well as on potential mechanisms for attracting investment.

The report examines each key EU act and related acts step by step, conducts a comparative analysis with current Ukrainian legislation, identifies gaps and develops practical recommendations for public authorities, businesses and international partners.

The aim of the report is to create the conditions for the systematic, large-scale and timely deployment of a network of electric charging stations along the TEN-T corridors in Ukraine, without unnecessary administrative or technical barriers, ensuring the real integration of our transport system into the EU.

Methodology and research methods

Methodological basis

The methodological basis of this study is the principles of comparative law, public policy analysis and a functional-systemic approach, which allows us to consider the infrastructure of alternative fuels not only as a technical phenomenon, but also as a legal and institutional one. The study was carried out in several interrelated stages — from analysing the European legislative field to comparing it with Ukrainian regulations and formulating specific recommendations for harmonisation.

The methodology was developed taking into account the objectives of the Association Agreement between Ukraine and the EU, the provisions of Regulations (EU) 2024/1679 (TEN-T), 2023/1804 (AFIR), as well as related acts (2021/1153, 2022/362, 2022/1012, 2021/1187), which define the interdependence between planning, financing and regulation of transport infrastructure.

Research methods

- **Comparative legal analysis** — comparison of EU and Ukrainian legislation to determine the level of compliance, gaps and areas for adaptation to the acquis communautaire.
- **Analysis of regulations and technical standards** — study of requirements for the location, technical characteristics, operation, digitalisation and safety of electric charging infrastructure, including DBN/GBN standards, EN standards and ISO specifications.
- **Gap analysis** — identification of missing or partially harmonised provisions of Ukrainian legislation in comparison with EU law; classification of gaps by degree of criticality (Not Aligned / Partially Aligned / Fully Aligned).
- **Stakeholder analysis** — identifying and mapping the roles of key actors: state institutions (Ministry of Development, Ministry of Energy, NEURC, State Agency for Energy Efficiency, Agency for Reconstruction), market operators (state and private), EES operators, international financial organisations and EU partners.
- **Policy coherence assessment** — assessment of the coherence between Ukraine's transport, energy, climate and digital policies in the context of fulfilling international commitments.

Research principles

- **Systematic approach** — consideration of legal, technical, digital, environmental and financial aspects as a whole, forming a comprehensive AFI development policy.
- **Relevance** — use of the latest versions of EU and Ukrainian regulations as of 2023–2025, including updates following the adoption of Regulations (EU) 2024/1679 and 2023/1804.
- **Scientific validity** — application of proven methods of comparative law, structural and functional analysis, and use of official EU sources.
- **Environmental orientation** — taking into account the EU's climate goals, the European Green Deal, as well as Ukraine's international commitments under the Paris Agreement and the second Nationally Determined Contribution (NDC-2).
- **Practical focus** — orientation of research results towards the preparation of regulatory proposals and policy recommendations suitable for direct use by state bodies and EU partners.

Expected results and target audience of the study

The results of this study are of practical and applied importance and will be useful to a wide range of stakeholders, including:

- Ukrainian public authorities — for the preparation of amendments to legislation and subordinate acts aimed at harmonisation with the acquis communautaire of the European Union, integration into the TEN-T network and ensuring compliance with the provisions of Regulations (EU) 2024/1679 and 2023/1804 (AFIR);

- the Ministry for Development of Communities and Territories of Ukraine (Ministry of Development), the Ministry of Energy, the State Agency for Infrastructure Restoration and Development, the NEURC, the State Agency for Energy Efficiency, and NPC Ukrenergo – for developing policies, regulatory approaches and technical standards in the field of transport, energy and digital infrastructure development;
- the European Commission, the Energy Community and international financial institutions (EIB, EBRD, World Bank) – to assess Ukraine's readiness to implement European standards, identify priority areas for funding and prepare projects compatible with CEF/AFIF requirements;
- operators, investors and organisations implementing international technical assistance programmes – to better understand the regulatory environment, infrastructure requirements and the potential of the electric charging station market on Ukrainian sections of the TEN-T network;
- the expert and scientific community – to conduct further research in the field of sustainable mobility, energy transition and digitalisation of Ukraine's transport system.

Practical significance and further use of the results

The research results provide an analytical and conceptual basis for the development of public policy in the field of alternative fuel infrastructure development and should serve as a foundation for:

- harmonising the national legal framework with the EU acquis in terms of road infrastructure, energy and digital standards;
- the formation of regulatory and technical prerequisites for the deployment of modern electric charging/hydrogen refuelling infrastructure on Ukrainian sections of the TEN-T;
- increasing the investment attractiveness of Ukraine's transport sector through the introduction of European principles of planning, operation, financing and digital management of infrastructure;
- the gradual integration of Ukraine into the single European transport area, which will open up access to EU funding, ensure mutual recognition of standards and allow participation in projects of common interest (Projects of Common Interest, PCI).

KEY CONCLUSIONS FOR MANAGEMENT

I. STRATEGIC CONTEXT AND CRITICAL WINDOW OF OPPORTUNITY

Despite ongoing Russian aggression, Ukraine demonstrates unwavering commitment to its European choice and integration into the EU's single transport area. The development of modern, safe and climate-neutral transport infrastructure has been identified as a key priority for both European integration and the country's post-war recovery, and **the infrastructure must be rebuilt in line with European standards** to avoid future reconstruction and ensure full compatibility with the EU transport area.

The main challenge is **the integration of the Ukrainian road network into the updated Trans-European Transport Network (TEN-T)**, which is officially extended to the territory of Ukraine in accordance with Regulation (EU) 2024/1679 and the High Level Memorandum between Ukraine and the EU on the extension of the TEN-T indicative maps to the territory of Ukraine.

The EU has built a comprehensive and interconnected system of regulatory acts that simultaneously defines the spatial logic of European transport corridor development, technical standards, digital infrastructure requirements, financing rules and project acceleration tools. This is not a set of separate documents, but a comprehensive regulatory ecosystem in which each element supports the other. It is this **interaction** that creates the basis for the modernisation of the EU transport system and the gradual transition to carbon-free mobility.

As a candidate country for EU membership and an associated country **of the Connecting Europe Facility (CEF)**, Ukraine has gained direct but conditional access to key EU investment instruments. Ukraine is also included in the financial architecture of the Ukraine Facility, which creates a unique window of opportunity for modernising the transport system in line with EU standards.

However, the effective use of this potential depends on Ukraine's ability to ensure full and timely compliance with European regulatory requirements. Without harmonisation with TEN-T, AFIR, SSPA and the Directive on accelerating permit granting procedures (2021/1187), even formal access to financial mechanisms will not translate into real investment and network modernisation.

The **Ukraine Facility** includes **a** special **Reform 1** — *"Comprehensive Transport Sector Development Planning*," which is directly aimed at integrating Ukraine into TEN-T, unifying technical requirements, ensuring digital compatibility, and bringing national infrastructure into line with European standards. These reforms are a necessary prerequisite not only for Ukraine's participation in the CEF, but also for obtaining funding for AFI projects, cross-border corridors, digital infrastructure and energy system sustainability.

Thus, access to the CEF and Ukraine Facility is not an automatic financial resource, but a strategic tool that can only be used if EU standards are fully implemented. Successful

implementation of the reform will enable Ukraine to attract funding for the construction of a modern, integrated and sustainable transport infrastructure that will become part of the single European transport area.

The main logic of EU implementation: the architecture of the EU Acquis

The EU regulatory framework for TEN-T and AFI is designed as a coherent system of interlinked regulations that provides a comprehensive approach to decarbonising the transport sector. This system covers the entire infrastructure life cycle: from spatial planning to financing and digital integration.

Table 1. Architecture of AFI and TEN-T integration (interdependence of regulations)

Component	EU Regulatory Act	Functional purpose (Implementation logic)
I. Spatial architecture (Framework)	**Regulation (EU) 2024/1679 (TEN-T)**	Defines the spatial network (Core/Extended Core/Comprehensive) and forms **the functional framework**. Establishes **AFI** and **SSPA** as mandatory "*Associated Equipment*" that is an integral part of the infrastructure, rather than a road service facility.
II. Technical and quantitative standards	**Regulation (EU) 2023/1804 (AFIR)**	Establishes mandatory, measurable **quantitative (distance-based)** and **operational** requirements (minimum power, placement intervals **every 60/100 km**, compatibility standards, Smart Charging) for AFI on the TEN-T network. Requires the existence of **a National Policy Framework (NPF)** for strategic planning and reporting.
III. HDV safety and integration	**Delegated Regulation (EU) 2022/1012 (SSPA)**	Establishes standards, classification (Bronze–Platinum) and certification procedures **for Safe and Secure Parking Areas**. **Critical requirement:** AFIR requires high-power charging infrastructure for heavy-duty vehicles (**HDV AFI**) to be located **only** at certified SSPA.
IV. Financial logic and incentives	**Directive 1999/62/EC (Eurovignette)**	Establishes the principles **of "user pays"** and **"polluter pays"**. Introduces **CO_2 differentiation** of tariffs and allows road charges to be used to finance the development of charging infrastructure (AFI).
V. Financial support	**Regulation (EU) 2021/1153 (CEF / AFIF)**	Provides grant and blended financing, giving priority to **Projects of Common Interest (PCI)** that fully comply with the technical and climate requirements of TEN-T/AFIR/SSPA.
VI. Procedural efficiency	**Directive (EU) 2021/1187 (Streamlining Directive)**	Establishes **procedural guarantees** for accelerated PCI implementation: **a** maximum **4-year period** for permitting procedures and the creation of **a Single Authorised Body (One-Stop Shop)**.

Thus, the entire system of EU regulations forms a single coordinated regulatory ecosystem, where each act supports the other, ensuring a complete cycle of infrastructure development.

II. REGULATION (EU) 2024/1679: TEN-T ARCHITECTURE AND ITS IMPLEMENTATION LOGIC FOR UKRAINE

Regulation (EU) 2024/1679 forms the basis of the EU's current transport policy, establishing a comprehensive model for the development of TEN-T. Its significance extends far beyond purely road-related issues: the document synchronises spatial planning, digital integration, safety standards, European Green Deal requirements and the new energy architecture associated with alternative fuel infrastructure (AFI). The integration of Ukraine's

national road network into the Trans-European Network (TEN-T) faces a fundamental legal gap. Current Ukrainian legislation (primarily the Law of Ukraine "On Motorways") uses an outdated administrative-territorial classification of roads that does not correspond to the new functional-strategic hierarchy of TEN-T, enshrined in Regulation (EU) 2024/1679. This makes it impossible to legally define the status of Ukrainian sections as TEN-T-compatible, blocks priority funding and violates mandatory EU technical, climate and digital requirements.

1. Strategic objective and change in the legal nature of TEN-T

The adoption of Regulation (EU) 2024/1679 marks a shift from framework recommendations to a binding system with clearly defined deadlines and responsibilities for participating countries. The document fulfils two key functions:

1) Spatial and infrastructural:
– identifies roads, nodes, ports, airports and multimodal hubs that form the backbone of the European logistics network;
– eliminates "bottlenecks" and "missing links" in the EU transport system.

2) Political and reformist:
– integrates infrastructure into the EU's environmental goals;
– makes compliance with requirements a prerequisite for access to CEF, AFIF and other instruments.

The regulation also codifies a new approach: any TEN-T project must comply with EU technical, digital and climate standards and be implemented within specified time frames.

2. TEN-T architecture: functional levels and time horizons

Regulation (EU) 2024/1679 clearly structures TEN-T into three levels for the first time, each with its own priority logic and specific commitments:

- **Core Network – by 2030 –** the core of TEN-T, ensuring the mobility of people and goods between key economic centres in the EU. Sets the highest technical requirements.
- **Extended Core Network,** which was not included in the previous version of the Regulation **– by 2040 –** connects critical cross-border routes and ensures the strategic resilience of the network.
- **Comprehensive Network – by 2050 –** forms complete territorial coverage, including regional transport corridors.

These timeframes are not recommendations but legal obligations. Their fulfilment is a prerequisite for the state's participation in Projects of Common Interest (PCI).

3. Mandatory technical standards for motorways

The Regulation significantly raises the bar for technical specifications for the Core and Extended Core Networks. The main requirements include:

1). Traffic safety standards

- **Dual carriageway with physical separation of traffic flows**: barrier or dividing strip.
- **Complete ban on at-grade intersections** with any type of traffic.
- **High level of road maintenance** (IRI < 2.84).

Ukraine currently does not meet these standards in many areas of the potential Core/Extended Core network.

2). The concept of "Associated Equipment" – a new vision for road transport infrastructure

The Regulation defines a TEN-T motorway as more than just a road surface and structures. It is a road transport infrastructure that includes:

- alternative fuel infrastructure (AFI);
- safe and secure parking areas (SSPA);
- Weigh-in-Motion (WIM) systems;
- intelligent transport systems (ITS);
- digital infrastructure and data exchange requirements.

These elements are legally binding and must be integrated during reconstruction and new construction.

4. Climate, digital and operational requirements

For the first time, the regulation makes procedures mandatory that were previously only characteristic of EU-funded projects:

- **Climate Proofing** – assessment of resilience to climate risks;
- **DNSH** – the principle of "do no significant harm";
- **Life-Cycle Approach** – consideration of costs throughout the entire life cycle;
- **digital integration and interoperability** – compatibility with European data and ITS standards.

Failure to comply with at least one of these elements blocks access to CEF and AFIF funding.

5. Ukraine's inclusion in TEN-T and key regulatory gaps

Although Ukraine is formally integrated into TEN-T, there is a systemic mismatch between EU requirements and the current national regulatory framework.

1). Classification inconsistency

The Ukrainian classification of roads **(international/national/regional/territorial)** does not correspond to the functional division of TEN-T (*Core/Extended Core/Comprehensive)*. This makes it impossible to legally determine the status of sections and hinders the planning of projects for submission to the CEF.

2). Technical gaps

The current relevant DBNs allow:

– single-level intersections and no physical separation of traffic flows (except for Category I roads);
– significantly lower requirements for SSPA and AFI parameters.

3). AFI and SSPA are not integrated as mandatory network components

In Ukraine, they are defined as "road service facilities" rather than **components** of **TEN-T road transport infrastructure ancillary equipment**.

4). Digital and climate divide

Not implemented:
– DNSH,
– Climate Proofing,
– Life-Cycle Costing,
– requirements for digital infrastructure and data exchange (ITS, eFTI, DATEX II).

5). Urban Nodes

Ukraine lacks clear legal mechanisms to ensure full compliance with European standards for Urban Nodes and the mandatory adoption of Sustainable Urban Mobility Plans (SUMP) by 31 December 2027. Although the NTS Operational Plan provides for the development of SUMPs, these initiatives are advisory rather than mandatory.

6. Systemic transformation in accordance with Regulation (EU) 2024/1679: key areas of reform

Regulation (EU) 2024/1679 forms the basic spatial, functional and institutional architecture of the Trans-European Transport Network (TEN-T) and is the regulatory core around which all other EU acts are built — from AFIR and SSPA to CEF and procedural directives. It determines what, in what configuration and under what technical and time standards ( ) should be built and modernised. Without harmonisation with its requirements, Ukraine will not be able to integrate into TEN-T, receive CEF/AFIF funding, or legally define its projects as complying with the EU acquis.

Therefore, the reform of the national regulatory framework must be carried out through the prism of Regulation (EU) 2024/1679. The key areas of such a transformation are as follows.

1). New TEN-T classification system: transition from administrative to functional logic

For full compatibility with the European planning system, it is necessary to move away from the current four-level administrative classification (international, national, regional, territorial roads) and transition to a three-level functional TEN-T model:

- **Core Network**
- **Extended Core Network**
- **Comprehensive Network**

This will require systemic changes to the Law of Ukraine "On Motorways", including a separate article on TEN-T logic, the establishment of European transport corridors (ETCs) and relevant definitions. This step will create a legal basis for prioritising investments and monitoring progress in line with the 2030/2040/2050 time horizons.

Legal basis: Regulation (EU) 2024/1679.

2). Legal recognition of AFI, SSPA and WIM as mandatory components of TEN-T infrastructure

Unlike Ukrainian practice, where charging stations, WIM systems, or rest areas are classified as auxiliary elements of road service, European legislation defines them as **functionally mandatory components of the road** (Associated Equipment).

To achieve harmonisation, it is necessary to:

- consolidate AFI, SSPA and WIM as part of the TEN-T road infrastructure in legislation,
- define them as mandatory technical and operational elements for Core/Extended Core sections,
- integrate them into all regulations concerning design, reconstruction and operation.

Legal basis: Articles 29(1)(h) and 30 of Regulation (EU) 2024/1679.

3). Legal mechanisms for Projects of Common Interest (PCI) and access to CEF/AFIF funding

In order for Ukrainian projects to be submitted to the CEF and recognised as PCIs, national legislation must include:

- A PCI authorisation and support mechanism has been created,
- mandatory implementation of Climate Proofing and the DNSH principle has been introduced,
- procedures for strategic project assessment have been defined, including transparent TEN-T compliance criteria.

This will allow Ukrainian projects to undergo technical and legal verification by the European Commission without additional barriers.

Legal basis: Articles 5, 46 of Regulation (EU) 2024/1679; Regulation (EU) 2021/1153.

4). Project life cycle and new infrastructure management logic

The EU is moving from a *"build"* approach to a *"plan throughout the life cycle*" approach. Ukraine needs to:

- legislate mechanisms for life-cycle costing
- integrate these requirements into financial and project procedures, including the Road Fund,
- ensure that any investment decisions comply with the requirements of sustainability, climate adaptation and DNSH.

Legal basis: Article 49 of Regulation (EU) 2024/1679.

5). Urban nodes as a structural element of TEN-T: new responsibilities for cities

For all Urban Nodes identified in Annex II to Regulation (EU) 2024/1679, Ukraine shall:

• make it mandatory to develop and approve Sustainable Urban Mobility Plans (SUMPs) by 31 December 2027,

• integrate AFI, multimodal hubs, parking solutions and public transport into these plans,

• identify sources of funding and institutional mechanisms for implementation.

This is critical because urban nodes are key points of the TEN-T and mandatory for compliance with AFIR requirements.

Legal basis: Article 40 of Regulation (EU) 2024/1679.

III. REGULATION (EU) 2023/1804 (AFIR): STRATEGIC LOGIC, TECHNICAL REQUIREMENTS AND CRITICAL GAPS FOR UKRAINE

Regulation (EU) 2023/1804 (AFIR) is one of the European Union's central instruments shaping the new architecture of energy and transport infrastructure. It establishes a fundamentally new approach: AFI is no longer a voluntary element of transport policy but becomes **legally binding** and integrated into the TEN-T structural framework.

AFIR not only transforms technical standards, but also defines the strategic logic for the deployment of charging and hydrogen infrastructure, governance mechanisms, digital interoperability and Member States' responsibilities for planning and monitoring. For Ukraine, this Regulation is one of the most critical pieces of legislation, as it determines the technical compliance of future infrastructure with the single European market.

1. Purpose and strategic importance of AFIR

Adopted as part of the **Fit for 55** package, AFIR has become a key regulatory document ensuring the transition from declarative policy to clearly defined, measurable and controllable commitments.

Its significance for the EU and Ukraine lies in three components:

1). Transport decarbonisation — transition to zero-emission technologies

AFIR establishes mandatory energy infrastructure for electric vehicles, heavy-duty transport and hydrogen solutions, making these technologies an integral part of TEN-T and urban hubs.

2). Structural integration with TEN-T

AFIR functions as an "energy layer" under Regulation (EU) 2024/1679. AFIR's technical requirements are linked to the spatial logic of TEN-T — Core, Extended Core, Comprehensive.

3). Transition from a directive to a regulatory model

Unlike Directive 2014/94/EU, AFIR has direct effect and does not require transposition. This eliminates variability and requires full technical compliance from Member States.

2. Key innovations and quantitative requirements of AFIR

1). Infrastructure for light-duty vehicles (LDV)

- **Core TEN-T**: charging stations every 60 km, **minimum** capacity of **3600 kW** per pool, with individual point capacity ≥150 kW.
- **Comprehensive TEN-T:** stations every **100 km**.

These requirements guarantee a uniform, predictable and similar fast charging network across all EU countries.

2). Heavy-duty vehicle (HDV) infrastructure

One of the most revolutionary provisions of AFIR is the linking of HDV infrastructure to certified SSPA (Regulation (EU) 2022/1012).

- **by 31 December 2027**: at least **2 points** of ≥100 kW at each SSPA along the TEN-T;
- **by 31 December 2030**: at least **4 points** of ≥100 kW.

For Ukraine, this means that without the introduction of SSPA, it will be impossible to meet the HDV requirements of AFIR.

3). Hydrogen infrastructure

AFIR focuses hydrogen stations primarily on heavy transport and provides for:
– Core TEN-T coverage with an interval of approximately 200 km,
– possibility of integration into logistics hubs and Urban Nodes.

4). Urban Nodes

AFIR elevates Urban Nodes to strategic elements of TEN-T:
– mandatory presence of AFI;
– infrastructure for passenger buses and logistics operators;
– at least one charging station in multimodal hubs by 2030.

3. Digital and operational requirements (interoperability)

AFIR creates a comprehensive digital ecosystem for AFI management, which requires data unification, transparency and interoperability.

Table 2. Key AFIR digital requirements and the status of their harmonisation in Ukraine

AFIR requirement	Essence of the requirement	Term	State of Harmonisation in Ukraine (Key Gap)
Data Transparency (NAP)	Mandatory creation of **National Access Points (NAPs)** for the collection and dissemination of static and dynamic data on AFIs (location, capacity, status, price).	NAP is mandatory by **31 December 2024**.	**Critical Gap:** Ukraine lacks a legally established mechanism for creating NAPs. Its absence hinders integration into the European digital ecosystem.
Data Exchange Format	Mandatory use of the European **DATEX II** standard (CEN/TS 16157) for the exchange of transport data and AFIR data.	Mandatory use of DATEX II for AFI from **14 April 2026**.	Not harmonised. There is no mechanism for integrating AFI data into the DATEX II format.
Smart Charging/V2G	Mandatory implementation of *smart charging* functions and support for	Mandatory for new public and private	**Critical Gap:** Ukrainian legislation does not establish mandatory

	the **ISO 15118-20** standard for bidirectional charging (**V2G**).	EV chargers from **1 January 2027**.	requirements for the implementation of *smart recharging* and V2G functions, which undermines the goals of energy system flexibility.
Ad Hoc Payment	Mandatory provision of **ad hoc payment** (without subscription/contract) via terminals or contactless payment devices.	Mandatory for public EV charging stations with a capacity of **≥ 50 kW** from **1 January 2027**.	Not harmonised. No obligation for compatibility with payment terminals.

At the same time, to ensure full compatibility (interoperability), transparency and functional unity of the European AFI area, the EU is adopting a package of Delegated and Implementing Regulations. These acts detail technical standards, data exchange procedures and operational requirements, translating the general regulatory objectives of AFIR into specific, practical mechanisms.

The EU's Delegated and Implementing Regulations form the technical "operating system" of AFIR — digital, standardised and mandatory. It is these documents that determine what AFI must be like in order to become part of the single European market for energy and transport services.

For Ukraine, their implementation is not a technical choice, but a strategic condition:
- access to CEF/AFIF funding;
- integration into the TEN-T digital infrastructure for transport;
- implementation of AFIR in terms of $\mathrm{LDV/HDV/H_2}$;
- ensuring convenience and safety for users;
- synchronisation with the planned revision of AFIR in 2026.

Without the adoption of a legislative framework for NAP, DATEX II, ISO 15118-20 and smart/V2G, Ukraine will not be able to ensure the full functioning of AFI and fulfil its international obligations within the framework of European integration.

4. Governance

• **National Policy Framework (NPF):** AFIR requires each Member State to develop and approve **a National Policy Framework (NPF)** that combines objectives, indicators and investment instruments. The draft NPF had to be submitted to the EC by 31 December 2024, and the final version must be approved by **31 December 2025**.

• **Monitoring and reporting:** Member States are required to submit national progress reports to the EC every two years, starting on **31 December 2027**.

• **Technical review:** Article 24 of the AFIR provides for a general review of the effectiveness of the Regulation by **31 December 2026**, with a focus on assessing the charging infrastructure needs for HDVs.

5. Conclusions: critical gaps for Ukraine

Although Law of Ukraine No. 2956-IX and DBN B.2.2-12:2019 laid the initial groundwork for the development of AFI, they remain only partially compatible with AFIR.

1). **Lack of strategic coordination:** The absence of **NPF-AFIR Ukraine** and an authorised body responsible for coordination and biennial reporting makes comprehensive strategic planning and regular reporting to the EC impossible.

2). **Potential blocking of HDV funding:** The absence of national standards and **SSPA** certification (in accordance with Regulation 2022/1012) effectively makes it impossible to achieve the HDV objectives of AFIR, as high-power charging for HDVs must be located **exclusively** on certified SSPA.

3). **Incompatibility of digital requirements:** The lack of legalisation and implementation **of NAP**, the **DATEX II** standard, and mandatory **Smart Charging/V2G** functions creates a systemic gap with the EU digital ecosystem, which is a key requirement for AFI interoperability.

4). **Classification inconsistency:** The current standards are not integrated into the three-level hierarchy of the TEN-T network (Core/Extended Core/Comprehensive), which does not allow reporting based on *distance-based targets* and prevents the formal recognition of Ukrainian road sections as complying with European targets.

5). **Urban Hubs:** There are no mandatory provisions for the installation of AFI in multimodal freight terminals, passenger hubs and bus terminals, which is necessary to achieve the AFIR targets in urban hubs by 2030.

6. Recommended systemic steps to address the fundamental regulatory gap and fully integrate AFIR

In order for Ukraine to move from partial compliance to full integration into the European AFI and TEN-T systems, a set of actions covering the strategic, regulatory, digital and procedural levels must be implemented. These form a unified reform architecture and are critical for accessing CEF/AFIF and meeting AFIR quantitative requirements in 2027–2030.

1). Formation of a strategic framework: National Policy Framework (NPF-AFIR Ukraine)

Ukraine needs a centralised strategic document that will define the development of alternative fuel infrastructure in all transport sectors. The national policy framework should be an instrument that:

- enshrines the mandatory AFIR targets (Articles 3, 4, 6, 8–12),
- describes coordination mechanisms between ministries, regional state administrations/municipal administrations, DSOs/TSOs and the private sector,
- defines national high-level and sectoral KPIs,
- establishes a timetable for removing administrative barriers,
- integrates AFI into the broader context of TEN-T, energy planning and spatial development.

The existence of an NPF is not only an AFIR recommendation — it is a prerequisite for EU funding.

2). Harmonisation of SSPA standards and integration of AFI for heavy goods vehicles (HDV AFI)

One of the most critical gaps is the absence of the SSPA category in national legislation — a mandatory element of TEN-T road infrastructure in accordance with Regulation (EU) 2022/1012. Eliminating this gap involves:

- the introduction of a new infrastructure class, "Safe and Secure Parking Area," into the DBN/GBN with clear requirements for services, safety, and protection levels (Bronze, Silver, Gold, Platinum)
- the development of a National Technical Standard for SSPA based on **Regulation (EU) 2022/1012** and **ISO 17021**,
- establishing a regulatory obligation: all high-power charging stations for **HDVs (≥100 kW)** located along the TEN-T may only operate on SSPA-certified stations,
- creation of an independent certification mechanism with regular and unannounced audits, as well as maintenance of a public register of certified areas.

These changes are key to achieving **HDV's AFIR targets for 2027–2030** and to making Ukrainian projects eligible for AFIF funding.

3). Digital transformation and integration into the EU ITS ecosystem

AFIR requires not only infrastructure, but also full integration into the EU digital space. This means that urgent digital reform is needed, including:

- the creation of a National Access Point (NAP) as a single state platform for the collection, standardisation and dissemination of static and dynamic AFI data,
- ensuring mandatory integration with DATEX II (CEN/TS 16157) — a standard that defines data exchange between EU Member States and the European Commission,
- amending Law No. 2956-IX and DBN regarding the mandatory use of Smart Charging and V2G support from 2027,
- harmonisation of terminology with AFIR (Article 2): types of charging points, operating modes, availability statuses, power classes.

Without the creation of a NAP and digital interoperability, Ukraine will not be able to ensure full data transparency — a key criterion of AFIR and a condition for access to CEF/AFIF.

4). Procedural modernisation and institutional coordination

The implementation of TEN-T and AFIR requires the state to radically reduce the duration of licensing procedures and streamline institutional interaction. To do this, it is necessary to:

- create a single coordination centre (Designated Authority) — a body that will perform the functions **of a "One-Stop Shop"** for all procedures related to TEN-T and AFI,

- legislatively establish a maximum duration for permitting procedures (up to 48 months) in accordance with Directive (EU) 2021/1187,
- give TEN-T/AFI projects priority administrative status in all regulatory cycles,

- regulate the use of road right-of-way for AFI and SSPA, including a digitalised approval procedure and a clear deadline for its implementation.

This reform will provide predictability for investors, shorten project implementation times and increase Ukraine's ability to participate in European infrastructure programmes.

IV. IMPLEMENTATION OF SSPA STANDARDS: DELEGATED REGULATION (EU) 2022/1012 AND THE CRITICAL REGULATORY GAP IN UKRAINE

The implementation of high-power charging infrastructure for heavy-duty vehicles (HDVs) within the framework of Regulation (EU) 2023/1804 (AFIR) is impossible without the creation of a comprehensive network of Safe and Secure Parking Areas (SSPA). In the EU, SSPA is not an "additional service" but **a mandatory element of the TEN-T transport infrastructure**, performing a strategic security, logistics and energy function. In Ukraine, there are no analogues to such requirements: current regulations treat rest areas as road service facilities with minimal requirements, without reference to transport safety, standardisation or energy infrastructure.

This gap creates one of the most critical barriers to Ukraine's integration into TEN-T and to the use of EU financial instruments (CEF/AFIF, Ukraine Facility), as AFIR directly links HDV charging to certified SSPA and sets specific time commitments.

1. Strategic importance of Regulation (EU) 2022/1012 for TEN-T and AFIR

Delegated Regulation (EU) 2022/1012 is part of the EU's social legislation package for road transport and sets standards for the safety, infrastructure equipment and procedural audit of SSPA. It has a direct logical link to:

- **Regulation (EU) 2024/1679 (TEN-T)** — as a mandatory component of road infrastructure (Article 29(1)(h));
- **Regulation (EU) 2023/1804 (AFIR)** — as an exclusively permitted location for high-power HDV charging pools;
- **Regulation (EC) No 561/2006** — as an element of driver safety.

In European Union practice, SSPA perform a dual function:

- Security — reducing the risk of theft, attacks and dangerous incidents;
- Infrastructure and energy — placement of powerful HDV charging infrastructure, logistics points and services.

For Ukraine, which is geographically becoming a key transit country for the EU, the issue of SSPA is becoming even more important — without them, no European logistics corridor can function.

2. EU standards: functionality, classification and requirements for SSPA

Regulation (EU) 2022/1012 establishes a unified, multi-level system of standards covering:

1). Minimum level of service (mandatory)
Includes:
- gender-sensitive toilets and showers with hot water;
- 24/7 access to food and beverages;
- availability of information about emergency services;
- lighting, accessibility, basic safety requirements.

2). Four levels of safety (Bronze, Silver, Gold, Platinum)
Each level defines standards for:
- physical barriers (fencing, controlled entry/exit);
- video surveillance (minimum and recommended parameters);
- personnel and security requirements;
- digital integration;
- cargo and vehicle security.

3). Certification and audit
SSPA certification must be carried out by:
- by an independent body accredited to **ISO 17021**;
- for a period of **three years**;
- include **an unannounced audit** for compliance with standards.

Important: without a certificate, SSPA is not considered SSPA and cannot be included in the official EU register.

3. Key interdependence between SSPA and AFIR (HDV charging)

AFIR establishes direct obligations for HDV charging along TEN-T:
- **by 31 December 2027 — at least 2 charging points (≥100 kW)** at each SSPA;
- **by 31 December 2030 — at least 4 charging points (≥100 kW)**;
- high-power charging pools for HDVs may **only** be installed **at certified SSPA**.

In other words, **SSPA is a legally binding element of AFIR**, not just a place to stop.
For Ukraine, this means that the absence of SSPA = automatic failure to meet AFIR HDV targets.

4. Gap Analysis: national legislation and complete divergence from EU requirements

1). Absence of the SSPA category

Neither the Law "On Motorways" nor GBN V.2.3-37641918-549:2018 contain the concept of SSPA.

2). Absence of safety level classification

There is no Bronze–Platinum system, no requirements for access control, video surveillance, perimeter security, or sanitary conditions.

3). Lack of certification and audit mechanisms

Ukraine does not have any ISO 17021-accredited bodies that could certify SSPA in accordance with EU requirements.

4). Technical non-compliance with standards

Ukrainian standards do not include:

- requirements for gender-sensitive sanitary conditions;
- requirements for round-the-clock availability of services;
- safety standards;
- requirements for digital integration.

5). Digital incompatibility (DATEX II)

For Gold/Platinum levels, parking management systems integrated with DATEX II are mandatory. There are no such requirements in Ukraine.

5. Critical conclusions

1. SSPA is Ukraine's largest cumulative legal gap in terms of AFIR/TEN-T.
2. Without SSPA, it is impossible to deploy HDV charging in accordance with AFIR.
3. The absence of a harmonised SSPA system blocks funding from CEF/AFIF and Ukraine Facility, as projects do not meet eligibility criteria.
4. All rest areas in Ukraine have "Not Aligned" status and cannot be included in the European register.
5. The restoration of EU-Ukraine logistics and the development of energy infrastructure for transit are impossible without SSPA harmonisation.

6. Recommendations: priority regulatory and institutional actions

Problem	Urgent actions	EU acquis
Absence of the concept of SSPA	Include the definition of SSPA in the Law "On Motorways" and GBN/DBN; develop a National Standard for SSPA	Reg. 2022/1012; Reg. 2024/1679
Absence of classification levels	Transpose the Bronze–Platinum system and safety standards	Reg. 2022/1012
Lack of certification	Create an institutional certification system in accordance with ISO 17021; ensure audits	Reg. 2022/1012; Reg. 561/2006

Impossibility of placing HDV charging	Legislatively link HDV charging (≥100 kW) only to certified SSPA	Reg. 2023/1804 (AFIR)
Digital incompatibility	Provide for mandatory integration of SSPA Gold/Platinum into DATEX II	Reg. 2022/670; Reg. 2022/1012

V. DIRECTIVE 1999/62/EC ON THE CHARGING OF VEHICLES FOR THE USE OF ROAD INFRASTRUCTURE (EUROVIGNETTE DIRECTIVE): LEGAL BASIS, TARIFF MECHANISMS AND DIRECTIONS FOR ADAPTATION IN UKRAINE

One of the key prerequisites for implementing the European Green Deal and the Strategy for Sustainable and Smart Mobility is the development of a financially sustainable transport system that simultaneously encourages the transition to low-carbon transport. Directive 1999/62/EC — in its updated, systematically revised version (Eurovignette recast, Directive (EU) 2022/362) — is the EU's main instrument for creating a unified, transparent and environmentally oriented road pricing system.

For Ukraine, as an associated partner of the TEN-T network, a critical challenge remains that the current road charging model does not take into account external climate costs, does not differentiate tariffs according to pollution levels and does not create dedicated funding sources for alternative fuel infrastructure (AFI). This creates a systemic gap between national practice and EU financial mechanisms.

The Eurovignette Directive covers the entire TEN-T spatial framework defined by Regulation (EU) 2024/1679 and aims to ensure a consistent transition to an economically fair and environmentally motivated road management system. The key logic of the regulation is to integrate the two principles of *"user pays"* and *"polluter pays"* into a single charging model that removes market distortions and is internally consistent with EU climate policy.

1. Strategic principles of the European road pricing model

The main charging mechanisms provided for in Directive 1999/62/EC are

1). Unified road charging structure

The road charging system consists of three separate but interrelated elements:

- infrastructure charge (for road construction and maintenance);
- external cost charge (CO_2, local pollution, noise);
- congestion charge (if traffic intensity thresholds are exceeded).

This ensures transparency in the payment structure and reflects the actual costs that transport generates for society.

2). Environmental differentiation of rates

The directive establishes the obligation to differentiate road charges depending on the CO_2 emission class and Euro class of heavy goods vehicles (HGVs).

The aim is to create economic incentives for fleet renewal and the transition to low-carbon technologies.

3). Transition to distance-based charging

For HGVs travelling on the TEN-T Core network, EU Member States are required to switch from time-based charges (vignettes) to distance-based charging:

- time-based charges must be abolished by 25 March 2030.

This makes flat-rate charging models, which do not reflect the actual impact on infrastructure and the environment, impossible.

2. The Directive as an EU financial instrument for AFI development

The Eurovignette is not only a charging directive — it also acts as a financial mechanism that supports the implementation of the AFIR.

1). Targeted financing of AFI

The Directive allows Member States to introduce special surcharges or regulatory fees aimed exclusively at:

- the deployment of charging and refuelling infrastructure for alternative fuels,
- modernising TEN-T road junctions,
- supporting the interoperability and digital integration of AFI.

This creates a sustainable financial flow that does not rely solely on budgetary resources or structural funds.

2). Incentives for zero-emission vehicles (ZEVs)

The Directive provides broad powers to promote electric and hydrogen transport:

- discounts of up to 75% on road tolls for zero-emission vehicles,
- the possibility of full exemption from charges until 31 December 2025,
- differentiation of tariffs depending on CO_2 classes.

These instruments create direct economic incentives for the renewal of logistics fleets.

3. Synergy with CEF/AFIF funding

The existence of an integrated road pricing model in a Member State is a prerequisite for:

- the creation of mixed financing models within the CEF,
- submitting applications to AFIF for the deployment of AFI along TEN-T,
- obtaining support for freight decarbonisation projects.

4. Current incompatibility of Ukrainian legislation

Ukrainian legislation, in particular the Law "On Motorways", implements only certain elements of the "user pays" principle, but does not contain the key provisions of the Eurovignette. The main gaps are:

1). Lack of environmental differentiation of tariffs

There are no rules allowing different rates to be set for heavy goods vehicles depending on their CO_2 class or Euro category. This contradicts the basic logic of the polluter pays principle.

2). Lack of mechanisms for targeted financing of AFI

There is no instrument that would allow part of the road charges to be directed towards the development of charging infrastructure. This critically limits the ability to implement AFIR.

3). Lack of legal transition to distance-based charging

The national road toll system retains a time-based model, which should be abolished based on the requirements of the TEN-T acquis.

4). Unpredictable incentives for ZEV commercial vehicles

The lack of discounts or exemptions makes the Ukrainian market for commercial electric trucks uncompetitive.

5. Conclusions and recommendations (for decision-making, 2026–2030)

Harmonisation with the Eurovignette Directive is not a technical but a systemic solution that determines the financial model of road management, the investment attractiveness of TEN-T and Ukraine's ability to implement AFIR.

1). Introduction of the “polluter pays” principle

Amendments must be made to the Law of Ukraine "On Motorways" to introduce CO_2-differentiated tariffs for heavy goods vehicles.

2). Creation of a targeted AFI financial mechanism

Develop a mechanism that will allow part of the road tolls or special surcharges to be directed towards the construction and maintenance of AFI along TEN-T.

3). Legal transition to distance-based charging

Ensure the phasing out of vignettes for heavy goods vehicles on Core TEN-T by 2030.

4). Promoting ZEVs in freight transport

Provide discounts (50–75%) or full exemptions for electric trucks and hydrogen vehicles.

VI. REGULATION (EU) 2021/1153: INSTITUTIONAL AND FINANCIAL FRAMEWORK FOR THE IMPLEMENTATION OF TEN-T AND THE INTEGRATION OF UKRAINE INTO THE EUROPEAN TRANSPORT AREA

The European Union has identified the strategic need to develop integrated, sustainable and interoperable infrastructure in the transport, energy and digital sectors, which requires significant investment to achieve climate neutrality by 2050 and to implement the phased targets (2030, 2040, 2050) for the development of the TEN-T network.

Regulation (EU) 2021/1153 establishes the legal basis for the Connecting Europe Facility (CEF) – the main financial instrument that translates the political objectives of TEN-T, the European Green Deal and AFIR into investment programmes. Ukraine's participation in the CEF was ratified by Law No. 3469-IX, which gives legal entities the right to apply for grant funding (up to 50%, and up to 85% for cross-border projects). The CEF is critical for Ukraine, as it finances infrastructure projects that have "European added value" and ensure cross-border integration.

1. Financial architecture and climate orientation

1). Multi-sector focus: CEF covers three key sectors: transport, energy and digital infrastructure. Funding is directed towards the development of TEN-T, trans-European energy networks (TEN-E) and digital connectivity (in particular, 5G corridors).

2). Climate commitments: CEF is required to allocate 60% of its total financial envelope to achieving EU climate goals, thereby supporting the European Green Deal and the decarbonisation of transport.

3**). PCI and TEN-T funding:** The CEF provides targeted grant funding and blending operations for projects of common interest (PCI) with European cross-border significance, finances the removal of bottlenecks and missing links, and provides cross-border connectivity. For the purposes of the CEF, references to the Core Network shall be interpreted as also including the Extended Core Network as defined in Regulation (EU) 2024/1679.

2. Catalyst for AFI and SSPA integration

The CEF is a key instrument for implementing the requirements of Regulation (EU) 2023/1804 (AFIR) on alternative fuels infrastructure (AFI).

1). Alternative Fuels Infrastructure Facility (AFIF): The CEF operates the AFIF, which provides targeted funding for the deployment of high-power charging and hydrogen infrastructure along the TEN-T.

2). Support for HDV infrastructure and SSPA: CEF finances heavy-duty vehicle (HDV) charging infrastructure to be integrated into Safe and Secure Parking Areas (SSPA). This is critical as AFIR requires that by 31 December 2027, each SSPA be equipped with at least two public charging stations for HDVs with a capacity of ≥100 kW, and by 31 December 2030, four. CEF supports these comprehensive projects.

3). Digital synergy: CEF finances ICT components (ITS, 5G, IoT platforms) necessary for AFI to function, ensuring Smart Charging integration and data exchange via National Access Points (NAP) in DATEX II format.

3. Ukraine's role and access restrictions

Ukraine is eligible for associated participation in the CEF, which was ratified by Law of Ukraine No. 3469-IX of 21 November 2023.

1. Right to funding: Ukrainian legal entities can apply for CEF grants. The standard funding share can be up to 50%, and for dual-use or cross-border projects — up to 85%. CEF also funds projects that improve civil and military mobility.

2. Actual participation: Ukraine has already attracted CEF funds for the modernisation of railway sections and the development of service areas in border regions, which concerns European Transport Corridors (ETCs) extended into Ukraine.

3. Key prerequisite (Compliance): Despite its associated status, access to full CEF and AFIF funding critically depends on Ukraine's implementation of an internal legal mechanism for determining PCI and harmonising EU environmental, technical and digital standards. In particular, non-compliance with standards may lower the priority of a project during selection and limit the level of grant support.

4. Recommendations for decision-making (priority: 2026–2027)

To ensure Ukraine's full access to financing from the Connecting Europe Facility (CEF) and its specialised instrument AFIF, as well as to fulfil its obligations under the TEN-T and AFIR Regulations, a comprehensive transformation of the legislative, institutional and procedural architecture is necessary. At the heart of this transformation is the creation of an effective project management system, the harmonisation of technical standards and the removal of critical administrative barriers.

1). Institutional and strategic adaptation (NPF, CEF Coordination)

Establishment of a CEF/TEN-T Coordination Centre

Ukraine needs to establish a specialised coordination centre or designate an authorised body responsible for strategic project management within the CEF and TEN-T. Such a centre should perform key functions:

- centralised support for applications to CINEA and the EC,
- coordination of recipient institutions,
- forming a unified portfolio of projects taking into account TEN-T and AFIR priorities,
- ensuring compliance with direct management requirements.

The existence of such a centre is standard practice for EU Member States and is, in fact, a prerequisite for effective access to CEF funds.

Approval of the National Policy Framework (NPF-AFIR)

Ukraine needs to develop and approve a comprehensive National Policy Framework (NPF) in accordance with Article 14 of AFIR. The NPF should:

- define national AFIR objectives for 2027 and 2030,

- integrate TEN-T and AFIR requirements into a single infrastructure development plan,
- establish priority corridors and nodes for AFI deployment,
- create a system for collecting and reporting data to the EC (two-year cycle).

Without the NPF, Ukraine's participation in the implementation of AFIR is fragmented and does not ensure formal compliance with regulatory requirements.

2). Urgent harmonisation of SSPA and HDV infrastructure

Implementation of SSPA standards

Regulation (EU) 2022/1012 establishes strict requirements for Safe and Secure Parking Areas (SSPA), which are critical nodes for high-power charging infrastructure for heavy-duty vehicles. Ukraine needs to:

- integrate the SSPA category into national building codes/standards,
- transpose the four-level security system (Bronze–Platinum),
- create an SSPA certification mechanism with independent auditing,
- define responsible authorities and accreditation procedures.

This will provide the legal possibility to deploy AFI for HDVs in accordance with AFIR.

Mandatory linking of HDV charging to SSPA

AFIR stipulates that high-power charging infrastructure for heavy-duty vehicles may **only** be located **at SSPA-certified sites**. Therefore, it is necessary to:

- legislate this requirement,
- synchronise the development of HDV AFI with the planning and modernisation of parking areas,
- Include SSPA in the strategic development plans for TEN-T.

This is a prerequisite for meeting the AFIR targets for 2027 and 2030 and accessing AFIF funding.

3). Removal of procedural and environmental barriers (Streamlining, DNSH, Climate Proofing)

Implementation of the Streamlining Directive

In order to reduce the time required to implement infrastructure projects, it is necessary to implement the key provisions of Directive (EU) 2021/1187 on streamlining permit procedures, in particular:

- appointing a Single Designated Authority
- set a maximum four-year deadline for completing permitting procedures,
- give TEN-T projects priority status in administrative processes.

This will ensure predictability for investors and compliance with CEF requirements.

Integration of Climate Proofing and DNSH

To comply with EU rules on infrastructure financing, it is necessary to:

- Implement the Climate Proofing procedure into Ukrainian legislation (in particular, into the Law "On Environmental Impact Assessment").
- Ensure the legal binding nature of the "Do No Significant Harm" (DNSH) principle for infrastructure projects.

These requirements are mandatory for all projects applying for EU grant support.

4). Digital harmonisation of AFI (NAP, DATEX II, Smart Charging)

Creation of a National Access Point (NAP)

To integrate AFI into the EU digital ecosystem, it is necessary to:

- create a NAP as a central digital gateway for infrastructure data,
- ensure compatibility with the requirements of the ITS Directive and AFIR,
- introduce mandatory data exchange in DATEX II format.

The absence of a NAP makes it impossible to integrate Ukrainian charging stations into European digital platforms.

Smart Charging and V2G

To comply with the technical requirements of AFIR, it is necessary to:

- introduce mandatory Smart Charging technologies for public charging stations,
- ensure support for the EN ISO 15118-20:2022 standard, including bidirectional charging (V2G) functions,
- harmonise national norms and standards with AFIR requirements.

This will ensure the integration of infrastructure into energy networks and compliance with future EU technical requirements.

VII. STREAMLINING PERMITTING PROCEDURES: DIRECTIVE (EU) 2021/1187 AND THE KEY ADMINISTRATIVE GAP IN UKRAINE

The effective deployment of TEN-T infrastructure and alternative fuels infrastructure (AFI) is impossible without a clear, fast and institutionally streamlined permitting process. In the European Union, this task is performed by Directive (EU) 2021/1187 — the procedural backbone of the EU transport acquis, which ensures predictability, coordination and reduction of project implementation times. For Ukraine, which is integrating into TEN-T and deploying AFI in accordance with AFIR, this Directive is of key importance: without its implementation, investment cycles will remain excessively long, fragmented and often unpredictable.

1. Purpose and strategic rationale of Directive (EU) 2021/1187

Unlike the TEN-T or AFIR technical regulations, Directive 2021/1187 focuses not on the design parameters of infrastructure, but on the procedural ecosystem necessary for its implementation. It reduces the impact of administrative barriers, sets clear deadlines and creates institutions capable of coordinating complex interdepartmental processes.

Key instruments of the Directive:

1). Four-year maximum duration of procedures (Article 5)

All authorisation and approval procedures must take no longer than **48 months**, excluding judicial appeals. The time limit is mandatory and subject to monitoring. **Significance:** a fixed planning horizon for investors and CEF projects.

2). Priority status of TEN-T (Article 3)

TEN-T projects should be given the highest priority in all national processes: land, construction, energy, and environmental.

3). Single authorised body — Designated Authority (Article 4)

An authority is created or appointed to perform the functions of a "One-Stop Shop" for all procedures — from application submission to final approval.

Strategic importance for Ukraine

Since AFI, SSPA, WIM and digital infrastructure are legally binding elements of TEN-T in accordance with Regulations 2024/1679 and 2023/1804, without a streamlined permitting system, these projects cannot be implemented on time, and therefore cannot receive funding from CEF/AFIF or Ukraine Facility.

2. Key procedural gaps in Ukraine

The analysis shows that there is a systemic, structural gap between European requirements and Ukrainian practice, which blocks the timely implementation of transport projects.

1). Lack of fixed deadlines and TEN-T status

Ukrainian legislation does not contain:

- any maximum time limit for completing procedures;
- any provision granting TEN-T or AFI priority status;
- any mechanism for controlling the duration of approvals.

Consequence: projects that take 2–3 years in the EU can take 5–7 years in Ukraine, making them financially unprofitable and unpredictable.

2). Institutional fragmentation (lack of a responsible authority and One-Stop Shop)

Ukraine does not have a responsible authority, and responsibility is divided among dozens of authorities, creating **consistent coordination gaps**, duplication of procedures and wasted time.

3). Critical regulatory vacuum: the withdrawal zone

One of the most serious barriers.

- The procedure for issuing permits in the road right-of-way has not been approved since **2012**.
- The procedure does not even exist in draft form.
- Local authorities and road organisations act at their own discretion.

Consequences:

- blocking the placement of AFI along TEN-T;
- inability to build access roads to SSPA, logistics hubs, multimodal terminals;
- investment projects are "frozen" due to legal uncertainty.

This vacuum is **one of the biggest regulatory barriers for AFIR-compatible projects**.

3. Critical consequences for integration and financing

Non-compliance with Directive 2021/1187 has direct consequences:

1). Risk of non-compliance with AFIR obligations

Without fast-track procedures, it will be impossible to meet the 2027–2030 deadlines for:

- deploying AFI along TEN-T;
- the creation of SSPA;
- the modernisation of road junctions;
- digital integration (NAP/DATEX II).

2). Loss of access to CEF/AFIF funding

The CEF only finances projects that can demonstrate their feasibility within a realistic timeframe. Without procedural reform, Ukraine risks remaining "Not Eligible/High Risk".

3). Decline in investment attractiveness

For private AFI operators, the main risk factors are:

- uncertain deadlines;
- loss of predictability;
- risk of unfinished network connections.

4. Recommendations: necessary legislative and institutional actions

1). Set a maximum period of 48 months

Through amendments to the laws on urban planning, motorways and the licensing system, establish a fixed time limit for the consideration of all procedures for TEN-T.

2). Grant TEN-T and AFI priority project status at the legislative level. Priority should apply to all procedures: land, energy, environmental, and design.

3). Establish a Designated Authority — a national One-Stop Shop (e.g. based on the Ministry of Development or the Agency for Reconstruction, similar to agencies in EU countries).

Functions:

- single point of entry;
- coordination of all procedures;
- monitoring of deadlines;
- digitalised interaction with all authorities.

4). Regulate the use of road right-of-way

Develop a new procedure with clear:

- deadlines (up to 90 days),
- digital submission of documents,
- unified technical requirements,
- the principle of "tacit consent".

Ukraine can only create a modern transport infrastructure integrated with the EU if it reforms its licensing system in line with Directive 2021/1187. The TEN-T and AFI projects are not just about roads or charging stations; they are part of the European public space, which operates under strict deadlines and procedural standards. Without streamlining the permitting processes, no technical or investment reform will be fully implemented.

VIII. THE EUROPEAN UNION'S BEST PRACTICES IN THE DEVELOPMENT OF ELECTRIC VEHICLE CHARGING INFRASTRUCTURE ALONG THE TEN-T NETWORK-T NETWORK AND HARMONISATION OF UKRAINIAN LEGISLATION WITH THE EU ACQUIS

The effective implementation of AFIR objectives and integration into TEN-T in EU Member States is based on a consistent institutional model, digital interoperability, a standardised approach to infrastructure and procedural predictability. An analysis of practices in Ireland, Bulgaria, the Netherlands, Germany and other countries shows that there are four key managerial and technical elements that form the basis of a successful AFI deployment policy. These elements must be implemented in Ukraine as a prerequisite for access to CEF/AFIF and compliance with Regulations (EU) 2023/1804 and 2024/1679.

1. Institutional coordination and strategic planning (NPF + institutional centre)

National Policy Framework (NPF)

The AFIR Regulation requires Member States to establish National Policy Frameworks (NPF) that define objectives, indicators and investment instruments for all types of AFI, from light-duty vehicles to HDVs and H_2.
The NPF has three functions:

- **strategic** (defines national goals and mechanisms for implementing AFIR),
- **coordination** (coordinates policy between sectors: road, energy, urban, rail),
- **financial** (preparation of projects for participation in CEF, AFIF, investment programmes).

For Ukraine, NPF-AFIR Ukraine should become the basic document for integration into the EU regulatory system and a condition for regular reporting to the European Commission.

Single coordinating body (Designated Authority)

Leading EU countries have created centralised management centres (e.g. Zero Emission Vehicles Ireland – ZEVI), which:

- coordinate AFI planning,
- develop technical standards,
- manage grant programmes,
- integrate digital systems (NAP/ITS),
- ensure interdepartmental coordination.

In Ukraine, this function should be performed by a specially created or authorised body capable of meeting the requirements of AFIR and the Streamlining Directive.

2. Use of existing state assets and sectoral synergies (energy, railways)

European approach

One of the key factors in the EU's success is the synergy between transport and energy infrastructure. The Bulgarian model is particularly effective, where:

- the national electricity grid operator ESO and the railway operator NRIC have combined their infrastructure capacities;
- AFI along TEN-T is located mainly in railway corridor areas, where powerful power lines already exist;
- connecting charging hubs reduces CAPEX/OPEX costs and speeds up project implementation.

Recommendations for Ukraine

- Initiate an interdepartmental model of "energy + railways + roads".
- use traction substations and energy corridors of JSC Ukrzaliznytsia as a basis for AFI development,
- introduce simplified connection procedures (flexible connection), which the EC identifies as a key tool for overcoming delays (up to 48 months).

3. Technical and digital interoperability (NAP, DATEX II, Smart Charging, MCS)

Digital architecture (ITS + NAP)

AFIR defines digital integration as a mandatory requirement, just like the installation of charging stations. It provides for:

- the creation of a National Access Point (NAP),
- mandatory data exchange in DATEX II format,
- integration of AFI with national ITS,
- support for Smart Charging and V2G (ISO 15118-20).

Without this, no charging infrastructure is considered European in terms of interoperability.

Technical standards for HDV

The transition of freight transport to electrification is based on the Megawatt Charging System (MCS), which will become mandatory under AFIR/CEF.

Ukraine currently has no regulatory framework allowing for the installation or operation of MCS.

4. Procedural acceleration and licensing reform (Streamlining Directive)

Directive (EU) 2021/1187 sets out clear requirements:

- maximum duration of permitting procedures — **4 years**,
- creation of a single authorised body (One-Stop Shop),
- priority status for TEN-T projects in all national procedures.

This reform has significantly increased the investment attractiveness of AFI in Member States.

Ukraine lacks similar mechanisms, which creates high risks for the private sector and limits the possibility of submitting projects to the CEF.

5. Critical gaps in Ukrainian legislation (Gap Analysis)

The analysis reveals four systemic gaps that block Ukraine's integration into TEN-T and AFIR:

1). SSPA and HDV-AFI: complete absence of a regulatory framework

Ukraine does not have:

- a definition of SSPA in DBN/GBN,
- requirements for security levels (Bronze–Platinum),
- certification procedures (ISO 17021),
- regulations linking the installation of HDV generators (≥100 kW) exclusively to certified SSPA.

This makes it impossible to achieve the AFIR targets by 2027/2030 and blocks AFIF funding.

2). Lack of procedural acceleration

There is no legal:

- 4-year limit on permitting procedures,
- priority status for TEN-T projects,
- One-Stop Shop.

3). Inconsistency of TEN-T classification

The Ukrainian road classification does not correspond to:

- Core Network,
- Extended Core Network,
- Comprehensive Network.

This makes it impossible to submit projects as PCI.

4). Lack of AFI digital integration

Ukraine does not have:

- NAP,
- mandatory DATEX II,
- Smart Charging/V2G requirements,
- procedures for collecting and publishing static and dynamic data.

6. Conclusions and recommendations

Ukraine's strategic integration into TEN-T requires immediate, structural and coordinated action at the national level. The current legal framework does not meet key European standards and creates barriers to attracting CEF/AFIF funding and implementing AFIR.

Priority area	Recommended action	Relevant EU act
Institutional coordination	Establish a Designated Authority for TEN-T/AFIR, integrating the functions of a permit coordinator	Directive 2021/1187
SSPA and HDV-Charging	Implement Regulation 2022/1012, legalise SSPA and introduce mandatory linking of HDV-AFI to certified SSPA	AFIR, TEN-T Regulations

Permitting reform	Set a maximum 4-year deadline and TEN-T priority status	Directive 2021/1187
Digital integration	Create NAP, implement DATEX II and Smart Charging/V2G	AFIR Regulation, Directive 2010/40/EU (ITS Directive)
Use of public assets	Synchronise Ukrzaliznytsia, energy operators and the road sector into a single AFI development model	TEN-T Regulations, AFIR

Key conclusions

1. Ukraine finds itself in a situation of critical regulatory divergence between European TEN-T/AFIR requirements and the current national legal framework.

This gap blocks integration into the EU infrastructure space, limits the possibility of identifying projects as PCIs, and effectively prevents full access to CEF/AFIF funding. Ukraine has all the political prerequisites, but does not yet have legal and procedural compatibility.

2. Without the systematic implementation of key EU acts (TEN-T, AFIR, SSPA, Eurovignette, Streamlining Directive), it will be impossible to meet the mandatory targets for 2027–2030.

The following are particularly critical:
• the absence of SSPA and technical requirements for HDV charging;
• the absence of NAP/DATEX II and Smart Charging;
• the absence of a One-Stop Shop and a 4-year permit limit;
• the non-harmonised classification of TEN-T.

3. European experience shows that the success of AFIR depends on institutional centralisation, digital interoperability and the integration of transport and energy infrastructure.

The Irish ZEVI model, the Bulgarian "rail + energy" model, the German MCS readiness system, and pan-European ITS/NAP requirements provide a framework that Ukraine can adapt right now. Their implementation is a direct prerequisite for investment attractiveness.

4. Urgent reform should consist of five elements: NPF-AFIR, Designated Authority, SSPA implementation, Streamlining procedures, and AFI digital integration.

This will ensure compliance with the EU acquis, reduce permitting cycles, increase predictability for private investors, and unlock access to CEF/AFIF funds. Without these decisions, it will be impossible to implement the TEN-T roadmap (2030/2040/2050).

SECTION I. EU REGULATORY FRAMEWORK: ESSENCE, ARCHITECTURE AND IMPLEMENTATION LOGIC OF REGULATION (EU) 2024/1679

1.1. Purpose of adoption and scope of Regulation (EU) No 2024/1679

In the early 1990s, EU Member States decided to introduce a common infrastructure policy with the aim of developing the internal market and improving transport, energy and telecommunications networks.

Regulation (EU) 2024/1679 of the European Parliament and of the Council of 13 June 2024 on Union guidelines for, amending Regulations (EU) 2021/1153 and (EU) No 913/2010 and repealing Regulation (EU) 1315/2013 establishes updated Union guidelines for the development of TEN-T. Its adoption is driven by the need to move from a declarative approach to a clearly binding, phased and measurable infrastructure development system capable of ensuring climate neutrality, multimodality and transport security in the EU by 2050.

Objectives of the adoption of Regulation (EU) 2024/1679 ()

Regulation (EU) 2024/1679 fulfils two strategic functions:

1) **infrastructure** - EU spatial planning, in particular the creation of a single, high-quality transport network that eliminates bottlenecks and missing links at both national and cross-border levels;

2) **political** – implementation of the European Green Deal and the Sustainable and Smart Mobility Strategy (COM(2020)789) through the integration of transport and energy policies, in particular through the mandatory deployment of AFI.

Functional coverage

The scope of Regulation (EU) 2024/1679 extends not only to road infrastructure, but also to:

- rail, water and air transport;
- AFI alternative fuel infrastructure (EV Charging, Hydrogen Refuelling, Shore-Side Electricity);
- digital systems (Traffic Management, Data Sharing, Interoperability Requirements);
- Projects of Common Interest (PCI) management mechanisms, including military mobility.

Key conclusion for Ukraine as a candidate country

Regulation (EU) 2024/1679 not only defines the physical parameters of TEN-T roads, but also establishes functional, climatic and digital obligations that must be integrated simultaneously into urban planning, road, energy and digital regulation in Ukraine. Compliance with these requirements will form the basis for Ukraine's access to joint financing mechanisms such as CEF/AFIF and the opportunity to fully participate in Projects of Common Interest (PCI).

1.2. Architecture and European Transport Corridors (ETC) TEN-T: implementation stages (2030 / 2040 / 2050)

One of the key reforms introduced by Regulation (EU) 2024/1679 is the transition from a general vision for the development of the transport network to a phased structured system with fixed legal obligations. The EU has established a clear logic for the deployment of TEN-T infrastructure in three time horizons - by 2030, 2040 and 2050 - in accordance with the functional importance of individual categories of roads and nodes.

Table 1. *European TEN-T planning system: functional hierarchy and time horizons for development*

Network level[1]	Characteristics	Deadline for implementation
Core Network (Main network)	The most important trans-corridor arteries, providing connectivity between major economic centres and cross-border mobility.	**2030**
Extended Core Network	A new intermediate level covering the most strategically important TEN-T nodes and connections in line with traffic needs and intended to stimulate the development of the entire Comprehensive Network.	**2040**
Comprehensive Network	A complete list of existing and planned infrastructure facilities that provides full territorial accessibility, including less congested or peripheral routes.	**2050**

The establishment of an additional intermediate level and a new completion date allows for a clearer prioritisation of investments, the targeting of resources to critical sections and the strengthening of TEN-T integration with ETCs.

Regulation (EU) 2024/1679 also sets higher standards for road transport infrastructure belonging to the Core Network and Extended Core Network. Their implementation should ensure a high level of safety, capacity and continuity of traffic, which is critical for the effective functioning of TEN-T.

The updated version of Regulation (EU) 2024/1679 strengthens the mechanism of Member States' responsibility for compliance with TEN-T deadlines and technical standards.

[1] For the purposes of this Report, we use the terms "core network", "extended core network" and "comprehensive network". At the same time, some authors and sources use the following translations: Core Network as "support network", Extended Core Network as "extended support network" and Comprehensive Network as "comprehensive network". The final version of the terminology should be determined during the official translation of Regulation (EU) 2024/1679.

Although projects that do not yet meet all requirements are not excluded from funding, access to CEF and AFIF programmes is given primarily to initiatives that aim to address identified gaps and move towards full compliance.

Thus, non-compliance with standards does not disqualify a project from funding, but it does lower the project's priority during selection and may limit the level of grant support.

European Transport Corridors (ETCs) in Regulation (EU) 2024/1679

To ensure that infrastructure planning meets the real operational needs of the EU transport system, Regulation (EU) 2024/1679 combines the concepts of *Core Network Corridors* and *Rail Freight Corridors* into a single, more comprehensive system - European Transport Corridors (ETCs).

These corridors cover key long-distance transport flows, necessarily cross at least two national borders and include at least three modes of transport, ensuring multimodal integration within the TEN-T network.

The introduction of the three-level TEN-T structure ***(Comprehensive→Extended Core→Core Network)*** changed the approach to planning and prioritising transport infrastructure development.

- **The old system (CNC)** focused exclusively on the core network, which was planned to be completed by 2030.

- **New system (ETCs):** covers not only **the** core **network**, but also **the extended core network**, which is to be completed by 2040 and integrated into the **comprehensive network** by 2050.

The main difference lies in the combination of two previously separate instruments:

Table 2. *Comparative characteristics of approaches to transport corridor management in Regulation (EU) No 1315/2013 and Regulation (EU) 2024/1679*

Characteristic	Regulation (EU) 1315/2013	Regulation (EU) 2024/1679
Type of corridors	Core Network Corridors (CNC)	European Transport Corridors (ETCs)
System integration	Core network corridors existed in parallel with Rail Freight Corridors (RFC).	ETCs integrate CNC and RFC into a common management structure.
The aim of integration	Coordination was fragmented due to different geographical coverage and duplication of functions.	Ensuring unified management, infrastructure and operational synergies, and supporting multimodality.
Geographical coverage	Limited to Core Network.	Covers the Core Network and Extended Core Network

Number of corridors	Not standardised in the text of the Regulation.	Nine European Transport Corridors (ETCs) have been identified.
Coordination mechanism	European CNC coordinators.	Extended mandate of European ETC coordinators.

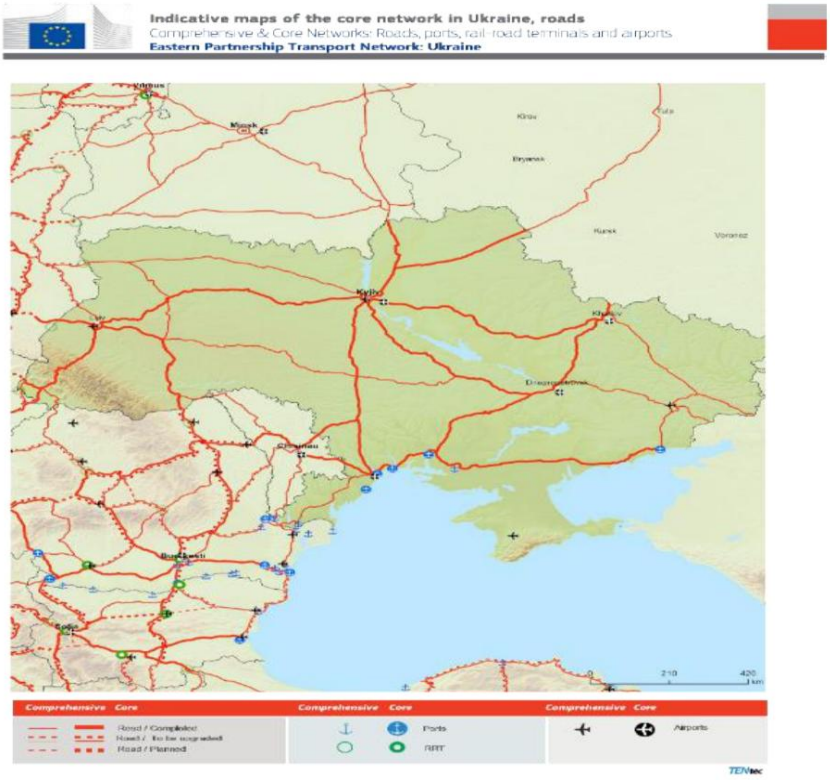
Extension of ETCs to Ukraine

After 2022, Ukraine's role in TEN-T policy took on a whole new dimension. With the aim of increasing the resilience of European logistics chains, the European Commission decided to formally extend the following four ETCs to Ukraine.

Table 3. TEN-T European transport corridors (ETCs) covering the territory of Ukraine (Annex IV to Regulation (EU) 2024/1679)

Name of European Transport Corridor (ETCs)	Key routes in Ukraine
North Sea – Baltic Corridor	Extended through Lviv and Kyiv to Mariupol. This is an important east-west route that integrates the Ukrainian network into the European space.
Baltic Sea – Black Sea – Aegean Sea Corridor	Extended through Lviv and Chernivtsi (and Moldova) to Odesa. Connects Odesa with the north-south route extending to Greece.
Baltic Sea – Adriatic Sea Corridor	Will pass through Lviv. Strengthens Lviv's position as a cross-border hub.
Rhine – Danube Corridor	Ukraine joins via the Danube River. The Danube ports (Izmail and Reni) play a strategic role in providing alternative logistics routes.

In addition to the ETCs themselves, the Memorandum of Understanding between Ukraine and the EU on the extension of the TEN-T indicative maps identifies major urban centres as potential Urban Nodes, given their role in cross-border and domestic transport. These include the cities of Kyiv (national transport centre and air/rail hub), Lviv (western cross-border hub, connection with Poland and Central Europe), Odesa (seaport and logistics hub), Kharkiv (industrial centre of the East), Dnipro (key transport and industrial hub). , this means that these cities should be viewed not only as transit points, but as hubs of integrated multimodal logistics, where standards of urban mobility, freight exchange, digital services and alternative fuel infrastructure must be ensured.



According to available data [from Transport Community (2024)], the approximate length of the core and comprehensive TEN-T network in Ukraine is at least **7,372.22 km**, which exceeds the total length of the networks of all Western Balkan countries and other observer states. Of this volume, **4,753.03 km** belong to the Core Network, while **2,619.19 km** cover the Comprehensive Network.

Thus, Ukraine ranks among the leading EU partner countries in terms of TEN-T scale, and the modernisation of this network should become a key factor for the integration of the state's transport system into the European space.

Despite significant improvements in road infrastructure in previous years, Russia's full-scale aggression has led to widespread destruction of the country's transport network. The regions that suffered the most damage were those in the zone of active hostilities. Key transport arteries, bridges, road junctions and bypasses, which play a critical role in the movement of goods and people, were destroyed or seriously damaged.

Military operations, mass population displacement and the destruction of critical transport infrastructure created significant obstacles to the proper maintenance and repair of

roads. As a result, transport and trade flows have been disrupted and the connectivity of the road network, both within the country and towards the European Union, has been significantly reduced.

Currently, under martial law, Ukraine has focused its resources on:

- emergency repair and restoration of vital transport links;
- developing alternative transport routes, in particular connections with Danube ports;
- deepening ties with EU member states and the Republic of Moldova as part of the EU-Ukraine Solidarity Lanes initiative.

At the same time, administrative capacities, in particular project planning, preparation of technical documentation and fundraising, remain a weak link. This complicates the implementation of EU-supported projects and hinders the development of fully compatible cross-border connections within the TEN-T.

The inclusion of Ukrainian transport routes in the ETCs means Ukraine's de facto accession to the TEN-T management and coordination system, which involves participation in consultation processes led by European coordinators, as detailed in **section 1.9** of this chapter. This not only expands Ukraine's political presence in the EU's common transport policy, but also creates practical opportunities for access to programme funding and technical assistance.

In particular, JSC Ukrzaliznytsia is already participating in cooperation with European Commission consultants on the collection and verification of TEN-T data, which is a necessary component for the preparation of **ETCs Work Plans**. Such participation ensures the alignment of technical standards, route parameters and modernisation priorities with European requirements.

The inclusion of Ukraine in the ETCs system also reflects **a strategic shift in the EU's focus** after 2022: the development of transport corridors is seen primarily as **a geopolitical and security issue**. The expansion of the TEN-T network to Ukraine is part of a comprehensive **Military Mobility** and **Resilience** policy aimed at ensuring the resilience of European infrastructure in the face of Russian aggression, supporting military logistics, humanitarian access and cross-border coordination.

Ukrainian context: the need for regulatory detail

The analysis reveals a fundamental discrepancy between Ukrainian legislation, which is based primarily on administrative-territorial and formal road classifications, and the functional-strategic hierarchy enshrined in European Union law. As a result, the Ukrainian system does not provide for the prioritisation of investments and monitoring of network development according to TEN-T principles.

In Ukraine, according to the Law of Ukraine "On Motorways", there is a four-level classification of public motorways: international, national, regional and territorial.

This structure is suitable for internal infrastructure management, but does not correspond to the TEN-T strategic model, which is based on levels of functional importance and European added value of transport links.

Regulation (EU) 2024/1679 defines three levels of transport network that are legally binding and have different implementation deadlines:

- **Core Network** → by 31 December 2030;
- **Extended Core Network** → until 31 December 2040;
- **Comprehensive Network** → until 31 December 2050.

Each level is not only a technical category, but also an institutional and political one, determining the priority of financing, planning and monitoring the implementation of EU commitments in the field of transport integration.

Ukrainian legislation, in particular the Law of Ukraine "On Motorways", does not currently reflect these functional and strategic priorities and does not contain a legal mechanism for classifying specific objects as Core Network or Extended Core Network.

The absence of relevant categories and terminology in national legislation creates a legal vacuum that:

- complicates the legal definition of the status of Ukrainian sections as part of the TEN-T;
- does not allow for the establishment of official modernisation deadlines commensurate with European ones;
- prevents the full use of CEF/AFIF funding mechanisms for projects in Ukraine;
- limits the ability to report to the EC on the implementation of the Core and Comprehensive Network development schedule.

The current version of Article 8 of the Law of Ukraine "On Motorways", using the concepts of *"international transport corridors"* (ITCs) and *"European network of main, intermediate and connecting motorways"*, reflects the legal framework adopted after the Pan-European Transport Conferences (1990s) and has largely lost its relevance.

The new TEN-T architecture, approved by Regulation (EU) 2024/1679, requires the transport network to function as a single, integrated entity. The success of the European Transport Corridor (ETC) depends on the simultaneous provision of three components: legal, physical and operational.

Today, Ukraine has geopolitical integration (Ukrainian routes are included in the indicative TEN-T maps), but it is in a state of critical disconnect between national legislation and the functional requirements of TEN-T.

European Transport Corridors (ETCs) are primarily an operational structure designed to remove systemic obstacles such as physical, technical, functional or administrative barriers. Ukrainian legislation does not reflect these priorities.

As a result, Ukrainian routes that are de facto part of the European Transport Corridors (ETCs) remain legally "invisible" in national law. Accordingly, the central executive body

responsible for formulating and implementing state policy in the field of road transport and the authorities responsible for managing motorways, ensuring their operation, development and financing cannot officially plan to complete the modernisation of Ukrainian Core Network levels by 2030, even if this is declared in international documents.

1.3. Alignment of TEN-T with the European Green Deal and climate neutrality goals for transport

Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804 (Alternative Fuels Infrastructure Regulation (AFIR)[2] form an interconnected regulatory framework that shifts EU transport policy towards a climate-centric approach.

Both acts no longer view infrastructure solely as a means of ensuring mobility – they directly integrate the objectives of the European Commission's European Green Deal Communication of 11 December 2019 and the Sustainable and Smart Mobility Strategy[3] as the EC's framework strategy (82 initiatives) and, by making decarbonisation and energy transformation of the transport sector a mandatory element of TEN-T planning, design and operation. This strategy serves as a benchmark for targets and indicators, in particular for the integration of alternative fuels and digital services, the prioritisation of investments and the monitoring of progress.

1) Regulation (EU) 2024/1679 - Transport and Climate Tool

The updated Regulation (EU) 2024/1679 **establishes the decarbonisation** of transport as a strategic function of the transport network, rather than a secondary objective. This is reflected in several key approaches:

- transport infrastructure is planned with a view to achieving the 2050 climate neutrality targets and an interim 55% reduction in emissions by 2030;
- priority is given to sustainable modes of transport – investments in the road sector must be coordinated with the development of rail, inland waterway and multimodal transport;
- mandatory integration of AFI and digital traffic management systems.

In contrast, Regulation (EU) 1315/2013 aimed to reduce greenhouse gas emissions from transport by only 60% by 2050 (compared to 1990) and did not require the mandatory deployment of alternative fuel infrastructure, setting specific quantitative and time frames as defined in Regulation (EU) 2023/1804.

Thus, TEN-T is transforming from a *"transport map"* into a *"climate infrastructure platform*".

2) Regulation (EU) 2023/1804 - TEN-T infrastructure "energy module"

[2] Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU (Text with EEA relevance). URL: https://eur-lex.europa.eu/eli/reg/2023/1804/oj/eng

[3] 'Sustainable and Smart Mobility Strategy — putting European transport on track for the future' https://share.google/FMjEcTfhbZ5hCzA3b

Regulation (EU) 2024/1679 details what energy infrastructure should be deployed along the TEN-T, with what parameters and within what timeframes, which we will discuss in more detail in the following sections. It sets minimum standards for charging continuity for all categories of vehicles.

References to the Core Network in Regulation (EU) 2023/1804 are interpreted in accordance with the new TEN-T structure in Regulation (EU) 2024/1679:

- **Core Network → Core Network**
- **Comprehensive Network → Extended Core + Comprehensive Network**

This ensures legal consistency, where the TEN-T spatial framework defines *"where"* and AFIR answers the question *"what exactly and with what characteristics should be deployed*".

Thus, TEN-T + AFIR act as a single policy architecture *for "Infrastructure obligations to deliver the Green Deal*": one part defines the corridors, the other defines the energy function of these corridors.

Harmonisation of Ukrainian legislation with the European Green Deal and transport decarbonisation targets

At the strategic level, Ukraine is in line with EU climate and transport policy. The Law "On the Fundamentals of State Climate Policy" (No. 3991-IX), adopted in 2024, enshrines the goal of achieving climate neutrality by 2050 and provides for a reduction in greenhouse gas emissions of at least 65% by 2030 (compared to 1990). This law is directly aimed at implementing *the acquis communautaire* in the field of climate change and requires the integration of climate policy into all sectors, including transport.

These benchmarks reflect the key parameters of the European Green Deal and are consistent with the pan-European target of reducing transport emissions by 90% by 2050, as set out in Regulation (EU) 2024/1679. By comparison, Regulation (EU) 1315/2013 provided for a 60% reduction in greenhouse gas emissions from transport by 2050 (compared to 1990).

The NTS Operational Plan contains a direct reference to the need to improve the regulatory framework in line with Regulation (EU) 2023/1804 and the commitment to transition to environmentally neutral, energy-efficient and safe transport. The document explicitly mentions Ukraine's integration into the TEN-T network in accordance with EU standards, which formally confirms political compatibility with the logic of Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804.

Specific provisions regarding the development of the electric vehicle market and charging infrastructure are contained in Law of Ukraine No. 2956-IX "On Certain Issues of Using Vehicles Equipped with Electric Motors and amendments to certain laws of Ukraine on overcoming fuel dependence and developing electric charging infrastructure and electric vehicles," which recognises electric transport as one of the priorities of state policy. Together, these documents demonstrate that, at the level of political declarations, Ukraine has set a course for synchronisation with EU targets.

At the same time, the actual state of implementation of the provisions of Regulation (EU) 2023/1804 can be assessed as partially harmonised. Currently, Ukraine lacks regulatory requirements for minimum intervals for the placement of charging stations along the European TEN-T transport corridors that pass through its territory, standards for high-power charging have not been defined, and there is no regulation on payment methods, tariff transparency and access to data in the format provided for in Regulation (EU) 2023/1804. There is also no special body responsible for monitoring the development of alternative fuel infrastructure, similar to the reporting mechanism laid down in Article 16 of Regulation (EU) 2023/1804.

Thus, Ukraine has established strategic alignment with EU climate policy, but has not yet moved on to full regulatory implementation of its commitments in the field of decarbonised transport infrastructure. Further adaptation should focus not only on the formal reproduction of the provisions of Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804 in legislation, but also on the creation of effective procedures for planning, technical design, connection and operation of charging infrastructure that ensure the practical implementation of the ***"user pays"*** and ***"zero-emission ready"*** principles in the road sector.

1.4. Technical requirements, basic components of the TEN-T road transport infrastructure and the composition of "associated equipment"

Regulation (EU) 2024/1679 establishes uniform technical requirements for TEN-T motorways in order to ensure a high level of safety, capacity and continuity of traffic throughout the EU.

In accordance with Article 31, these requirements are mandatory:
- for roads in the Core Network - **by 31 December 2030**;
- for roads in the Extended Core Network - **by 31 December 2040**.

The new Regulation transforms the previously advisory provisions of Regulation (EU) 1315/2013 into legally binding standards that must be implemented by all EU Member States.

Basic technical requirements for TEN-T motorways

- *separate carriageways*;
- must be designed, constructed or upgraded for motor transport with physical separation of traffic directions *(dividing strip or barrier)*.

No crossings at grade

- any level crossings with other roads, railway or tram tracks, cycle paths or footpaths are prohibited, except in temporary or specially justified cases, in particular where the traffic volume is **less than 10,000 vehicles per day** in both directions.

Thus, a road that has a high-quality surface but allows two-way traffic without a physical barrier or at-grade crossings cannot be considered to meet TEN-T standards, even if it is classified as international in the national classification. Regulation (EU) 2024/1679 introduces significant clarifications and stricter requirements for the Core Network and the newly introduced Extended Core Network compared to Regulation (EU) 1315/2013.

In practice, the compliance of TEN-T road infrastructure is assessed, among other things, by infrastructure profile and condition indicators, since motorways must be properly maintained in order to be recognised as complying with TEN-T criteria. Therefore, the International Roughness Index (IRI) criterion is used to determine the appropriate level of operational maintenance of the road surface. This requires that the condition of the road surface be assessed as very good or good, ensuring smooth traffic flow and high safety standards. The main technical compliance criterion for road surfaces is set as an International Roughness Index (IRI) below 2.84.

According to the Transport Community Report (2024), which also applies to observer countries (Ukraine, Moldova, Georgia), the IRI is used as the main indicator of technical compliance of road infrastructure, in particular for the following network categories:

a) Core Network

- For sections of motorways in this network, compliance is considered **cumulative**. They must comply with **motorway or expressway** standards (unless a special exemption is granted by the EC) *and* **be properly maintained** (i.e. have **an IRI below 2.84**).

b) Comprehensive Network

- For ordinary roads in this network (which are not motorways or expressways), compliance is assessed on the basis of **the current physical condition of the infrastructure (IRI)**. For reporting purposes, **an ordinary road in very good or good condition (IRI < 2.84) is considered to generally meet the basic safety requirements**.

For reference, according to the European methodology for classifying road conditions:

IRI 1.0–1.24 - very good condition;
IR**I 1.24–2.84** - good condition;
IRI above 2.84 - unsatisfactory or in need of reconstruction/resurfacing.

Ukrainian context: the need for regulatory detail

Ukrainian legislation currently lacks provisions requiring the mandatory absence of single-level intersections or physical separation of traffic directions for roads included in indicative maps or claiming TEN-T compatibility status and the gradual improvement of road infrastructure standards within the TEN-T framework.

The current DBN V.2.3-4:2015 ‘ROADS’ (as amended), which regulates the design and construction of roads, classifies roads according to traffic intensity (categories I-V), but not according to their functional integration into the European TEN-T network. At the same time, it should be noted that the term ‘motorway’ itself, defined in DBN V.2.3-4:2015 in a note as a ‘category I road’, generally meets the requirements set out in Regulation (EU) 2024/1679 regarding the key design parameters of a TEN-T motorway. The issue is that this high functional standard is not mandatory for all motorways (e.g. Category II-III Roads) that are included or may be included in the TEN-T indicative maps.

Table 4. Comparison of TEN-T design requirements (Regulation (EU) 2024/1679) and DBN V.2.3-4:2015 with assessment of non-compliance

Design parameter	Requirement of Regulation (EU) 2024/1679 for (Core/Extended Core)	Provision DBN V.2.3-4:2015	Non-compliance assessment
Separate carriageways	**Mandatory physical separation of** traffic lanes by engineering solutions that **ensure safety**.	A dividing strip (6.00 m or 3.00 m wide) is only required for **Category I** roads (I-a and I-b). For Category II and III roads, which may be part of indicative TEN-T maps, **physical separation is not mandatory**.	Not **harmonised.** DBN does not require mandatory safety guarantees through physical separation on all key TEN-T routes (even where traffic intensity exceeds 10,000 vehicles/day).
No level crossings (No Crossings at Grade)	**Complete ban on** at-grade crossings with any roads or pedestrian/cycle paths.	Grade-separated crossings (overpasses) must be provided for **Category I** motorways. For **Category II** roads, grade-separated crossings are only required where pedestrian traffic exceeds **200 pedestrians per hour** during peak hours. At-grade crossings **are permitted** for lower category roads.	**Not harmonised.** DBN allows for certain compromises and permits the operation of Category II roads, which may be part of ETCs, with single-level crossings. This directly violates the basic design standard of the Core/Extended Core Network, which excludes *No Crossings at Grade*.

The Law of Ukraine "On Motorways" (Article 8) classifies roads according to their administrative status (international, national, etc.). DBN V.2.3-4:2015, in turn, uses categorisation according to traffic intensity (categories I, II, III, IV, V).

Since the Law of Ukraine "On Motorways" does not use the functional definition of "motorway" as a mandatory standard for the Core/Extended Network, it is impossible to legally establish the requirement for complete traffic isolation and the absence of at-grade intersections along the entire length of European corridors.

Therefore, a motorway that complies with categories II or III of the State Building Standards (i.e. allows for single-level intersections) but is part of the ETC cannot be recognised as complying with TEN-T standards, even if it is classified as international in Ukrainian legislation.

Basic composition of road transport infrastructure and the concept of "ancillary equipment"

Regulation (EU) 2024/1679 broadens the traditional understanding of a motorway. While Ukrainian national legislation typically defines a road *as "a linear complex of engineering structures designed for continuous, safe and convenient movement of vehicles" (Article 1 of the Law of Ukraine "On Motorways")*, or as an engineering structure with a carriageway and separate technical elements, in the logic of TEN-T it is considered a multifunctional transport and energy platform that simultaneously provides mobility, power supply for vehicles, information interaction and environmental safety.

Regulation (EU) 2024/1679 establishes two structural levels of road infrastructure:

1) **the basic engineering framework of** the road and its structural elements;
2) associated equipment, without which the road is not considered fully functional in the context of TEN-T.

1. Basic composition of road transport infrastructure

The **basic** elements include motorways with all structural components (Article 29): bridges, tunnels, junctions, crossings, interchanges, hard shoulders.

Importantly, this group also includes infrastructure to mitigate environmental impact, including solutions for wildlife preservation and noise reduction *(infrastructure mitigating environmental impact, including fauna preservation and noise mitigation)*, which combines road planning with environmental policy from the outset.

2. The concept of "associated equipment" — a fundamental European innovation

The new Regulation (EU) 2024/1679 details the composition and content of the concept of "associated equipment", transforming it from an auxiliary technical category into a more structured element of road infrastructure.

Unlike Regulation (EU) 1315/2013, where this concept covered a wide range of auxiliary systems, it is now more specific, and some of its components have been given separate legal status as part of the main components of the TEN-T road transport infrastructure.

Regulation (EU) 2024/1679 is based on the assumption that a modern motorway is not only a place for vehicles to travel, but also an infrastructure and digital complex that must ensure continuity of traffic, energy supply and user protection. The mandatory components of such a complex **of "associated equipment"** include:

- intelligent transport systems (ITS) and digital infrastructure for traffic management and data exchange;
- equipment for refuelling or recharging vehicles with alternative types of power plants - charging or refuelling stations for electric and other "clean" vehicles;
- parking and rest areas, including safe and secure parking areas for freight transport (SSPA/SSTPA);
- access roads to multimodal terminals and connections to other modes of transport;
- Weigh-in-Motion (WIM) systems;
- toll and user charge technologies integrated with digital platforms.

Environmental infrastructure (e.g., elements to reduce environmental impact) is now directly attributed to the motorway component, while infrastructure related to alternative fuel

facilities and SSPA (Safe and Secure Parking Areas) is identified as separate core components of motorway transport infrastructure.

Thus, "associated equipment" now mainly covers intelligent and technical management systems (ITS, WIM, traffic control systems, toll collection, video surveillance, etc.), while elements related to energy, environmental or logistical infrastructure have been elevated to a higher level in the legal hierarchy as integral components of the motorway itself within the TEN-T structure.

Regulation (EU) 2024/1679 explicitly states that TEN-T road transport infrastructure cannot be considered in isolation from its "functional equipment" — i.e., a road without digital management, without safety systems, energy infrastructure and service areas, is considered incomplete and does not meet TEN-T standards or ensure compliance with an integrated, sustainable and efficient European transport system.

Thus, there has been a transition from **an optional** to a **mandatory** component of the TEN-T infrastructure, which must be taken into account during the national harmonisation of road construction regulations and standards.

Current Ukrainian legislation, in particular the Law of Ukraine "On Motorways" and the relevant State Building Standards (DBN), operates mainly with a classic engineering and construction approach to defining a road. It contains a list of individual structural elements - road surface, subgrade, engineering , road service facilities, road drainage structures, technical means, artificial structures, transport interchanges, etc. However, it does not form a systematic concept *of "road and transport infrastructure"* in the European sense, which covers:

Table 5. Comparison of road transport infrastructure elements (TEN-T) and Ukrainian legislation with an assessment of gaps

TEN-T component (EU Regulation 2024/1679)	State of implementation in Ukraine (laws, DBN)	Key gaps
I. Main elements (Roads)		
Infrastructure to mitigate environmental impact (fauna conservation, noise reduction)	In Ukraine, noise barriers, road drainage and water treatment facilities, sanitary facilities, green spaces, etc. are mentioned (Law of Ukraine "On Motorways", Art. 9).	There is no direct legislative provision for infrastructure requirements for fauna preservation.
II. Associated Equipment		
Digital infrastructure and ICT systems for transport (ITS, eFTI)	The Law of Ukraine "On Motorways" (Article 1) mentions engineering facilities, including technological communications and measurement of the weight and dimensions of vehicles.	There is no harmonisation with specific EU ICT systems (ITS, eFTI, ERTMS). There are no definitions of digital infrastructure and ICT systems for transport.

Weigh-in-motion (WIM) systems	The law mentions the measurement of vehicle weight and dimensions (Law of Ukraine "On Motorways" Articles 1, 9).	There is no definition of WIMs and no requirement to install them at specific intervals (≤300 km) across the entire TEN-T network.
Equipment for refuelling or recharging vehicles with alternative types of power plants	The development of electric vehicle charging stations is defined as a priority (Law No. 2956-IX, Art. 3). DBN B.2.2-12:2019 (clause 10.8.33, Appendix G.4) establishes requirements for EZS and placement intervals	There is no implementation of AFIR requirements for mandatory intervals (≤60/100 km) depending on the differentiation of motorways by strategic importance, typology and capacity of charging stations, and also requirements for hydrogen infrastructure.
Equipment for safe and secure parking SSPA, which must comply with the requirements listed in Article 8a(1) of Regulation (EC) 561/2006 and be certified in accordance with the Union standards and procedures referred to in Article 8a(2) of that Regulation	There are general concepts of rest areas (DBN V.2.3-37641918-549:2018) and road service facilities (Law of Ukraine "On Motorways", Art. 1).	There is no regulatory requirement for security, certification and maximum placement interval (≤150 km) for commercial transport.
Equipment for the levying of tolls or user charges	The Law of Ukraine "On Motorways" (Article 1) includes engineering facilities, which comprise "special structures and means designed to ensure safe and convenient traffic conditions". The Law also stipulates that motorways may be classified as toll roads on the basis of a separate law or in the case of construction (new construction, reconstruction, major repairs) and subsequent operation under concession terms. (Article 27)	In Ukrainian legislation, tolling/user charges systems are not integrated at the regulatory level as a mandatory, functional component of the TEN-T road infrastructure as "associated equipment".

The analysis shows that Ukrainian legislation **retains a conceptual difference** in the approach to defining the concept of a motorway.

Ukrainian regulations treat a road as *an engineering and construction object*, while in EU law, according to Regulation (EU) 2024/1679, it is considered *a functional transport platform that combines traffic infrastructure, energy supply, digital interaction and user services*.

As a result, the current definition ***of a "motorway"*** in Ukraine does not cover a number of mandatory components that are classified in the EU as "associated equipment" and are an integral part of the TEN-T road infrastructure.

These components include:

- infrastructure for refuelling and recharging vehicles with alternative power units (in accordance with AFIR);
- digital infrastructure and intelligent transport systems (ITS);
- safe and secure parking areas (SSPA) and rest areas;
- bus terminals.

These elements are still classified in Ukraine as separate engineering or commercial (service) infrastructure facilities, rather than as mandatory components of the road.

This approach creates a systemic gap between the Ukrainian and European models of road infrastructure management and prevents the formal recognition of Ukrainian sections as compatible with TEN-T.

1.5. Safety, sustainability and adaptation of road transport infrastructure to climate change

Regulation (EU) 2024/1679 introduces a comprehensive approach to the planning and implementation of infrastructure projects, requiring safety, climate change resilience and environmental compliance to be taken into account at all stages of the life cycle of facilities. These requirements are mandatory for Projects of Common Interest (PCI)[4] and cover both physical safety and the systemic capacity of the network to function in the face of external challenges and crises.

1. Infrastructure Resilience Criteria

According to the provisions of Regulation (EU) 2024/1679, Member States are required to increase the resilience of infrastructure to:

- climate change (heat, floods, landslides, extreme weather events);
- natural and man-made hazards (fires, accidents, pandemics);
- intentional disruptions (cyber attacks, sabotage, terrorist acts);
- geopolitical risks (disruption of logistics chains, military conflicts).

[4] Project of Common Interest (PCI) — a project of common interest to the EU, defined as an infrastructure initiative that is crucial to achieving the strategic objectives of TEN-T.

PCIs cover projects identified in Regulation (EU) No 1315/2013, Regulation (EU) No 347/2013 (trans-European energy infrastructure) and, in the field of digital networks, in Article 8 of Regulation (EU) 2021/1153 (Connecting Europe Facility).

In Regulation (EU) 2024/1679, the concept of PCI is broadened to cover any infrastructure project that contributes to the implementation of European Transport Corridors (ETCs) and the achievement of the overall objectives of TEN-T, including climate neutrality, transport continuity and digital integration of networks.

Planning takes into account not only the physical strength of an individual facility, but also its interdependence with other networks, such as energy, digital, telecommunications, etc.

2. Mandatory Climate Proofing procedure

For projects subject to environmental impact assessment (EIA) in accordance with Directive 2011/92/EU, climate proofing applies[5] . Articles 5 and 46 explicitly require climate proofing for each Project of Common Interest (PCI), including:

- assessment of CO_2 emissions throughout the project life cycle (life-cycle GHG emissions);
- assessment of risks associated with climate change (heatwaves, floods, landslides, droughts);
- integration of adaptation and mitigation measures.

Furthermore, Regulation (EU) 2021/241 on the Recovery and Resilience Facility (RRF) and Regulation (EU) 2020/852 on the taxonomy of sustainable investments require compliance with the "Do No Significant Harm" (DNSH), which requires the inclusion of climate analysis directly into the environmental approval procedure.

3. Environmental Assessment

Projects implemented as part of the TEN-T network are also subject to mandatory environmental assessment procedures in accordance with the comprehensive EU legal framework. Regulation (EU) 2024/1679 directly refers to the application of the following acts:

- Directive 2011/92/EU - Environmental Impact Assessment (EIA);
- Directive 2001/42/EC - Strategic Environmental Assessment (SEA) of plans and programmes;
- Directive 92/43/EEC (Habitats Directive) and Directive 2009/147/EC (Birds Directive) - assessment of the impact on Natura 2000 protected areas;
- Directive 2000/60/EC (Water Framework Directive) – assessment of the impact on water bodies;
- Directive 2002/49/EC (Environmental Noise Directive) – assessment of acoustic pollution.

In practice, this means that each project of common interest (PCI) must undergo a multi-level assessment of its impact on various components of the environment, using appropriate methodologies for:

- air pollution,
- noise pollution,
- impact on biodiversity,

[5] Climate Proofing is mandatory for projects whose procurement procedures for EIA were launched after 18 July 2024.

- impact on surface and groundwater,
- landscape integration.

The "Do No Significant Harm" (DNSH) principle

For projects for which EIA procurement procedures have not been initiated before 18 July 2024, an additional check for compliance with the Do No Significant Harm (DNSH) principle within the meaning of Regulation (EU) 2020/852 (Taxonomy) shall apply. This means that, even if it passes the standard EIA, a project may be deemed unacceptable if its implementation potentially violates one of the six EU environmental objectives (reducing greenhouse gas emissions, adapting to climate change, water resources, circular economy, pollution, biodiversity), and DNSH is a prerequisite for receiving EU funding, in particular through the CEF, RRF or AFIF mechanisms.

State of implementation in Ukrainian legislation and key gaps

Ukraine has declared a strategic goal of decarbonisation and transition to a sustainable transport system, but the current regulatory framework does not ensure full integration of the climate, environmental and security requirements set out in Regulation (EU) 2024/1679. The absence of climate proofing, DNSH and lifecycle infrastructure management mechanisms creates a gap between strategic goals and their practical implementation.

Table 6. Status of implementation of TEN-T environmental and climate requirements (Regulation (EU) 2024/1679) in Ukraine

TEN-T component (Regulation (EU) 2024/1679)	State of implementation in Ukraine (laws, DBN)	Key gaps
Climate Proofing	Not required as a mandatory procedure.	The concepts of *Climate Proofing* and *Climate Resilience* are not defined in legislation.
Environmental impact assessment (EIA) and GHG emissions	The EIA procedure exists (Law of Ukraine "On Environmental Impact Assessment" No. 2059-VIII).	EIA does not contain mandatory requirements for calculating greenhouse gas (GHG) emissions throughout the project life cycle. EIA focuses on local environmental impacts rather than integrated climate analysis.

Infrastructure resilience	The Law of Ukraine "On Motorways" (Article 43) directs regulation towards preventing the risks of natural and man-made disasters.	There are no mechanisms for assessing the long-term resilience of infrastructure to climate risks (floods, overheating, etc.).
DNSH (Do No Significant Harm) principle	Not implemented in national legislation.	There is no regulatory enshrinement of the principle required to obtain EU funding.
Life-Cycle Approach	Not implemented in national legislation	There is no obligation to include maintenance costs at the planning and design stage. The Ukrainian model is reactive (repair after damage occurs) rather than preventive.
Decarbonisation targets (90% reduction by 2050)	The Law "On the Fundamentals of State Climate Policy" (No. 3991-IX) sets the goal of achieving climate neutrality by 2050 and reducing emissions by 65% by 2030 (Article 4).	There are no regulations that require the integration of emission reductions into the planning and construction of road transport infrastructure.

The principle of resource efficiency and life-cycle management

Regulation (EU) 2024/1679 introduces a new conceptual approach to the planning, development and operation of TEN-T transport infrastructure, based on the principles of resource efficiency and resilience. This approach requires that the TEN-T network be designed and operated in a way that minimises resource use, ensures a high level of performance throughout the infrastructure's lifetime and complies with EU and Member State environmental legislation.

Table 7. Key components of the principle of resource efficiency and infrastructure management throughout the life cycle

Component	Essence according to TEN-T (Regulation (EU) 2024/1679)
Integrated planning	Requirement to include maintenance and calculation of costs throughout the life cycle (*maintenance over the life-time of the infrastructure*) at the construction or modernisation (reconstruction) planning stage.
Resilience	Ensuring the resilience of infrastructure to climate change, natural hazards, man-made disasters and deliberate disruptions (e.g. cyber attacks).

End-to-end quality	Maintaining a high level of service and safety in line with traffic flow throughout the infrastructure's service life.
Climate compliance	Mandatory climate *proofing* and integration of the DNSH (Do No Significant Harm) principle for all projects of common interest (PCI). This includes climate vulnerability assessment and life cycle greenhouse gas emissions calculation.
Main*tenance*	Considered a strategic tool rather than a support activity. Long-term maintenance planning is required.

This is a key difference from the Ukrainian model.

The TEN-T approach is based on the principle of the full life cycle of infrastructure (Life-Cycle Approach):

- ***"plan → build → maintain → upgrade throughout the entire service life".***

In contrast, the current Ukrainian model remains largely reactive and fragmented. It is dominated by the logic of

- ***"build → operate → repair (after wear and tear or destruction)".***

For example, the Methodology for determining the amount of funding for the construction, reconstruction, repair and maintenance of motorways (joint order of the Ministry of Infrastructure of Ukraine and the Ministry of Finance of Ukraine dated 21.09.2012 No. 573/1019) is traditionally focused on determining the cost of new construction, reconstruction, repairs and operational maintenance of public roads, as provided for in the general principles of road operation in Ukraine (Law of Ukraine "On Motorways").

The current Procedure for the allocation of funds from the State Road Fund does not, in essence, give priority to the financing of elements that the EU defines as mandatory components of the TEN-T network.

Instead, Regulation (EU) 2024/1679 requires **an** integrated **life-cycle approach (Life-Cycle Approach)** (Article 49), which stipulates that the costs of modernisation, adaptation and long-term maintenance must be included in project planning and financing.

As a result, there is no forecasting of long-term life cycle costs, which leads to uncertainty regarding the total cost of projects over their life cycle, the inability to consider project proposals for new construction or reconstruction taking into account the reduction in future operating costs and the increase in operating costs, and design and construction are separated from maintenance and renewal, which contradicts the requirements of TEN-T (Articles 5, 46, 49 of Regulation (EU) 2024/1679).

The current financial architecture of the road sector in Ukraine creates institutional and economic barriers to full integration into the European transport system, as it:

- it does not support the principle **of the life-cycle approach (Life-Cycle Approach)** to infrastructure asset management;
- it does not provide for priority funding for alternative fuel infrastructure (AFI) as a component of the transport network;
- it ignores EU requirements to improve the climate and digital resilience of road systems.

To harmonise with TEN-T policy, Ukrainian legislation must move from a reactive (repair after damage) to a preventive and integrated infrastructure management model covering its entire life cycle (life-cycle approach), where the costs of maintenance, modernisation and climate adaptation of transport infrastructure are taken into account before construction begins.

1.6. User-oriented infrastructure: AFI, WIM, rest areas and safe and secure parking areas (SSPA)

The deployment of AFI by EU Member States within the TEN-T is identified as one of the key elements in the development of the network and the implementation of the European Green Deal's transport decarbonisation objectives.

Regulation (EU) 1315/2013 only broadly declared the idea of using alternative environmentally friendly fuels (electricity, hydrogen, biofuels, etc.). Among other things, the document required that road transport infrastructure be capable of using alternative fuels based on demand and did not set any legally binding requirements for the deployment of the necessary infrastructure to ensure the smooth movement of zero- and low-emission vehicles.

Unlike the previous Regulation (EU) 1315/2013, where this component was considered within the broader concept *of "associated equipment" and this function was described as "refuelling or recharging vehicles with alternative types of power plant*, the new approach enshrined in Regulation (EU) 2024/1679 elevates its status to that of an independent component of the TEN-T road transport infrastructure (Article 29(1)(g).

According to Regulation (EU) 2024/1679 in conjunction with Regulation (EU) 2023/1804, the objective is to ensure sufficient coverage of the TEN-T network with infrastructure for alternative fuel transport, which is a prerequisite for the transition to zero- and low-emission mobility.

Table 8. Integration of AFI into the TEN-T network: comparative alignment between the provisions of Regulation (EU) 2023/1804 and Regulation (EU) 2024/1679

Reference in Regulation (EU) 2023/1804 AFIR	Correspondence in Regulation (EU) 2024/1679 TEN-T

Core network Core Network	Core Network
Comprehensive Network	Extended Core Network and Comprehensive Network

Thus, any requirements in Regulation (EU) 2023/1804 automatically apply to the relevant TEN-T network levels, including obligations regarding the spacing of charging and refuelling stations.

Key obligations of Regulation (EU) 2023/1804 regarding the deployment of AFI on the TEN-T road network (by 2030-2050)

Regulation (EU) 2023/1804 establishes mandatory distance-based targets to ensure the seamless movement of zero- and low-emission vehicles across the entire TEN-T network.

These obligations are legally binding and directly integrated into Article 30 of Regulation (EU) 2024/1679 as an element of the functional capacity of road infrastructure.

Electric Recharging Points

Regulation (EU) 2023/1804 requires the deployment of publicly accessible charging stations for both light-duty vehicles (LDVs) and heavy-duty vehicles (HDVs), ensuring defined coverage intervals.

Table 9. Parameters for the deployment of electric charging infrastructure on the TEN-T network in accordance with Regulation (EU) 2023/1804

TEN-T network level	Maximum permissible distance between charging points	Deadline for implementation
Core Network and Extended Core Network	≤ 60 km	**By 31 December 2040**
Comprehensive Network	≤ 100 km	By 31 December 2050

In accordance with Article 30(1)(h) and Article 31(1) of Regulation (EU) 2024/1679, Member States are explicitly required to ensure the deployment of AFI as an integral part of this network and focus on establishing legally binding targets and control and reporting mechanisms.

However, Regulation (EU) 2024/1679 provides for a mechanism whereby Member States may request exemptions from certain requirements, including road infrastructure requirements, in duly justified cases.

Such exemptions may be granted if:

- there are specific geographical or significant physical constraints that make it impossible to fully comply with the technical standards;
- a socio-economic cost-benefit analysis (CBA) shows that the investment is disproportionate to the expected results;
- compliance would have a significant negative impact on the environment or would be contrary to the principles of sustainable development.

Also, in the event of significant delays in the start or completion of work on TEN-T network facilities compared to the initial schedule agreed in national plans or progress reports, the European Commission has the right to request a written justification of the reasons for the delay from the Member State.

After assessing the information received, the Commission may issue formal recommendations to eliminate delays or adjust the national approach to project implementation.

Such recommendations are of a coordinating nature and are aimed at supporting the timely fulfilment of Member States' commitments, but do not automatically result in the loss of project status or funding rights.

Hydrogen Refuelling Infrastructure (Hydrogen Refuelling Stations)

Hydrogen refuelling stations (HRS) are a key component of AFIR for heavy-duty vehicles (HDV), given their range and need for rapid refuelling.

Table 10. Parameters for the deployment of hydrogen refuelling stations on the TEN-T network in accordance with Regulation (EU) 2023/1804

TEN-T network level	Maximum distance between H_2 stations for HDVs	Deadline for implementation
Core Network and Extended Core Network	≤ 200 km	**By 31 December 2040**

Regulation (EU) 2023/1804 additionally requires that electric recharging stations be located on the TEN-T road network or within 3 km driving distance of the nearest TEN-T exit, and hydrogen stations on the TEN-T road network or within 10 km driving distance from the nearest TEN-T road exit, while ensuring the possibility of refuelling both under pressure (350/700 bar) and in liquid form (LH_2), depending on the category of the vehicle.

Mandatory AFI in multimodal hubs (hubs and terminals)

Regulation (EU) 2023/1804 stipulates that AFI must be deployed not only along motorways, but also at key transport and logistics hubs. This ensures true multimodality and removes the so-called "last mile interoperability barrier".

Multimodal Freight Terminals

Multimodal freight terminals, as key intersections of road, rail and water transport, should become places of guaranteed access to AFI for commercial transport.

Deadline: By 31 December 2030.

Commitment: Each publicly accessible multimodal freight terminal operating on a non-discriminatory basis must be equipped with at least one charging station suitable for heavy-duty vehicles (HDVs) and, where appropriate, a hydrogen refuelling station for HDVs.

Location principle: The AFI must be located directly on the terminal premises or within a radius of ≤3 km.

Urban Nodes and Passenger Hubs

Urban Nodes are key points of integration between the TEN-T networks and urban transport.

Requirement of Regulation (EU) 2023/1804: Member States must ensure the availability of AFI within Urban Nodes in accordance with their status in the TEN-T network.

Multimodal passenger hubs (e.g. bus stations, railway stations, intermodal transfer centres):

By 31 December 2030, each of them must be equipped with at least one charging station designed for buses and intercity passenger transport (Article 41(1)(c) of Regulation (EU) 2024/1679).

Member States are encouraged to consider the possibility of installing hydrogen refuelling stations for buses.

General rules for the operation of AFI (access, technical requirements, digitalisation)

The AFIR requirements apply not only to the physical location of the infrastructure, but also to rules of use, compatibility and digital integration.

Non-discriminatory access

If AFI receives national or European financial support, all operators and drivers must have equal access.

The creation of monopolies, preferential tariffs or closed systems is prohibited.

Technical compatibility and digital integration

Uniform connection and payment standards: Each charging or hydrogen station must provide ad-hoc payment (without a subscription or contract).

Interoperability and roaming: Station data (power, availability, price) must be available in real time via digital platforms.

Smart charging: AFIR requires integration with energy networks (grid integration), which allows for dynamic power management depending on the time of day or load.

Ukrainian national legislation and gaps in harmonisation with AFIR and TEN-T

The Ukrainian regulatory framework is gradually converging with European approaches to the development of electric vehicle infrastructure, but it remains only partially compatible with the requirements of Regulation (EU) 2023/1804 and the integrated provisions of Regulation (EU) 2024/1679.

Despite the existence of basic legal principles and technical standards, Ukrainian legislation does not provide for comprehensive harmonisation of the quantitative, qualitative and functional parameters that are mandatory in the EU acquis.

The Law of Ukraine "On Certain Issues of Using Vehicles Equipped with Electric Motors and Amending Certain Laws of Ukraine to Overcome Fuel Dependence and Develop Electric Charging Infrastructure and Electric Vehicles" (dated 24 February 2023, No. 2956-IX) recognises the development of a network of electric vehicle charging stations as a priority of state policy in the transport sector. This law introduces an official definition of the term "electric vehicle charging station (electric charging station)" and lays the foundation for state support for electromobility.

Amendment No. 1 to DBN B.2.2-12:2019 (Appendix G.4 "Requirements for the placement of electric charging stations and charging points") details the basic technical, spatial and quality parameters for the placement of ECS along public roads starting from 1 January 2026: forming the initial basis for harmonisation with the technical requirements of Regulation (EU) 2023/1804 (AFIR) and related EU standards in the field of alternative fuels.

Table 11. Standards for the placement and capacity of EZS in accordance with DBN B.2.2-12:2019 (Appendix G.4) (from 01.01.2026)

Road category	Maximum interval	Requirements for the EZS complex (minimum)	DC power (minimum)
I (International corridors)	60 km or less	≥ 6 DC points + ≥ 12 AC points	≥ 150 kW
I (National/other international)	60 km or less	≥ 6 DC points + ≥ 12 AC points	≥ 100 kW
Category III–IV	60 km or less	≥ 2 DC points + ≥ 4 AC points	≥ 50 kW

The DBN also stipulates that the number of EV charging stations in populated areas is determined based on a calculation of no more than 5 electric vehicles per charging point. For electric heavy goods vehicles and electric buses, EV charging stations with high-power direct current (DC) charging points with a capacity of at least 150 kW should be installed.

The adoption of Amendment No. 1 to DBN B.2.2-12:2019 was one of the first steps towards creating a regulatory framework for the development of electric transport infrastructure in Ukraine and will become legally binding in the process of new construction, reconstruction or major repairs of motorways of the relevant category starting in 2026.

However, this rule is not retroactive: it does not oblige owners or balance holders of existing roads that are not subject to ongoing capital construction or reconstruction works to install EV charging stations solely on the basis of non-compliance with the 60 km interval.

Instead, the implementation of systematic coverage with charging infrastructure should be carried out in stages, in particular in accordance with:

- electric charging infrastructure development programmes provided for by Law of Ukraine No. 2956-IX (approval is expected by 31 December 2023);
- strategic planning documents, in particular the Sustainable Urban Mobility Plans (SUMP) and the National Transport Strategy (NTS), which coordinate investments in new construction and modernisation of the existing network.

Thus, the current version of the DBN provides for the phased implementation of AFIR requirements in construction and reconstruction processes, while requiring further improvement in terms of mechanisms for the mandatory retrofitting of existing roads within the TEN-T network.

In addition, despite the similarity of certain technical parameters (in particular, the interval ≤ 60 km), the current Ukrainian standards are not integrated into the three-level hierarchy of the TEN-T network (Core / Extended Core / Comprehensive). Therefore, they do not allow reporting according to the logic **of distance-based targets**[6] defined by Regulation (EU) 2023/1804 and do not provide formal recognition of Ukrainian road sections as complying with European targets.

Unlike Regulations (EU) 2023/1804 and (EU) 2024/1679, Ukrainian legislation does not contain mandatory provisions for the development of alternative fuel infrastructure at multimodal freight terminals, passenger hubs and bus terminals. The absence of such standards makes it impossible to achieve the EU's mandatory targets by 2030.

The provisions of DBN B.2.2-12:2019 on EZS at bus stations are a step forward, but they do not cover the systemic requirements of Regulation (EU) 2023/1804 on multimodality, non-discriminatory access and integration into Urban Nodes.

Although the Law of Ukraine "On Alternative Energy Sources" recognises hydrogen as an alternative energy source, no subordinate act or regulatory document defining mandatory placement intervals (≤ 200 km) or deadlines for the implementation of H_2 infrastructure has been adopted. This creates a complete lack of compliance with AFIR in terms of Hydrogen Refuelling Stations (HRS).

Despite significant progress in the development of infrastructure for electric vehicles, Ukrainian national legislation does not yet establish mandatory requirements for the implementation of smart charging technologies, the integration of charging stations into EU digital platforms, or the provision of payment compatibility and roaming, as required by Article 5 of Regulation (EU) 2023/1804 (AFIR).

There are no provisions that:

- require EES operators to provide intelligent charging management, including load balancing in power grids;

[6] Distance-based targets are mandatory minimum standards that set the maximum distance between consecutive charging/refuelling points along the TEN-T road network (Core, Extended Core and Comprehensive Networks).

- guarantee compatibility with EU digital platforms for the exchange of real-time data on the availability, status and tariffs of charging points;
- ensure the possibility of payment via terminals or contactless payment devices, which is the standard in the EU for all publicly accessible charging points with a capacity of 50 kW and above.

At the same time, the Action Plan for the Implementation of the Concept of Smart Grids in Ukraine by 2035, approved by the Order of the Cabinet of Ministers of Ukraine dated 14 October 2022 No. 908-r, it is planned to conduct a study of the impact of electric vehicles and charging systems of various capacities on the operation of power grids, a study of the involvement of electric vehicles in market structures and the operation of smart grids.

However, these initiatives are experimental in nature and are not enshrined in law as mandatory requirements for electric charging station operators.

Thus, the existing regulatory framework does not ensure the digital integration and functional compatibility of the Ukrainian charging infrastructure with the European AFIR space, which is a critical condition for Ukraine's further integration into the EU's single electric mobility market.

Regulation (EU) 2023/1804 requires that all publicly accessible charging points, especially those receiving state or European support, provide fair, transparent and non-discriminatory access for users (*publicly accessible, non-discriminatory access*). Ukrainian legislation does not currently contain similar provisions, which creates risks of restricting competition and incompatibility with EU principles.

Another significant gap in harmonisation with Regulation (EU) 2023/1804 is the lack of a legally established mechanism for the collection, processing and dissemination of data on charging and refuelling infrastructure for alternative fuel vehicles.

According to Article 20 of Regulation (EU) 2023/1804, each EU Member State is required to establish a National Access Point (NAP) that provides:

- centralised collection and storage of static and dynamic data (location, availability, connector types, tariffs, capacity, station status);
- open and non-discriminatory access to this data for users, operators, transport companies and digital services;
- integration with the EU-wide data ecosystem to ensure interoperability within TEN-T.

Currently, Ukrainian legislation does not contain provisions regulating:

- the creation of a national system for collecting data on charging and refuelling infrastructure;
- the designation of a body responsible for administering and updating such data;
- technical requirements for the format, standards of access and protection of information, in line with European directives.

According to the indicative plans of the Ministry of Energy and the Ministry of Development, the creation of **a National Access Point (NAP)** is planned **for the fourth quarter of 2028**, but these intentions are not currently supported by regulatory acts or approved technical specifications.

The absence of **a National Access Point (NAP)** hinders Ukraine's integration into the European digital ecosystem of data on alternative fuels, and the makes it impossible to fully comply with the requirements for transparency, user information and digital compatibility of the TEN-T infrastructure.

Thus, the Ukrainian legal and regulatory framework in the field of AFI covers only the initial elements of the European approach, but remains fragmented and does not ensure systematic compliance with the mandatory requirements of Regulations (EU) 2023/1804 and (EU) 2024/1679.

For full harmonisation, it is necessary to introduce a three-level TEN-T classification into the national planning system, extend the standards to multimodal nodes, define requirements for AFI and enshrine the principle of open and non-discriminatory access to charging infrastructure.

Weigh-in-Motion (WIM) systems as a mandatory element of TEN-T road transport infrastructure: requirements and deployment by 2050

Regulation (EU) 2024/1679 defines weigh-in-motion (WIM) systems as a mandatory component of the "ancillary equipment" of the TEN-T road transport infrastructure. Their implementation is seen not only as a control tool, but also as a structural component of policies to maintain road serviceability, manage freight flows and improve road safety.

Table 12. Main functions and purposes of weigh-in-motion (WIM) systems in the context of Regulation (EU) 2024/1679

Key function	Explanation
Detection of overloaded vehicles	Automatic identification of vehicles/combinations likely to exceed the permitted weight (in accordance with Directive 96/53/EC[7])
Preventive infrastructure protection and transport infrastructure lifecycle management tool	Protection against premature road surface deterioration

[7] Council Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic URL: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:31996L0053

Intelligent monitoring	WIM data is used to analyse freight traffic intensity and manage traffic flows in real time
Tolling and control tool	In the future, WIM could be integrated into toll collection or penalty systems via EETS/AFIR

Requirements for WIM deployment on the TEN-T network

Regulation (EU) 2024/1679 establishes differentiated deadlines and requirements for the deployment of WIM systems depending on the strategic level of the network.

Table 13. Installation of weigh-in-motion (WIM) systems on the TEN-T network

TEN-T network level	Implementation deadline	Deployment requirements (interval)
Core Network	By 31 December 2030	No more than **300 km** on average per Member State network.
Extended Core Network (Extended Core Network)	By 31 December 2040	no more than **300 km** on average per Member State network.
Comprehensive network (Comprehensive Network)	By 31 December 2050	no more than **300 km** on average per Member State network.

EU Member States may focus their efforts on installing WIM systems on road sections with **high intensity** of freight traffic.

In addition, the data collected from WIM, as an element of "smart enforcement", is used not only to assess the technical condition of the road surface and forecast repairs, but also to determine priorities in financing road projects and shaping safety policy and investment planning.

Thus, TEN-T is moving from selective weighing to systematic overload control across the entire network, which is a key tool for reducing road surface damage, ensuring fair distribution of infrastructure maintenance costs and improving freight transport safety.

National regulation of weigh-in-motion (WIM) systems and gaps in harmonisation with TEN-T requirements

Ukrainian legislation recognises the measurement of vehicle weight and dimensions as an element of road safety, but does not define such systems as a mandatory structural component of road transport infrastructure, as provided for in Regulation (EU) 2024/1679.

Accordingly, WIMs in the current Ukrainian regulatory framework are perceived primarily as a means of control rather than an integrated part of the road management system, which creates a significant conceptual difference compared to the European approach.

In the provisions of the Law of Ukraine "On Motorways", vehicle weighing systems are considered as elements of road engineering.

Engineering structures are special structures and means designed to ensure safe and convenient traffic conditions (lighting, technological communication, measurement of vehicle weight and dimensions, forced speed reduction, etc.).

Thus, the law does not recognise WIM systems as a separate functional element of road infrastructure that must be installed on all sections of TEN-T trunk routes, as required by Regulation (EU) 2024/1679.

In the EU approach, WIM is not only a control tool, but also a mandatory component of TEN-T "associated equipment", i.e. part of the intellectual and technological infrastructure aimed at managing traffic flows, monitoring safety and maintaining the operational suitability of roads.

The Law of Ukraine ‘On Motorways’ (Article 9) and State Building Standards "Motorways. Part I. Design. Part II. Construction" (DBN V.2.3-4:2015, as amended) establish weighing systems in motion as a component of public motorways, but they have a limited functional interpretation compared to European standards.

Section 14 ("Road Service Facilities") of DBN V.2.3-4:2015 only provides for:

- the subsection "Places for dimensional and weight control" (clause 14.6), which defines the procedure for their installation depending on the road category, traffic intensity and type of point (stationary, mobile, or automatic WIM point).
- the requirement to set up transition lanes and parking areas for vehicles whose weight or dimensions exceed the standards.

It is important to note that in previous versions of the regulations (Amendment No. 1), the terms *"preliminary dimensional and weight control"* and *"accurate dimensional and weight control"* were excluded from the list of terms, which indicates a lack of conceptual consistency in the definition of these systems.

Although subsequent amendments (Amendment No. 2) again mention automatic weighing stations in motion, the standard remains fragmentary and does not establish:

- minimum density of WIM points on national roads;
- requirements for system integration into national or European databases (interoperability);
- requirements for the transmission, processing and storage of data in digital transport platforms.

Unlike **Regulation (EU) 2024/1679**, which explicitly defines WIM systems as a mandatory component of TEN-T road infrastructure "Associated Equipment", the Ukrainian legal and technical framework considers them as an auxiliary engineering tool.

We consider that this limits the possibility of forming a comprehensive Smart Enforcement system that combines control, freight flow analytics, and road surface condition monitoring.

In order to harmonise with EU standards, it is advisable to amend the Law of Ukraine 'On Motorways' and DBN V.2.3-4:2015, defining WIM as an integrated element of road transport infrastructure, mandatory for the core and extended TEN-T networks, the minimum density of their placement, and the requirements for the transmission, processing and storage of data in digital transport platforms.

Rest areas and safe parking areas: intervals of 100/60 km, safe parking areas ≤150 km

General rest areas (Rest Areas) already existed in the legal framework of Regulation (EU) 1315/2013 and were intended to meet the basic needs of transport network users - short-term rest for drivers, access to sanitary infrastructure and parking spaces for vehicles. Their functional level was limited to meeting minimum service and sanitary standards, without an emphasis on safety or security issues.

Within the framework of road transport infrastructure operation, Regulation (EU) 2024/1679 pays considerable attention to ensuring high-quality and safe services for users, especially for commercial transport. The document sets out a clear requirement: rest areas and safe and secure parking areas (SSPA) are an integral part of the TEN-T road infrastructure and not optional service elements.

Table 14. Requirements for the spacing of rest areas depending on the level of the TEN-T network.

TEN-T network level	Maximum spacing	Deadline
Core Network and Extended Core Network	≤ 60 km	**by 31 December 2040**
Comprehensive Network	≤ 100 km	**by 31 December 2050**

Regardless of network level (Basic, Extended Basic or Comprehensive), rest areas must provide sufficient space for safe and sufficient parking and appropriate facilities, including sanitary facilities that meet the needs of a diverse workforce, particularly professional long-distance drivers.

Safe and Secure Parking Areas (SSPA)

There are stricter requirements for commercial vehicles (HGVs):

Table 15. Requirements for safe and secure parking areas

TEN-T network level	Parameter	EU requirement	Deadline
Core network (Core Network)	Location	Along the Core or Extended Core Network, or ≤ 3 km from them	**Until 31 December 2040**.

Extended core network (Extended Core Network)	Maximum interval	≤ 150 km between SSPA	
	Security criteria	Lighting, fencing/access control, video surveillance, security, facilities for drivers to rest and sanitary acilities - in accordance with Article 8a of Regulation (EC) 561/2006[8]	
	AFI integration	Mandatory charging or refuelling infrastructure in accordance with AFIR	

Although Regulation (EU) 2024/1679 does not explicitly define the certification procedure for such areas, it refers to the standards and procedures established by Regulation (EU) 561/2006 as amended, confirming the need to use certified solutions in accordance with the single European safety assessment system for parking areas.

At the same time, Regulation (EU) 2024/1679 provides for an exception for island territories, in particular Cyprus, Malta and the outermost regions, where, due to the absence of transit freight traffic, the requirement to set up safe and secure parking areas does not apply.

Interconnection with Regulation (EU) 2023/1804: deployment of alternative fuels infrastructure in rest areas (SSPA)

The requirements for safe and secure parking areas (SSPA) are directly linked to Regulation (EU) 2023/1804 on alternative fuels infrastructure (AFIR), as these areas are defined as mandatory locations for the deployment of charging stations for heavy-duty vehicles (HDVs).

Mandatory deployment of charging stations for HDVs in SSPA areas

Regulation (EU) 2023/1804 sets clear time and quantity targets for the deployment of publicly accessible charging stations specifically designed for Heavy-Duty Electric Vehicles (HDVs) in Safe and Secure Parking Areas (SSPAs).

Table 16. Requirements of Regulation (EU) 2023/1804 for the deployment of charging stations for heavy-duty vehicles (HDVs) in SSPA

Object	Term	Mandatory requirement (for HDVs)	Power
Safe and secure	Until 31 December **2027**	At least **two** publicly accessible charging stations.	Individual capacity of each station **at least 100 kW**.

[8] Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85 (Text with EEA relevance) - Declaration. URL: https://eur-lex.europa.eu/eli/reg/2006/561/oj/eng

parking areas SSPA	By 31 December **2030**	At least **four** publicly accessible charging stations.	Individual capacity of each station **at least 100 kW**.

Thus, SSPA become not only elements of traffic safety, but also important hubs for the deployment of a new generation of energy infrastructure to ensure cross-border electric mobility, supporting the transition to zero- or low-emission freight transport.

Furthermore, the interconnection between Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804 (AFIR), particularly with regard to SSPA, is systemic in nature and covers not only technical but also digital, environmental and user aspects.

Integrated requirements for alternative fuels infrastructure (AFI): digitalisation, environmental sustainability and inclusiveness in the TEN-T system

AFI, deployed on the Core and Extended Core Networks, is also considered an integrated component of the TEN-T road transport infrastructure, including digital systems, information services and accessibility standards.

Digitalisation and ICT systems

Charging infrastructure installed within SSPA rest areas must comply with the requirements of Regulation (EU) 2023/1804 on digital interoperability and functional compatibility.

Regulation (EU) 2024/1679 explicitly defines infrastructure related to AFI facilities as part of the road transport infrastructure, covering digital infrastructure and ICT systems for transport. This ensures integration with intelligent transport systems (ITS) and data exchange via **National Access Points (NAPs)**.

Information and location marking

Member States must ensure that AFI locations within SSPA along the TEN-T network are clearly marked with road signs.

This promotes navigational accessibility, reduces station search times and increases the efficiency of the charging network.

Electronic payment requirements

Publicly accessible charging stations with a capacity of **50 kW or more**, located within safe and secure parking areas or along the TEN-T, must accept **electronic payments** via terminals or devices widely used in the EU (in particular, bank cards or contactless payment systems) from **1 January 2027.**

This ensures transparency, interoperability and convenience for users from all Member States.

Green modernisation and resource efficiency

In accordance with the requirements of Regulation (EU) 2024/1679, TEN-T must be resource-efficient, promote energy transformation and the deployment of alternative fuel infrastructure, "thus contributing to decarbonisation technologies". The development of SSPA equipped with charging stations is a direct implementation of these objectives, combining safety and environmental functions.

Accessibility and inclusiveness

Regulation (EU) 2023/1804 stipulates that all charging points must be equipped in accordance with **the accessibility requirements** set out in Directive (EU) 2019/882[9] , in particular for persons with reduced mobility. This ensures that the TEN-T infrastructure is **inclusive, barrier-free** and in line with the principles of universal design enshrined in the European Accessibility Strategy.

Regulation (EU) 2024/1679 has thus transformed the concept of "Rest Areas" into a system of "Safe and Secure Parking Areas (SSPA)", turning them from an ancillary element of roadside services into a mandatory component of TEN-T infrastructure aimed at improving the safety, resilience and energy autonomy of the transport network.

SSPA are defined not only as places to rest, but as a strategic component of TEN-T safety and sustainability policy, with a dual purpose:

- ensuring safe conditions for drivers and vehicles, in particular commercial vehicles (HGV/HDV);
- to increase the resilience of transport infrastructure to security risks, including theft, vandalism, terrorist threats and emergencies.

Regulation (EU) 2024/1679 also explicitly links SSPA to other EU policies:

- Regulation (EU) 2023/1804 (AFIR) – in terms of deploying alternative fuel infrastructure specifically within certified SSPA areas;
- with provisions on military mobility – in terms of ensuring the resilience and security of logistics chains on EU transport corridors (ETCs).
- Thus, the SSPA is a new mandatory standard for EU Member States, requiring:
- the placement of such zones at specified intervals along the Core/Extended Core Network;
- security level certification (in accordance with EU Parking Security Standards);
- integration of digital monitoring, communication and payment systems;
- the possibility of installing charging stations for heavy goods vehicles (in accordance with AFIR).

Rest areas and road service areas: national standards and gaps with TEN-T requirements

[9] Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services (Text with EEA relevance). URL: https://eur-lex.europa.eu/eli/dir/2019/882/oj/eng

Ukrainian legislation, in particular the Law of Ukraine "On Motorways" and State Building Standards (GBN V.2.3-37641918-549:2018), contains basic provisions for the development of rest areas and sites along motorways. At the same time, Ukraine's approach differs significantly from the European one in terms of integrating such areas into the TEN-T system and ensuring the safety and security of users, which are key requirements of Regulation (EU) 2024/1679.

Thus, the Law of Ukraine "On Motorways" classifies rest areas as road service facilities, defining them as auxiliary infrastructure rather than a functional element of the transport network.

According to GBN V.2.3-37641918-549:2018, a "rest area" is defined as *"a road structure for short-term rest, including a parking area, a rest area and sanitary facilities (in accordance with DSTU B A.1.1-100)".*

A "rest area" is *a plot of land within a rest area within the right-of-way of motorways with green spaces, intended for the organised rest of road users and equipped with engineering communications and amenities for their maintenance.*

Ukrainian legislation, including the Law of Ukraine "On Motorways" and DBN/GBN, regulates rest areas, but critically does not meet the TEN-T requirements for SSPA.

Table 17. Comparison of the requirements of Regulation (EU) 2024/1679 on safe and secure parking areas (SSPA) with the provisions of Ukrainian legislation

Component	Requirements Regulation (EU) 2024/1679	Corresponding provisions of Ukrainian legislation	Conformity assessment
Classification	Road infrastructure component, including SSPA (Article 29(1)(h)).	Law of Ukraine "On Motorways" (Article 1), DBN/GBN V.2.3-37641918-549:2018. are considered as **road service facilities**.	**Partially compliant** (there are common rest areas equipped with green spaces, engineering communications and sanitary facilities).
SSPA (Definition)	*Safe and Secure Parking Area* - a certified parking area for commercial vehicles that meets EU safety requirements. (Article 3(39))	National legislation **does not contain** such a definition.	**Not harmonised**.
Placement intervals	Core/Extended Core: 60 km (Rest Areas), **150 km** (SSPA).	GBN B.2.3-37641918-549:2018: 15–20 km (Categories I–II) 20–30 km (Categories III–IV). Ukrainian standards set shorter intervals for general parking areas, but not for SSPA.	**Partially compliant** (only in terms of distance to common areas).

SSPA mandatory	Mandatory deployment on Core/Extended Core Network by **31 December 2040**.	No requirement.	**Not harmonised**.

Thus, unlike the requirements of Regulation (EU) 2024/1679, Ukrainian regulations treat rest areas exclusively as an ancillary service facility, without establishing mandatory requirements for their functional safety, accessibility for commercial transport or integration with digital management systems.

According to GBN V.2.3-37641918-549:2018, national standards provide for shorter intervals between rest areas than those established in the TEN-T system. Although formally the density of rest areas in Ukraine is higher, this does not mean that they comply with TEN-T standards.

Ukrainian sites do not provide an adequate level of safety, security and service support for commercial transport (especially for heavy-duty vehicles), as required by Article 8a(1) of Regulation (EC) 561/2006 and Regulation (EU) 2024/1679.

Furthermore, there are no defined criteria for safety certification, requirements for lighting, video surveillance, sanitary facilities, digitalisation or alternative fuel infrastructure (AFI).

There are no provisions for the integration of such areas into the TEN-T network or their designation as mandatory elements in the design of Category I-II roads of international importance.

Thus, even despite the greater density of rest areas, Ukrainian standards do not ensure their functional compliance with European SSPA, which creates a legal and institutional gap between national standards and TEN-T/AFIR requirements.

1.7. Urban Nodes and Sustainable Urban Mobility Plans (SUMP): integration by 2027

Regulation (EU) 2024/1679 defines *Urban Nodes* as strategic territorial elements of the TEN-T transport system that serve as integration centres between different modes of transport – road, rail, public and freight. Their role is to ensure effective interaction between urban mobility, freight logistics and TEN-T networks.

While in the previous Regulation (EU) 1315/2013, the concept of *Urban Nodes* was mainly considered as a guideline for the development of sustainable transport policy, Regulation (EU) 2024/1679 transforms these guidelines into legally binding requirements and strategic points where long-distance transport connects with regional and local mobility, ensuring the connectivity of the transport system at different levels.requirements and strategic points where long-distance transport connects with regional and local mobility, ensuring the connectivity of the transport system at different levels.

Urban nodes are key centres for the implementation of Regulation (EU) 2023/1804, as it is within their boundaries that the largest transport flows, multimodal hubs and logistics terminals are concentrated.

Regulation (EU) 2024/1679 explicitly sets out the obligations of Member States to deploy AFI within urban nodes, in accordance with the provisions:

- ensuring the availability of alternative fuel infrastructure within urban nodes;
- equipping multimodal passenger hubs with charging stations for buses and freight terminals with high-power charging stations for heavy-duty vehicles (HDVs).

Thus, *Urban Nodes* become centres for the decarbonisation of the transport system, combining TEN-T objectives with the environmental requirements of AFIR. They form the basis for the development of intelligent, sustainable and climate-neutral urban mobility, which is a key element of the European Green Deal.

An Urban Node includes TEN-T transport infrastructure passing through urban areas (in particular *bypasses*) as well as *access points* where Member States are required to deploy AFI in accordance with the AFIR Regulation and which must be open to all operators and users on a non-discriminatory basis. Such mandatory points include seaports, airports, rail and bus terminals, and multimodal freight terminals. It is also stipulated that they must integrate AFI into the urban mobility system, including the provision of charging stations for buses and, potentially, hydrogen refuelling points for intercity transport. In addition, Member States are encouraged to deploy charging/refuelling infrastructure in passenger hubs to support the development of sustainable multimodal mobility.

The cities that form the centre of the TEN-T urban node are listed in Annex II to the Regulation. To be included in the network, a city must meet one of the following criteria:

- have a population of at least 100,000 inhabitants;
- or, if there is no such city in the *NUTS 2* region, act as the main hub of that region.

Thus, urban nodes are determined not only by demographic indicators, but also by the territorial balance of TEN-T development. They ensure the integration of different levels of mobility and act as key platforms for innovation in the transport sector.

Sustainable Urban Mobility Plans (SUMP): content, data, deadline 31.12.2027

Regulation (EU) 2024/1679 significantly enhances the legal status and binding nature of *Sustainable Urban Mobility Plans* (*SUMP*), transforming them from a recommendatory tool into a mandatory element of the TEN-T legal framework.

While the previous Regulation (EU) 1315/2013 viewed urban nodes primarily as connection points where sustainable transport solutions were recommended, Regulation (EU) 2024/1679 makes SUMPs a legally binding instrument.

From now on, SUMPs are directly relevant to the achievement of pan-European goals in the following areas:

- decarbonisation of urban transport;
- integration of AFI into transport planning;
- improving the quality of urban life by reducing noise, emissions and transport congestion.

A key change is the setting **of** a clear deadline **– 31 December 2027** – for the adoption of SUMPs in each urban node identified within the TEN-T network.

*SU*MP must be a long-term, comprehensive and integrated plan for freight and passenger mobility for the entire functional *urban area*, particularly in commuting *zones*, and the creation of safe, high-quality and sustainable *low- and zero-emission mobility* for people, businesses and goods. It may include targets, objectives and indicators that define both the current and future performance of the urban transport system.

In addition, EU Member States are required to ensure:

- the collection, processing and reporting of mobility data necessary for monitoring transport flows and the accessibility of urban nodes;
- the integration of digital platforms for analysing mobility data, in particular data related to public transport, cycle routes, pedestrian flows and charging infrastructure for electric transport.

The cities that form the centre of each TEN-T urban node are listed in Annex II to Regulation (EU) 2024/1679. To be included in this network, a city must have a population of at least 100,000 inhabitants or, if there is no such node in the relevant ***NUTS 2*** region, be the main node of that region. The definition of urban nodes also combines the demographic criterion with the territorial balance of the network. Thus, *NUTS 2* serves as a mechanism for ensuring balanced coverage of the TEN-T network. In practice, this means that even less populated or peripheral regions get their strategic entry points into the TEN-T, which is in line with the EU's objectives of cohesion and accessibility.

Regulation (EU) 2024/1679 also stipulates that SUMPs must take into account their impact on the TEN-T as a whole, ensuring unimpeded transit, bypasses and connections through and around urban nodes. This means that Urban Mobility Plans are becoming not only a local but also a European tool for increasing network capacity, reducing congestion and enhancing multimodality.

Thus, SUMPs are not only a local planning tool, but also a key element in the integration of urban transport systems into TEN-T. They ensure the coordination of urban mobility with European transport flows, support multimodality, promote the development *of* alternative fuels infrastructure and help achieve the goals of the European Green Deal. This makes them an essential tool for the effective functioning of TEN-T at local and pan-European levels.

Table 18. Member States' responsibilities for integration and planning in Urban Nodes.

Requirement/Criterion	Deadline	Purpose
Adoption and monitoring of SUMP	31 December 2027	Sustainable Urban Mobility Plan (SUMP) for each urban node. Should integrate different modes of transport and promote sustainable modal shift.

AFI	Indefinite	Ensuring the availability of charging/refuelling infrastructure for alternative fuels in accordance with Regulation (EU) 2023/1804.
Charging stations for buses	31 December 2030	Multimodal passenger hubs must be equipped with at least one charging station for buses.
Multimodal freight terminal	31 December 2040	Development of at least one terminal, if none exists, subject to a positive CE analysis.
Data collection	31 December 2027	Collection and submission of mobility data (sustainability, safety, accessibility) to the EC.

Context of Ukrainian legislation and harmonisation gaps

Ukrainian legislation recognises the strategic importance of integration into the European transport area and the development of sustainable mobility, but the current regulatory framework remains only partially aligned with the mandatory requirements of Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804.

Despite the existence of strategic guidelines, there are no clear legal mechanisms, definitions or institutional instruments to ensure full compliance with European standards ( ) on Urban Nodes, Sustainable Urban Mobility Plans (SUMPs) and Alternative Fuels Infrastructure (AFI) integration.

The updated National Transport Strategy of Ukraine until 2030 (NTS), approved by CMU Resolution No. 1550 (2024), defines the integration of Ukraine's transport system into the TEN-T network as one of the key priorities of state policy. The document also focuses the development of the sector on the fulfilment of climate commitments and the principles of transport decarbonisation.

The Operational Plan for the implementation of the NTS for 2025-2027 includes measure 96 - the development and approval of Sustainable Urban Mobility Plans in cities with a population of over 50,000 by 2027. This initiative is the first step towards systematising urban transport planning, but it is advisory rather than mandatory and does not cover the TEN-T requirements for the classification of urban nodes. Furthermore, the development of such plans is not legally binding, whereas in the EU it is a requirement on which access to funding depends.

At the same time, national legislation does not contain definitions of **"Urban Node"** and **"SUMP"** within the meaning of Article 3(1)(13) of Regulation (EU) 2024/1679.

Table 19. Legal status of Urban Nodes

EU requirement	Provisions of Ukrainian legislation (laws/DBN)	Compliance assessment
Definition of "Urban Node"	There is no direct definition **of "Urban Node"** in the Law of Ukraine "On Motorways" or the Law of Ukraine "On Regulation of Urban Development". The term **"Transport**	**Not harmonised**.

	Transfer Node" (TTN) is used**,** which focuses on passenger flows and pedestrian accessibility (up to 200 m).	
Population criterion (100,000+)	Not included in legislation.	**Not harmonised**.
Non-discriminatory access	The requirement is not enshrined in law for all modes of transport, although it is mentioned for seaports (Law of Ukraine "On Seaports of Ukraine", Article 4).	**Partially compliant**.

Table 20. Legal status of SUMPs and their implementation

EU requirement	Provisions of Ukrainian legislation (NTS / Operational Plan)	Compliance assessment
Adoption of SUMPs by 31 December 2027.	The NTS Operational Plan contains measure No. 96: Sustainable urban mobility plans developed and approved in cities with **a** population **of over 50,000** by 2027, *taking into account TEN-T urban planning*.	**Partially compliant**. The 2027 deadline is the same, but the population threshold (50,000) is lower than the European one (100,000).
Compliance with Annex V (Guidelines, integration, zero emissions).	The need to take into account the Guidelines of Annex V to the Regulation is a challenge that needs to be reflected in national legislation.	**Not harmonised** (requires further detail in the SUMP).

At the same time, **the Urban Node** model in TEN-T covers a comprehensive system that includes logistics, energy, digital and climate aspects, in particular AFI infrastructure, secure parking, multimodal terminals, etc.

Ukrainian legislation does not contain direct provisions on:

- the installation of charging stations for buses in multimodal passenger hubs by 2030 (Article 41(1)(c) TEN-T);
- the deployment of AFI for heavy goods vehicles at freight terminals (HDV Freight Terminals) (Article 38 TEN-T).

Currently, there is no obligation to collect and submit data on mobility in terms of sustainability, safety and accessibility, as well as data breakdown by age, gender and disability, a requirement explicitly enshrined in Article 41(1)(b) of Regulation (EU) 2024/1679.

Without this, it is impossible to report properly to the EC and assess the effectiveness of SUMP implementation.

1.8. Projects of Common Interest (PCI), dual-use infrastructure and third-country risk protection mechanisms

Regulation (EU) 2024/1679 radically updates the approach to the identification, assessment and implementation of Projects of Common Interest (PCI) compared to the previous Regulation (EU) 1315/2013. Whereas economic viability was previously the main criterion for selecting PCIs, sustainable development, climate resilience and infrastructure security are now central. Projects of Common Interest (PCI) are transnational in nature and involve the participation of several countries (EU Member States and/or neighbouring third countries). Regulation (EU) 2024/1679 emphasises that cooperation with third countries, in

particular neighbouring countries, is an essential condition for ensuring the continuity and interoperability of the European Union's transport network. This cooperation aims, among other things, to create a coherent transport area between the EU and partner countries, including Ukraine, Moldova and Georgia.

Such projects cover the entire life cycle, from preparatory technical and economic feasibility studies and permit procedures to construction, operation, maintenance and subsequent evaluation of results. Unlike traditional infrastructure initiatives, PCIs are not limited to "construction" in the narrow sense: they include all measures that can improve the resource efficiency, sustainability and interoperability of the transport network.

PCIs can be implemented at all three hierarchical levels of the TEN-T: the Core Network, the Comprehensive Network and the Comprehensive Network. Thus, their status does not depend solely on their geographical location, but is determined primarily by their contribution to achieving European added value (EAV). In addition, the requirements for demonstrating EAV in the new Regulation (EU) 2024/1679 have become more structured and linked to four strategic objectives. EAV is manifested not only in improving cross-border mobility or eliminating infrastructure bottlenecks, but also in creating a high-quality, resilient and multimodal transport network that increases the efficiency, cohesion and user-friendliness of the transport system across the EU.

Thus, the new Regulation (EU) 2024/1679 uses the concept of the TEN-T not only as a tool for prioritising international connections, but also as **a mechanism to ensure that investments are in line with the EU's climate and digital ambitions.**

A key condition for the approval of PCIs is proving their economic viability. To this end, it is mandatory to conduct a socio-economic cost-benefit analysis using a recognised European methodology. Regulation (EU) 2024/1679 also allows for a more flexible approach for projects located in sparsely populated regions or those with dual-use significance (in particular for military mobility). In such cases, priority is given not so much to direct financial return as to the contribution to social cohesion, strategic resilience and security integration of the network.

Separately, there is an obligation to ensure the environmental compliance of PCIs. For projects subject to an environmental impact assessment (EIA), an additional climate resilience verification procedure is introduced. It includes an analysis of vulnerability to climate risks, planning of adaptation measures, and consideration of the cost of greenhouse gas emissions in the overall cost-benefit calculation. In addition, the Regulation requires compliance with the "do no significant harm" (DNSH) principle defined in the EU Taxonomy Regulation. Thus, PCIs are recognised not only as transport projects but also as elements of climate policy.

Thus, the concept of PCI within TEN-T goes far beyond the traditional understanding of infrastructure construction. These are not just "projects" but integrated policy instruments that simultaneously perform transport, economic, environmental and security functions. For Ukraine, as a candidate country, this means the need to introduce a similar mechanism at the national level for identifying, selecting and certifying projects of common interest (to EU Member States and/or neighbouring third countries), taking into account the requirements for socio-economic analysis, environmental compliance and climate resilience. Only in this case

will Ukrainian infrastructure projects be formally recognised as part of European transport corridors and gain access to funding under the CEF, Military Mobility or other EU instruments.

Table 21. Key requirements for PCI projects, which form the basis for the development of the TEN-T network.

PCI criterion / Requirement	Detailed requirement	Conditions of application/Terms
Project life cycle	PCI covers its entire cycle: feasibility studies, authorisation procedures, construction, operation, maintenance and evaluation.	Covers the entire life of the project.
Economic viability	The project must be economically viable based on a socio-economic cost-benefit analysis (Socio-economic CBA). The analysis takes into account social, economic, health, climate and environmental benefits/costs.	Required for all PCIs; for sparsely populated areas/dual-use projects, a positive contribution to network development is sufficient.
DNSH principle	The project must comply with the Do No Significant Harm (DNSH) principle within the meaning of the Taxonomy Regulation (EU) 2020/852.	Applies to projects for which the procurement process for environmental assessment was not initiated before 18 July 2024.
Climate Proofing	Mandatory check, including assessment of vulnerability to climate change and risks (including adaptation measures) and integration of GHG emissions costs into the CE analysis.	Applies to PCIs for which an environmental impact assessment (EIA) is required in accordance with Directive 2011/92/EU. Does not apply if the procurement process for the EIA was initiated before 18 July 2024.
Security	Measures to protect TEN-T infrastructure from risks related to security or public order, in particular with regard to the participation of third-country companies.	Assessment of potential risks.

State of implementation in Ukrainian legislation and proposals

Currently, Ukrainian legislation lacks a legal mechanism for identifying, supporting and authorising Projects of Common Interest (PCI) as provided for in Regulation (EU) 2024/1679. This creates a systemic gap for the integration of Ukrainian infrastructure initiatives into TEN-T mechanisms and limits access to EU funding.

Current Ukrainian legislation does not contain a definition **of a "project of common interest"** within the meaning of Article 3(41) of Regulation (EU) 2024/1679. This makes it impossible to officially recognise Ukrainian projects as belonging to the TEN-T priority network.

The legislation also does not define the procedures for initiating, agreeing, supporting and approving (authorising decision) projects that can be classified as PCI. There are no evaluation criteria, inter-agency coordination mechanism or institutional responsibility.

The legislation governing design does not provide for mandatory requirements for the content of project dossiers for infrastructure projects.

- socio-economic cost-benefit analysis (CBA);
- Climate Proofing;
- assessment of dual use of infrastructure in the context of military mobility (Article 57 of Regulation (EU) 2024/1679).

Thus, Ukrainian projects, even potentially strategic ones, cannot be legally formalised as PCIs without the creation of an appropriate national mechanism.

Inconsistency of environmental procedures (EIA vs. Climate Proofing)

The Ukrainian environmental assessment system currently focuses on local environmental aspects, while Regulation (EU) 2024/1679 requires an assessment of climate risks and infrastructure resilience throughout the entire life cycle.

The Law of Ukraine "On Environmental Impact Assessment" (No. 2059-VIII) focuses on assessing direct impacts on the environment (flora, fauna, water, soil, landscape).

In addition, the EIA procedure does not include requirements for:

- calculation of greenhouse gas (GHG) emissions throughout the project life cycle;
- assessing the vulnerability of the facility to projected climate change;
- assessing compliance with the "Do No Significant Harm" (DNSH) principle.

According to Articles 5 and 46 of Regulation (EU) 2024/1679, all TEN-T projects must undergo climate proofing — a process of assessing resilience, climate risks, and the potential to mitigate climate change.

Due to the absence of these provisions, Ukrainian infrastructure projects, even after passing the EIA, do not meet the EU's climate adaptation requirements and are not eligible for funding from the CEF or InvestEU.

Military mobility and dual-use infrastructure: TEN-T requirements and mechanisms to protect against third-country risks.

European law distinguishes between the principle of dual use and dual-use infrastructure. This distinction is important for harmonising Ukraine's national legislation with the requirements of Regulation (EU) 2024/1679, particularly in the context of developing the TEN-T network and integrating it into the Military Mobility initiative.

The dual-use principle is a conceptual planning requirement that provides for the adaptation of transport infrastructure so that it can be used for both civilian and defence purposes without the need to create separate networks.

This principle is reinforced in the new Regulation (EU) 2024/1679, as it facilitates the rapid movement of military personnel, materials and equipment necessary for training, force deployment or crisis response within the EU and neighbouring regions.

Dual-use infrastructure is a physical transport network (roads, bridges, terminals, hubs) that meets both the civil and defence needs of EU Member States. It must be designed, built and operated taking into account the requirements for load capacity, dimensions, safety and strategic mobility of military units.

Regulation (EU) 2024/1679 amends the requirements relating to PCI and infrastructure in general, directly integrating military **mobility** and protection against geopolitical risks, which was absent from Regulation (EU) 1315/2013.

This change is a direct response to the new geopolitical context caused by Russia's aggression against Ukraine, which highlights the need to increase the EU's resilience and strategic autonomy.

The full-scale Russian invasion of Ukraine has revealed a number of shortcomings in the European transport system. In particular, Ukraine's exports by land transport have been hampered by insufficient border crossings, congested roads and differences in railway track gauges.

This EU initiative aims to ensure the rapid and uninterrupted movement of military personnel, material and equipment both within and outside the Union. The main goal is to create conditions for rapid movement on a large scale in the shortest possible time, which is strategically important in the current security environment.

Following Russia's unprovoked aggression against Ukraine, the European Commission, together with the High Representative, adopted the Military Mobility Action Plan 2.0. This document sets out new priorities for adapting infrastructure, increasing its capacity and ensuring that the network is ready for simultaneous use by civilian and military structures.

To support the implementation of this Action Plan, the EC is using dual-purpose financing instruments, including:

Connecting Europe Facility (CEF) – funding for dual-use transport infrastructure projects that improve both civil and military mobility. Expenses within these projects are covered only to the extent necessary to achieve dual use**.** If the measures go beyond this objective (e.g., include exclusively military functions), such expenses may be considered acceptable only to the extent that they directly ensure dual use – civil and defence at the same time.

European Defence Fund (EDF) - support for the development of compatible logistics solutions, digital systems and innovative technologies that promote the integration of defence and transport capabilities.

The development of TEN-T provides for the integration of dual-use requirements, whereby infrastructure must meet the needs of both the civil and defence sectors. Particular emphasis is placed on routes necessary for the rapid and large-scale movement of military forces, which is crucial in the context of contemporary geopolitical threats. This also allows

for the optimisation of resources, the avoidance of duplicate investments and the enhancement of the strategic resilience of the network.

Projects of common interest (PCIs) should maximise synergies with military infrastructure, in particular taking into account the provisions of the document "Military Requirements for Military Mobility within and beyond the EU", approved by the Council on 26 June 2023 and 23 October 2023[10] . This means that the planning and modernisation of TEN-T facilities must take into account their potential role in military mobility, which strengthens the EU's ability to respond to crisis situations.

Also, when planning, building, or upgrading TEN-T facilities that overlap with **the military transport network**, Member States should consider the need and usefulness of going beyond the standard technical requirements set out in Chapter III of Regulation **(EU) 2024/1679**. This approach aims to ensure that the infrastructure can be used to move military transport, including heavy equipment, large vehicles and materials.

In this way, the military mobility initiative creates synergies between EU transport and defence policies, increases the resilience of the TEN-T and contributes to the development of an integrated infrastructure capable of functioning effectively in both peacetime and crisis situations.

Regulation (EU) 2024/1679 also provides for special mechanisms to protect against external risks that may arise from the participation or investment of undertakings of a third country in strategic TEN-T projects, in particular projects of common interest (PCI). Member States are required to conduct a systematic assessment of security and public order in cases where foreign companies are involved in the development of critical infrastructure. Particular attention is paid to sectors of increased strategic importance, such as ports, airports and container terminals, as excessive presence of third countries in these areas could undermine the security and resilience of the EU. In this way, Regulation (EU) 2024/1679 directly combines infrastructure development tasks with **risk assessment** tools, forming preventive legal guarantees to protect strategic TEN-T facilities from geopolitical and security threats.

Comparative analysis with Ukrainian legislation and problematic aspects of harmonisation in the field of military mobility and infrastructure security

The analysis shows that Ukrainian legislation partially recognises the defensive function of motorways, but does not contain an integrated Dual-Use model and preventive control mechanisms provided for by the EU.

Table 22. Schematic representation: Key differences (Ukraine vs. EU)

Aspect	EU (Regulation (EU) 2024/1679)	Ukrainian legislation (Law of Ukraine "On Motorways")

[10] Military Requirements for Military Mobility within and beyond the EU. URL: https://share.google/l0Gbj02Apvfu41gFe

Definition	Mandatory concept **Dual-Use Infrastructure** (combination of civil and military needs, Art. 4, 48).	Recognition of **motorways of defence significance** (Article 5-1).
Design	**Preventive integration:** Designing with military standards in mind (loads, dimensions, bridge load capacity) at the planning stage.	**Reactive function:** Use of existing roads for military transport and evacuation *in a state of martial law*.
Security screening (Third countries)	**Mandatory preventive mechanism** (Security Screening) for foreign investors/operators in critical TEN-T infrastructure (Article 49).	**Absence:** No specific provisions for the control of foreign legal entities (especially from aggressor states).
Institutional participation	Mandatory consideration of " Military Requirements " (Military Requirements for Military Mobility) and involvement of the defence sector.	No direct requirement to involve the Ministry of Defence/General Staff in the approval of civil concessions or investment agreements on TEN-T roads.

1.9. TEN-T financing and coordination mechanisms: CEF and the role of European coordinators

The development of TEN-T in accordance with Regulation (EU) 2024/1679 is based on a combination of EU financial support and national resources, with a key role played by instruments that promote investment in strategic infrastructure projects.

The main financial instrument is the Connecting Europe Facility (CEF) (established in 2014, current framework - Regulation 2021/1153 (CEF-2) – an EU funding instrument that promotes economic growth, job creation and competitiveness through targeted investments in infrastructure, in particular transport, and provides financial assistance (Union financial assistance) to projects of common interest (PCI).

In addition to the CEF, other EU programmes and mechanisms are used to finance the network, including InvestEU, the Recovery and Resilience Facility, Cohesion Policy, Horizon Europe, the Innovation Fund, as well as instruments of the European Investment Bank (EIB) and the Technical Support Instrument.

PCI projects that contribute to the development of TEN-T, including new infrastructure facilities that have been granted PCI status through a delegated act, are eligible for financial assistance. At the same time, projects excluded from the network lose their eligibility for funding from the date of entry into force of the relevant act. Particular priority is given to cross-border projects that significantly improve connections between Member States or with third countries.

For the purposes of financing through the CEF, EU Regulation 2024/1679 has clarified the terminology: the term " " is now interpreted as " "; "motorways of the sea" as "European

Maritime Space"; "telematic applications" as "ICT systems for transport"; and references to the "Core Network" also cover the "Extended Core Network".

European coordinators play an important role in the financial process, advising the Commission on the examination of funding applications, verifying the compliance of projects with transport corridor work plans, and preparing annual status reports that reflect progress and identify necessary investments.

The Regulation separately emphasises the importance of cooperation with third countries, which can be carried out through PCI to integrate their infrastructure networks with TEN-T. At the same time, the Regulation explicitly states that such cooperation does not entitle the Union to contribute financially to projects outside the EU, unless otherwise specified in other legal acts.

This means that even though the infrastructure networks of neighbouring countries such as **Ukraine, Moldova and Georgia** are included in the TEN-T indicative maps (Annex IV), **the mere fact of such integration or cooperation does not automatically entitle them to funding from the EU budget**. EU financial support under TEN-T is primarily intended for Member States, while neighbouring countries can only be involved indirectly through specific cooperation instruments or special assistance programmes.

The CEF is also open to third countries associated with the CEF. Legal entities established in a third country not associated with the CEF may only receive EU financial support if it is indispensable for achieving the objectives of a specific PCI (Article 9(44) of the CEF Regulation).

Ukraine is involved in attracting CEF funds and international technical assistance for the modernisation of border infrastructure, which directly concerns ETCs (in the context of "Solidarity Routes"). First and foremost, this concerns funding (CEF 2022 and CEF 2023 projects) aimed at modernising and electrifying railway infrastructure, particularly in areas that ensure interoperability (1435 mm gauge) and the expansion (modernisation) of border crossing points - construction of a new bridge crossing over the Western Bug River, major repairs to the M-09/M-10 roads with the construction of parking areas for freight transport (service areas) in the Lviv region, development of parking/service areas at the Reni border crossing point (Odesa region), etc. Ukraine can also participate in projects that support the deployment of alternative fuel supply infrastructure under the Alternative Fuels Infrastructure Facility (AFIF) mechanism.

Despite these successes, full access to CEF funding requires Ukraine to implement an internal legal mechanism for determining PCI and harmonising environmental, technical and digital standards, which is currently lacking.

ETCs management and coordination mechanisms

ETCs are managed through a defined institutional architecture that ensures coordinated strategic, technical and political management of their implementation. **European Coordinators** and **Corridor Forums** play a key role in this system, ensuring continuous

dialogue between the European Commission, Member States, operators, investors and, where appropriate, neighbouring countries, including Ukraine.

The European Commission appoints a European Coordinator for each ETCs, as well as for horizontal priorities such as the European Rail Traffic Management System (ERTMS) and the European Maritime Space. The coordinator is appointed by agreement between the Member States, after consulting the European Parliament, the Council and, where appropriate, neighbouring countries.

Thus, Commission Decision (EU) 2025/1874 of 12 September 2025, which amends Decision (EU) 2024/2383, appointed European coordinators for the European transport corridors — **Atlantic, Rhine-Danube and Baltic Sea — Black Sea — Aegean Sea** — and set out detailed mechanisms for the implementation of their mission and tasks for a four-year term.

The European Coordinator acts on behalf of and on the instructions of the EC, ensuring the coordinated implementation of the corridor in accordance with the requirements of Regulation (EU) 2024/1679.

The main functions of the coordinator are:

- ensuring coordination between Member States and neighbouring countries within a specific corridor;
- monitoring the status of projects and identifying bottlenecks and missing links;
- coordinating the integration of multimodality, military mobility and alternative fuel infrastructure (AFI) elements.

Each coordinator develops **Work Plans**, which contain a detailed analysis of the status of project implementation within the corridor, determine the level of compliance with the requirements of the Regulation, form a roadmap for removing obstacles and set priorities for further development.

The Work Plan is agreed with the Member States concerned, and formal consultations are held with third countries (in particular Ukraine).

European coordinators prepare an Annual Status Report **on the implementation of the corridor**, which is submitted to the European Parliament, the Council and the Commission. These reports are the main analytical tool for assessing progress, identifying priority investments and ensuring political accountability.

The European coordinator is assisted by **the Corridor Forum**, an officially established advisory body chaired by the coordinator.

The Corridor Forum comprises representatives of Member States, infrastructure managers, rail freight management bodies and, where appropriate, representatives of port authorities and related sectors.

The Corridor Forum serves as a permanent platform for technical and political dialogue, promoting the coordination of strategies for transport infrastructure development, digitalisation, safety, multimodality and climate resilience.

The Coordinator may decide to set up thematic working groups focusing on areas such as:

- interoperability of railway infrastructure (ERTMS, TAF/TAP-TSI);
- introduction of new technologies and intelligent transport systems (ITS);
- cross-border cooperation and removal of administrative barriers;
- development of urban nodes and interaction with third countries, including Ukraine.

Ukraine's participation in Corridor Forums and consultations with European coordinators is important for ensuring institutional integration into the TEN-T network.

In particular, this will enable:

- coordinate planning and investment in infrastructure in accordance with the requirements of the Core and Extended Core Network;
- ensure that Ukrainian priorities are taken into account in the Work Plans of the European transport corridors;
- receive technical assistance and funding under the Connecting Europe Facility (CEF) and Military Mobility programmes.

Thus, ETCs are a tool for achieving the long-term strategic goals of TEN-T. Their key function is to ensure continuity of movement, eliminate bottlenecks and fill in the missing links at the borders between Member States, which have historically been the biggest obstacle to the EU single market.

European Transport Corridors (ETCs) perform several systemic functions at once. First, they ensure modal integration by obliging states to develop links between environmentally friendly modes of transport – rail, inland waterways and seaports. Secondly, they set interoperability requirements, particularly for signalling systems, dimensions, load capacity and digital standards. Thirdly, they act as a platform for the implementation of innovations and digital services (ERTMS, ITS), as well as a framework for the deployment of alternative fuel infrastructure provided for in the AFIR Regulation.

The three-level structure of TEN-T — **Core Network (by 2030), Extended Core Network (by 2040) and Comprehensive Network (by 2050)** — provides a time horizon for project planning.

To take measures to ensure that the transport infrastructure included in the ETC complies with the requirements of Regulation (EU) 2024/1679:

- **by 31 December 2030** for ETC infrastructure that is part of the Core Network;

- **by 31 December 2040** for ETC infrastructure that is part of the extended core network.

1.10. Digitalisation and deployment of ICT systems for transport

Digitalisation and the deployment of information and communication technologies (ICT) is a cross-cutting priority in EU policy, enshrined in Regulation (EU) 2024/1679 as a key tool for improving the efficiency, safety and resilience of the TEN-T transport system. These systems should ensure the optimisation of operations, reduction of congestion and emissions. ICT systems for transport (Article 3(15) of Regulation (EU) 2024/1679) cover both physical infrastructure and digital systems. They enable the processing, storage and exchange of data and information necessary for the efficient management of infrastructure, mobility and traffic in the TEN-T network. The aim of these systems is to ensure **the reliable, safe, environmentally friendly and efficient use of network capacity**. They should also facilitate seamless communication between infrastructure and mobile assets.

Requirements for the systematic implementation of ICT solutions apply to Core, Extended Core and Comprehensive networks and define the list of mandatory ICT solutions (Article 43(2) Regulation (EU) 2024/1679, the list of mandatory ICT solutions includes:

- ERTMS (European Rail Traffic Management System) for rail transport;
- RIS (River Information Services) for inland waterways;
- VTMIS (Vessel Traffic Monitoring and Information System) and EMSWe (European Maritime Single Window environment) for maritime transport;
- ITS (Intelligent Transport Systems) for road transport;
- eFTI (electronic Freight Transport Information) for multimodal transport.

More details on **ITS (Intelligent Transport Systems)** for road transport, taking into account the functioning of AFI, will be discussed in the next section.

In addition, Regulation (EU) 2024/1679 stipulates that urban centres should promote the wider deployment of ICT tools and open access intelligent transport systems to optimise vehicle routes, improve traffic management, reduce congestion and air pollution.

Also, multimodal freight terminals that are part of the network must be equipped with digital tools that facilitate efficient terminal operations (such as digital driver registration, cameras or sensors on transhipment equipment) and enable the exchange of information flows within the terminal and between modes of transport by 31 December 2030.

Electronic freight transport information (eFTI) – digital transformation of regulatory interaction

Regulation (EU) 2020/1056 creates a single legal framework for the electronic exchange of regulatory information related to freight transport within the EU. Its **aim** is to ensure the complete digitisation of administrative procedures in the transport sector, promote multimodality and remove paper barriers, which remain one of the main causes of delays in logistics.

According to Article 1 of Regulation (EU) 2020/1056, electronic freight transport information (eFTI) is a mandatory ICT solution for ensuring data exchange between economic operators (carriers, freight forwarders, terminal operators) and the competent authorities of Member States.

Key elements of the eFTI legal mechanism

Mandatory electronic format for submission:

Economic operators must provide regulatory information in electronic form using certified eFTI platforms that meet EU technical and security requirements (Article 4(2)).

The data must be available in both machine-readable format for automated processing and human-readable format at the request of the control authorities (Article 4(4)).

Mandatory acceptance of electronic information:

State authorities are obliged to accept and process eFTI data at a level equivalent to paper documents (Article 5(1)), which eliminates administrative asymmetry between digital and traditional media.

Certification of eFTI platforms:

The use of electronic data is only permitted through certified platforms that ensure the authenticity, integrity and availability of data (Articles 7–9).

This guarantees mutual recognition of digital systems between all Member States and creates the conditions for a single EU information space in the field of freight transport.

Thus, eFTI is a key digital tool for multimodal logistics, ensuring transparency, reducing administrative burdens and integrating freight transport into a single European digital transport environment.

For Ukraine, the implementation of eFTI will be a prerequisite for digital compatibility with the EU, especially in terms of customs, border and environmental procedures on TEN-T corridors.

Therefore, ICT systems and digital solutions are seen as one of the main means of overcoming gaps in digitalisation and increasing interoperability between different transport systems, which is a key objective of TEN-T.

Conclusions to SECTION I

This section provides a systematic assessment of the updated Regulation (EU) 2024/1679, which replaces Regulation (EU) 1315/2013 and sets out the mandatory requirements for EU Member States regarding the formation, standardisation and digital integration of TEN-T.

Particular attention is paid to the relationship between Regulation (EU) 2024/1679 (TEN-T) and Regulation (EU) 2023/1804 (AFIR) on the development of alternative fuels infrastructure (AFI), as the former defines **the spatial and functional framework** for the development of the transport network, while the latter establishes **the technical, operational and quantitative parameters** for the deployment of alternative fuels infrastructure (AFI),

which will be discussed in more detail in the following section. An assessment of discrepancies with current Ukrainian legislation is also provided, in particular the Law of Ukraine "On Motorways", DBN V.2.3-4:2015, GBN V.2.3-37641918-549:2018 and other relevant acts.

The introduction of the updated TEN-T/AFIR terminology system is necessary to eliminate a critical legal gap, as the current legislation of Ukraine — primarily the Law of Ukraine "On Motorways" and the relevant state building codes (DBN) — does not contain the functional and strategic hierarchy of the TEN-T network and does not recognise alternative fuel infrastructure (AFI) as a mandatory element of road transport infrastructure.

The transposition of TEN-T/AFIR definitions and concepts should be achieved through their integration, in particular into:

- The Law of Ukraine "On Motorways" - in terms of the structure and classification of the road network;
- the Law of Ukraine "On the Regulation of Urban Development" - in terms of planning and zoning of territories;
- The Law of Ukraine "On Certain Issues of the Use of Vehicles Equipped with Electric Motors" - in terms of defining and regulating the infrastructure for such vehicles.

It should be noted that, in accordance with paragraph 5 of part one of Article 92 of the Constitution of Ukraine, **the principles of organisation and operation of energy systems, transport and communications are determined** exclusively **by the laws of Ukraine.**

However, **Article 2** of the Law of Ukraine "On Certain Issues of Using Vehicles Equipped with Electric Motors," defining the scope of application only as *"the use of vehicles equipped with electric motors and the creation/use of infrastructure for them*," does not consider electric transport as **a separate subsystem of the state's unified transport system**. Therefore, this law **does not establish the principles of operation of this type of transport, does not form legal relations in the field of its development, and does not ensure the achievement of the declared goal.**

In addition, the law contains mainly general provisions, providing a list of definitions of terms that are not used in its main text, and also amends other acts in paragraph 3 of Article 5 *"Final and Transitional Provisions"* without creating its own regulatory mechanism for the implementation of state policy in the field of electric transport.

We believe that the subject of legal regulation of this law needs to be expanded and systematically corrected, based on the requirements of Section II and Article 92 of the Constitution of Ukraine, in order to define the rights, obligations and mechanisms for implementing state policy in the field of electric transport and related infrastructure.

1. Transformation of TEN-T into a system with legally binding requirements

Regulation (EU) 2024/1679 transforms TEN-T from a framework concept into a mandatory system with legally defined implementation deadlines, clear safety parameters and digital technology integration.

Unlike the previous approach, which was based on "soft" recommendations, the new version establishes three network levels (Core - Extended - Comprehensive) with specific completion dates - 2030, 2040 and 2050, respectively.

In Ukraine, however, the current classification of motorways (international, national, regional, territorial) does not correspond to the functional hierarchy of TEN-T, which makes automatic integration into the European reporting and monitoring system impossible.

2. Mandatory technical standards and design parameters

According to Article 31 of Regulation (EU) 2024/1679, roads included in the Core Network and Extended Core Network must be:

- two-lane (Separate Carriageways);
- without level crossings (No Crossings at Grade);
- equipped with modern safety features and related digital systems.

Ukrainian DBN V.2.3-4:2015 does not ensure direct compliance with these requirements: roads of categories II–III, which may be part of European corridors (ETCs), allow two-way traffic and at-grade crossings.

This creates a technical barrier to the certification of Ukrainian sections as compatible with Core / Extended Core networks.

3. Recognition of "Associated Equipment"

Regulation (EU) 2024/1679 (Article 29(1)(g)) expands the concept of road transport infrastructure by defining mandatory components - AFI infrastructure, safe parking areas (SSPA), WIM systems, digital ICT solutions.

In Ukraine, these facilities remain scattered across various industry standards as service or control elements rather than structural components of the transport network.

Thus, a road without integrated AFI, SSPA, and WIM systems cannot be considered to meet the TEN-T criteria.

4. Life-Cycle Management and Climate Proofing

The requirements of Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804 require a transition from a reactive infrastructure management model (repair after damage) to **a preventive life-cycle approach**. In addition, the EU's climate goals require the integration of climate proofing into the design and environmental impact assessment (EIA) procedures for all **Projects of Common Interest (PCI)**.

Current Ukrainian legislation has some critical gaps:

1. **Lack of Life-Cycle Costing (LCC):** Ukrainian methodologies do not require the inclusion of maintenance and modernisation costs throughout the entire life cycle of a facility at the planning and design stage.
2. **Lack of climate proofing:** The current Law of Ukraine "On Environmental Impact Assessment" (No. 2059-VIII) does not contain requirements for calculating **life-cycle greenhouse gas (GHG) emissions** and assessing vulnerability to climate risks.

3. **Non-compliance with the DNSH principle:** Ukraine has not implemented the **Do No Significant Harm (DNSH)** principle, which is a prerequisite for receiving EU funding (CEF, InvestEU, AFIF).

5. Integration of alternative fuels infrastructure (AFIR)

Regulation (EU) 2024/1679 directly refers to Regulation (EU) 2023/1804 (AFIR) and makes alternative fuels infrastructure an integral part of TEN-T.

AFIR introduces mandatory quantitative indicators for the deployment of charging and hydrogen stations **(≤ 60 km for LDV, ≤ 100 km for HDV, ≤ 200 km for H_2),** and requires digital compatibility through **NAP and DATEX II.**

Ukrainian legislation currently only partially complies with these requirements in terms of intervals for EES, but does not provide for either mandatory capacities or digital integration standards.

6. Safe and secure parking areas (SSPA)

Regulation (EU) 2024/1679, in conjunction with Delegated Regulation (EU) 2022/1012, establishes a clear SSPA classification system (bronze to platinum level) and minimum requirements for security, lighting, service and AFI.

Ukrainian GBN V.2.3-37641918-549:2018 does not contain any provisions regarding certification, technical security levels or the integration of SSPA into road infrastructure.

The absence of these standards makes it impossible to implement AFIR components for heavy goods vehicles (HDVs) and limits the possibility of financing from CEF / Ukraine Facility instruments.

7. Institutional gaps: PCI, NPF and One-Stop Authority

Regulation (EU) 2024/1679 defines Projects of Common Interest (PCI) as the main mechanism for implementing TEN-T. They are subject to Directive (EU) 2021/1187, which provides for:

- a maximum duration of the authorisation procedure of 4 years;
- the functioning of a single competent authority (One-Stop Authority).

In Ukraine, there is no legislative definition of PCI, nor is there a designated national authority responsible for their support, which creates an institutional gap.

In addition, the National Policy Framework (NPF), mandatory under Article 14 AFIR, has not yet been developed, making it impossible to officially plan, monitor and report to the EU.

Thus, Regulation (EU) 2024/1679 establishes a new TEN-T operational paradigm in which infrastructure, security, digitalisation and climate resilience are considered as a single complex.

For Ukraine, this means the need to:

- integrate the three-level TEN-T hierarchy into the road classification system;

- harmonisation of technical and safety standards with Core/Extended Core Network;
- legislative definition of digital infrastructure (ICT, ITS, WIM, SSPA);
- creation of an institutional framework (NPF, PCI, One-Stop Authority).

Without these steps, Ukraine will not be able to ensure full compatibility of its transport infrastructure with EU networks, which will limit access to CEF, AFIF and Ukraine Facility funding.

SECTION II. REGULATION (EU) 2023/1804 (AFIR) AND UKRAINE: LEGAL AND INSTITUTIONAL ASPECTS OF INTEGRATING ALTERNATIVE FUEL INFRASTRUCTURE INTO THE TEN-T NETWORK

2.1. Purpose of adoption and scope of Regulation (EU) No 2023/1804

Regulation (EU) 2023/1804 of 13 September 2023, known as **the Alternative Fuels Infrastructure Regulation (AFIR)**, is a key EU regulatory act aimed at accelerating the decarbonisation of the transport sector within the European Green Deal and the Fit for 55 package of initiatives. Its adoption was a response to the uneven development of alternative fuel infrastructure in EU Member States, the low level of interoperability between national networks, and the lack of ambition in national policies, which have hampered the widespread introduction of zero- and low-emission vehicles.

The main **objective** of Regulation (EU) 2023/1804 is to set mandatory national targets for the deployment of publicly accessible infrastructure for alternative fuels - electricity, hydrogen, ammonia, renewable fuels (including biomethane and synthetic fuels), as well as transitional fossil fuels (LNG, CNG, LPG) for all modes of transport - road, rail, maritime, inland waterways and aviation. The document establishes a single interoperable network to ensure seamless mobility across the EU, **a 90% reduction in greenhouse gas emissions from transport by 2050** and a minimum 14% share of renewable energy sources in the transport sector by 2030, in accordance with Directive (EU) 2018/2001.

Regulation (EU) 2023/1804 sets out a set of mandatory measures for the deployment, operation and technical maintenance of alternative fuel infrastructure. It contains quantitative and spatial targets covering **fleet-based indicators** (calculation of capacity per transport unit) and **distance requirements** (intervals of placement on the TEN-T network) for electric vehicles, hydrogen refuelling stations, liquefied gas refuelling points, shore-side electricity supply systems in ports and power supply for stationary aircraft. The operational provisions provide for transparent pricing conditions, the availability of ad hoc payments, the introduction of smart and digital recharging technologies, and standardised data exchange via open application programming interfaces (APIs) in accordance with Article 20 of Regulation (EU) 2023/1804.

The governance system is based on national policy frameworks (NPFs) defined by Member States and regular reporting to the European Commission (Articles 14-18). Annex II sets out technical specifications and security requirements, and Article 24 provides for a periodic review of the standards in 2026 and every five years thereafter. Regulation (EU) 2023/1804 also introduces flexibility mechanisms, including the possibility of granting exemptions for remote, sparsely populated or economically disadvantaged areas.

Regulation (EU) 2023/1804 is directly applicable in EU Member States, provides for the adoption of delegated and implementing acts to specify technical standards and data, and repeals Directive 2014/94/EU with effect from 13 April 2024.

Analysis shows that the infrastructure for charging cars and trucks is developing rapidly in the EU. It is important to note that the AFIR indicators define the minimum level of infrastructure deployment necessary for the basic functional compatibility of the TEN-T network, rather than its optimal level of development. The actual deployment of infrastructure in Member States significantly exceeds the minimum requirements, reflecting market dynamics of demand and private investment.

Using empirical data from the European Commission's Directorate-General for Mobility and Transport (DG MOVE), as of the end of 2024, significant progress can be seen in the implementation of the requirements of Regulation (EU) 2023/1804 (AFIR).

According to DG MOVE, the total installed capacity of charging points in the EU at the end of 2024 was **around 28,000 MW**, which is more than double **the** minimum **requirement of 11,000 MW**, calculated in accordance with AFIR requirements based on **5.8 million BEVs** (Battery Electric Vehicles) and **4.2 million PHEVs** (Plug-in Hybrid Electric Vehicles).

Between 2021 and 2024, the number of electric vehicles (BEVs) and charging points in the EU increased by approximately 180%, while the average power per point increased by 260% (to around 33 kW). This indicates a gradual shift from predominantly low-power urban stations to more powerful ones suitable for interurban and trans-corridor use. Higher power means that charging stations can serve more cars.

Table 1. Dynamics of charging infrastructure deployment for passenger vehicles (2021–2024)

Year	Vehicles (BEV)	Number of charging points	Total output power (MW)
2021	2,050,000	299,000	7,810
2022	3,081,000	448,000	13,740
2023	4,408,000	632,000	20,312
2024	5,829,000	845,000	28,147
Growth 2021–2024	**184**	**183**	**260**

(Source: DG Mobility and Transport, 27 January 2025; Data from the European Alternative Fuels Observatory (EAFO))

Most segments of the TEN-T core network, especially **in Western European countries** *(Germany, France, the Netherlands, Belgium, Austria)*, already have full or near-full coverage with charging infrastructure in line with AFIR requirements. There is a high probability ( ) that the AFIR quantitative targets for TEN-T will be achieved before 2030, which creates a favourable benchmark for Ukraine in developing its own roadmap for AFIR implementation. Financial support through the Alternative Fuels Infrastructure Facility (AFIF) under the Connecting Europe Facility (CEF) has played a decisive role in the development of this infrastructure. **The** total budget **of** AFIF is **approximately €2 billion**, of which **€500 million** has already been allocated **to more than 23,000 fast charging points** along the TEN-T network. This serves as proof of the need to harmonise Ukrainian legislation as soon as possible in order to access similar instruments, such as the Ukraine Facility.

2.2. Key innovations of Regulation (EU) 2023/1804 and their significance for the development of alternative fuel infrastructure on the TEN-T network

Regulation (EU) 2023/1804 marked a qualitative step forward in the development of European legislation in the field of transport decarbonisation. It radically changed the EU's approach to the development of AFI, making the requirements mandatory and measurable, and replaced the previous Directive 2014/94. This Directive required Member States to independently determine their national infrastructure development plans. Regulation (EU) 2023/1804 is **a binding regulation** that does not require implementation into national legislation, meaning that all quantitative requirements, technical requirements and deadlines are now uniform for all EU countries.

As a candidate for EU membership, Ukraine is obliged to ensure the implementation of Regulation (EU) 2023/1804 (AFIR) on the deployment of AFI, Directive (EU) 2024/1275 on the energy performance of buildings, as well as other EU acquis requirements in the transport and energy sectors.

Integration into TEN-T is also defined as a strategic goal of Ukraine in **the National Transport Strategy**, approved by Resolution of the Cabinet of Ministers of Ukraine No. 1550 of 27 December 2024.

The development of AFI in Ukraine is directly linked to **the implementation** of Regulation (EU) 2024/1679, which establishes a comprehensive environmental, digital and technical framework for sustainable mobility, as described in more detail in Section I of this study. This synergy allows AFI to be considered not as an auxiliary element, but as an integral part of the TEN-T transport infrastructure, ensuring the energy and functional integrity of the network.

The transformation of the previous Directive 2014/94/EU into Regulation (EU) 2023/1804 (AFIR) was a turning point in EU transport policy, shifting the development of charging infrastructure from a voluntary initiative to **a clearly regulated legal obligation** for Member States. These changes are aimed at accelerating decarbonisation, overcoming *range anxiety* and creating a single, interoperable energy transport network in the EU.

The new Regulation (EU) 2023/1804 (AFIR):

- establishes **uniform quantitative, technical and operational standards** for EU Member States, including requirements for the density, capacity and digital compatibility of alternative fuel infrastructure (AFI);
- introduces clear, measurable **distance-based targets** that are integrated with the **TEN-T network** architecture defined by **Regulation (EU) 2024/1679 (TEN-T)**;
- integrates the development of charging infrastructure for heavy-duty vehicles with security requirements, setting mandatory, measurable targets for the deployment of **secure and protected parking areas (SSPA)** certified in accordance with **Delegated Regulation (EU) 2022/1012** along the **TEN-T** network**;**

- obliges Member States to deploy **hydrogen infrastructure**, primarily targeting heavy-duty vehicles (HDVs), ensuring coverage of the TEN-T networks in accordance with defined intervals and minimum daily hydrogen capacity;
- **shore-side electricity supply** for certain vessels in our seaports and electricity supply to stationary aircraft at our airports.
- It elevates the status **of Urban Nodes**, transforming them into strategic territorial elements of the **TEN-T** network, which act as mandatory centres for the implementation of **AFIR** requirements, ensuring the integration of **long-distance transport, freight logistics and sustainable urban mobility**.
- creates **a comprehensive digital ecosystem for managing** alternative fuel infrastructure, based on data unification, information exchange standards and the implementation of Smart Charging technologies;
- establishes **the principle of user-centricity** as a basic element of the EU's single market for electric mobility, which provides for non-discriminatory access, tariff transparency, payment compatibility and a single electronic roaming system for users of charging services.
- introduces **a single integrated system** for **strategic monitoring, management and reporting,** replacing fragmented planning and providing a coordinated methodology for implementing AFI objectives through National Policy Frameworks (NPFs), energy flexibility assessments (V2G) and regular reporting to the European Commission.

Thus, Regulation (EU) 2023/1804 (AFIR) forms a new regulatory paradigm for the development of alternative fuels infrastructure (AFI), combining quantitative, technical and digital requirements with the TEN-T network architecture. Its implementation for Ukraine means **a transition from a fragmented approach to a unified system of strategic planning, management and reporting in the field of e-mobility**. Thus, AFIR is a key instrument for Ukraine's integration into the European green and transport space.

2.3. Comparative analysis of terminological differences between AFIR and Ukrainian legislation

The comparative analysis showed that the key challenge for Ukraine is not only the lack of a consistent translation of the terms used in AFIR, but also the existence of systemic legal gaps, which makes it impossible to fully apply the quantitative indicators, digital integration requirements and "smart recharging" requirements provided for in Regulation (EU) 2023/1804.

Current national legislation, in particular **Law of Ukraine No. 2956-IX** "On Certain Issues of the Use of Vehicles Equipped with Electric Motors and Amendments to Certain Laws of Ukraine on Overcoming Fuel Dependence and Developing Electric Charging Infrastructure and Electric Vehicles" and **DBN B.2.2-12:2019** - uses **outdated or vague definitions** that do not reflect the current architecture of AFIR and hinder harmonisation with European standards.

To address these gaps, it is advisable to introduce **an updated terminology system** based on the provisions **of Article 2 of Regulation (EU) 2023/1804**, in particular regarding

the concepts of *alternative fuels*, *recharging point*, *smart charging*, *vehicle-to-grid (V2G)*, *captive fleet*, *urban node*, etc.

This will ensure the unification of the legislative field, facilitate the implementation of European standards, and create a legal basis for the further development of **the National Policy Framework (NPF-AFIR Ukraine).**

The use of uniform generalised terms in Ukrainian legislation (in particular in Law No. 2956-IX and subordinate legislation) complicates the regulatory classification of objects according to AFIR requirements, in particular when determining capacity, type of access (public/non-public) and requirements for data exchange via NAP. This creates a risk of incorrect technical design and loss of compliance with European standards in the future integration of Ukrainian infrastructure into the TEN-T network.

Table 2 Infrastructure elements (AFI) and capacity accounting: comparison of terminology in Regulation (EU) 2023/1804 (AFIR) and Ukrainian regulatory acts

Scope of AFIR	EU definition and key requirement (Regulation (EU) 2023/1804)	Status in Ukrainian legislation (legislative acts)	Legislative gaps and recommendations
Recharging point	A fixed or mobile interface for the transfer of electrical energy, capable of charging only one electric vehicle at a time. Excludes devices ≤ 3.7 kW, unless this is their primary purpose.	Current terminology uses the terms "electric vehicle charging station (electric charging station)" (Law of Ukraine No. 2956-IX) and **"electric charging station (ECS)**". (DBN B.2.2-12:2019) (10.8.33) mentions only "electric charging stations (ECS)".	**Gap:** The absence of this basic term makes it impossible to accurately account for **fleet-based indicators** (1.3 kW/BEV), which are calculated on the basis of charging points (Article 4 of Regulation (EU) 2023/1804). **Recommendation:** Introduce the definition **of Charging Point** into (Law of Ukraine No. 2956-IX).
Recharging pool	A set of charging points in a specific physical location used to establish **the** minimum **total output power** on TEN-T (e.g. 3600 kW on the Core Network).	Not established. The Ukrainian term "EZS" does not reflect the concept of aggregate pool capacity.	**Gap:** Inability to apply AFIR spatial requirements (Articles 4, 5 of Regulation (EU) 2023/1804) regarding the minimum power required on TEN-T roads (e.g. 600 kW for LDVs and 3600 kW for HDVs). **Recommendation:** Introduce a definition of **a charging complex** with reference to aggregate power requirements.

Digitally-connected recharging point	A point that can send and receive information in real time, communicate bidirectionally with the power grid and electric vehicle (V2G), and be remotely monitored and controlled.	Not available. Current regulations do not contain mandatory requirements for two-way communication and remote control.	**Gap:** The absence of this definition makes it impossible to implement the requirements for **Smart Recharging** (Article 21 of Regulation (EU) 2023/1804), the provision of dynamic data (Article 20 of Regulation (EU) 2023/1804), and integration with ITS architecture.
High-power recharging point, normal power recharging point	Definition based on power thresholds (e.g. LDV HPC - over 22 kW, HDV HPC - over 150 kW).	(DBN B.2.2-12:2019) (10.8.33) uses outdated categories **of "normal charging"** (3.5 kW, 7.0 kW) and **"fast charging"** (43 kW, 240 kW).	**Gap:** Terminology inconsistency hinders proper AFIR accounting and reporting, where power requirements are key for the TEN-T network (e.g. minimum 350 kW per point in the HDV pool).
LDV/HDV charging point, station or complex	Clear distinction between infrastructure intended for light (LDV) and heavy (HDV) vehicles, with different quantitative targets.	Ukrainian legislation does not set quantitative targets for HDV infrastructure (Article 4 AFIR).	**Gap:** The lack of a definition of **an HDV recharging point/pool** hinders the implementation of quantitative targets (3600 kW every 60 km by 2030) and spatial planning requirements in urban nodes.

The analysis also shows that current Ukrainian legislation does not contain the definitions necessary to regulate non-discriminatory access, roaming and financial transparency (Article 5 of Regulation (EU) 2023/1804).

Table 3. Market functioning and infrastructure accessibility AFI: comparison of the requirements of Regulation (EU) 2023/1804 (AFIR) and Ukrainian legislation

Scope of AFIR	EU definition and key requirement (Regulation (EU) 2023/1804)	Status in Ukrainian legislation (NPA)	Legislative gaps and recommendations
Operator *of a recharging point*	A natural or legal person responsible for the management and operation of a recharging point.	No clear definition has been established.	**Gap:** The absence of this definition makes it impossible to establish the legal liability of the CPO (Charging Point Operator) for compliance with AFIR requirements, in particular regarding data quality (Article 20) and payment assurance (Article 5 of Regulation (EU) 2023/1804).

Mobility service provider (MSP)	A person who provides services to the end user, including e-roaming and contract-based payment. (Article 2(43)).	None.	**Gap: The** lack of regulation of MSP (Mobility Service Provider) makes it impossible to systematically implement **e-roaming** and transparent **contract-based pricing**, which is key to the interoperability of e-roaming, which is key to free movement on the TEN-T.
End **user**	A person who purchases a charging service.	No clear definition exists.	A definition needs to be introduced for the purposes of consumer protection and ensuring non-discriminatory access to payment (*ad hoc basis*).
Re*charge on an ad hoc basis*	A service purchased by an end user without the need for registration, a written agreement or a commercial relationship other than the purchase of the service.	None.	**Gap:** Inability to introduce mandatory **ad hoc** payment (using payment cards or terminals), which is a critical requirement of AFIR to ensure non-discrimination (Article 5(2) of Regulation (EU) 2023/1804).
Register of identification numbers of at least charging point operators and mobility service providers and the authorised person responsible for maintaining it Identification Registration Organisation ('IDRO')	A system of identification numbers for charging point operators (CPOs) and mobility service providers (MSPs) required for **e-roaming**.	Not available	**Gap: No register** of identification numbers for at least charging point operators and mobility service providers, no designated person responsible for maintaining it (Article 20 of Regulation (EU) 2023/1804).
E-ro**aming** / **E-roaming platform**	A mechanism that allows users to charge through different MSPs/CPOs.	Not available.	**Gap:** No obligation to be compatible with EU digital platforms and ensure roaming

In addition, the uncertainty of key technological processes makes it impossible to implement **Smart Charging**, which is a fundamental requirement of AFIR for energy system flexibility.

Table 4. Digital processes and Smart Charging: uncertainty of terms and legislative gaps (Regulation (EU) 2023/1804, Articles 2, 5, 21)

AFIR scope	EU definition and key requirement (Regulation (EU) 2023/1804)	Status in Ukrainian legislation (NPA)	Legislative gaps and recommendations

Smart *recharging*	Intelligent control of the charging process.	Absent.	**Gap:** Without this definition, it is impossible to introduce mandatory **ISO 15118-20** standards for **V2G**, which should become mandatory in the EU from **1 January 2027**.
Bi-directional recharging (*bi-directional recharging*)	A technology that allows electricity to be transferred both to and from an electric vehicle **(V2G).**	Absent.	**Gap:** The absence of this definition in Ukrainian legislation undermines the possibility of achieving the NPF's objectives regarding **energy system flexibility** and the integration of renewable electricity (Article 14(8) of Regulation (EU) 2023/1804).
Recharging session	The charging process from the moment of connection to disconnection.	Not available.	**Gap:** Necessary for unified service accounting and pricing.

Therefore, the priority task for Ukraine is the need to conduct a comprehensive review and transposition of Article 2 (Definitions) of Regulation (EU) 2023/1804 (AFIR) into the national legal system. This involves updating and harmonising terminology in key regulatory acts, in particular Law of Ukraine No. 2956-IX and DBN B.2.2-12:2019 (in terms of the definition and classification of electric charging stations and technical parameters).

Such a revision should be an integral part of the process of developing the National Policy Framework (NPF-AFIR Ukraine), which will ensure the legal compatibility of Ukrainian legislation with the EU acquis, unify technical requirements, definitions and digital standards, and create a basis for further integration into the TEN-T infrastructure ecosystem.

2.4. Electric charging infrastructure: quantitative requirements and spatial coverage

Regulation (EU) 2023/1804 sets clear mandatory quantitative targets for EU Member States for the deployment of publicly accessible infrastructure for electric vehicles. This refers to the proportional relationship between the number of registered vehicles and the total available capacity of charging stations.

A key innovation is the introduction of fleet-based indicators:

- at least **1.3 kW** of total charging capacity per registered BEV (Battery Electric Vehicle) and **0.8 kW** per PHEV (Plug-in Hybrid Electric Vehicle), with cumulative accumulation starting in 2024.

At the same time, the regulation specifies **distance requirements** for the deployment of EV infrastructure on the TEN-T network:

- on Core Network and Extended Core Network roads, charging stations must be located at intervals **of no more than 60 km**, providing a minimum total capacity **of 400 kW in 2025** and **600 kW in 2035.**

- For heavy-duty vehicles (HDVs), phased coverage of the TEN-T network is envisaged:
- at least **15% by 2025** (with a pool capacity of at least **1,400 kW**) and **100% by 2030** (minimum **3,600 kW** on sections of the Core Network with intervals of 60-100 km).

Detailed comparative parameters are provided below in Table 5 of this Section (requirements for LDVs (categories M1 + N1 - according to the EU vehicle classification system established by Annex II to Regulation (EU) No 2018/858) and Table 2 (requirements for HDVs - categories M2–M3 + N2–N3).

Table 5. Distance targets for IZEs **(for passenger cars and minibuses)**.

Deadline	Coverage	Minimum power every 60 km (in both directions)
31 December 2025	TEN-T core network	**400 kW**
31 December 2027	TEN-T core network	**600 kW**
	50%* of the comprehensive TEN-T network	**300 kW**
31 December 2030	TEN-T comprehensive network	**300 kW**
31 December 2035	Comprehensive TEN-T network	**600 kW**

*Part of the TEN-T may be taken into account for the purpose of meeting this percentage coverage requirement in each direction of travel only if it is located between two charging pools no more than 60 km apart.

The AFIR pays particular attention to the deployment of infrastructure for heavy-duty **electric** vehicles (HDVs), which require more powerful charging points and specially equipped areas for manoeuvring and driver rest. The requirements for such stations cover not only technical power parameters, but also spatial planning, safety standards and integration with multimodal hubs.

Table 6. Distance-based targets for EV and hydrogen refuelling stations **(for trucks and buses).**

Deadline	Coverage	Minimum capacity requirements	Minimum distance requirements
31 December 2025	15%* of the Core and Comprehensive Networks TEN-T	One charging station with a total capacity of 1,400 kW	Every 120 km* in both directions
	Urban hub	One charging station with a total capacity of 900 kW	-

31 December 2027	50% of the Core and Comprehensive Network TEN-T	One charging station with a total capacity of 2,800 kW on the TEN-T Core Network and 1,400 kW on the TEN-T Comprehensive Network	Every 120 km* in both directions
31 December 2030	TEN-T Core Network	One charging pool with 3600 kW of total capacity	Every 60 km in both directions
		One hydrogen refuelling station	Every 200 km
	Comprehensive network TEN-T	One charging station with a total capacity of 1500 kW	Every 100 km in both directions
	Urban hub	One charging station with a total capacity of 1800 kW	-
		One hydrogen refuelling station	-

*Part of the TEN-T may be taken into account for the coverage requirement in both directions only if it is located between two charging stations no more than 120 km apart.

Electric charging infrastructure in urban nodes

Regulation (EU) 2023/1804 sets out clear, mandatory and quantifiable requirements for the deployment of electric charging infrastructure (ECI) in urban nodes defined by Regulation (EU) 2024/1679 (TEN-T). As we noted in the previous section, these provisions aim to ensure the full integration of urban transport systems into the European TEN-T network, creating conditions for seamless electric mobility both within cities and along major transport corridors.

Unlike the infrastructure for light-duty vehicles (LDVs), the development of which in urban areas is largely regulated by national targets linked to the number of registered electric vehicles, the infrastructure for HDVs has uniform mandatory standards at EU level. This approach aims to standardise the technical and spatial parameters of urban nodes, which are key TEN-T logistics points and must provide conditions for charging, parking and operational maintenance of electric transport.

Table 7. Requirements of Regulation (EU) 2023/1804 for the placement of electric charging stations in urban nodes

Location	Total capacity	Minimum individual capacity of ECS	Term
Each Urban Node	900 kW	150 kW	**Until 31 December 2025**
Each urban node	1800 kW	150 kW	**Until 31 December 2030**

These requirements relate to **the minimum total power** that the City Node must provide for HDVs, regardless of road intervals. The goal is to charge HDVs for delivery and destination charging. For Ukraine, this means the need to include the requirements of

Regulation (EU) 2023/1804 on Urban Nodes in strategic planning, to provide for the placement of high-power charging stations within bus stations, terminals and transport hubs, as well as integrating such facilities into the National Policy Framework (NPF) and Sustainable Urban Mobility Plans (SUMP).

Placement of electric charging stations in safe and secure parking areas (SSPA)

Regulation (EU) 2023/1804 (AFIR) establishes specific mandatory requirements for the deployment of electric charging infrastructure in safe and secure parking areas (SSPA). These provisions aim to create the right conditions for overnight recharging of heavy-duty vehicles (HDVs) during long stops or rest periods for drivers, which is an integral part of European policy on road transport safety and sustainability.

According to the provisions of the AFIR Regulation, **by 31 December 2027,** each SSPA on the TEN-T network must be equipped with at least **two publicly accessible charging stations** for heavy electric vehicles, each with an individual capacity of at least 100 kW. Further development envisages an increase in the number of such stations: according to the same Regulation, **by 31 December 2030**, each SSPA must have at least **four charging stations** with similar technical parameters.

The introduction of such requirements is aimed not only at ensuring energy accessibility, but also at increasing the commercial attractiveness of SSPA for international carriers, who are increasingly switching to electric trucks. In addition to energy characteristics, AFIR considers these parking areas to be complex infrastructure facilities that must comply with the safety, comfort and digital integration standards set out in Regulation (EU) 2024/1679 (TEN-T).

There are currently **around 13,500** battery-electric trucks registered in the EU, but almost no buses. CO2 emission standards for heavy-duty vehicles require a rapid increase in the number of zero-emission heavy-duty vehicles in the coming years. Trucks need high-power charging stations.

At the end of 2024, there were **more than 15,000 350 kW charging stations** in the EU**.** In theory, they can serve heavy-duty vehicles, but in practice this requires the availability of a trailer or adjacent parking space, as it is not possible to disconnect the trailer elsewhere. To date, there are very few dedicated charging stations for heavy-duty vehicles. According to the EC's investment plan, more than **20**,**000 charging stations** dedicated to heavy-duty vehicles need to be built along the TEN-T **by 2030**. The AFIF mechanism is expected to co-finance a significant part, but additional efforts will be needed to achieve the AFIR targets for dedicated heavy-duty vehicle (HDV) charging infrastructure.

Derogations

Member States may apply for derogations from the requirements for the deployment of stations along the TEN-T for passenger cars and minibuses and trucks and buses separately. For roads with a total average daily annual traffic of less than 8,500 passenger cars and minibuses or 2,000 trucks and buses, and where infrastructure cannot be justified from a socio-economic point of view, Member States may be allowed to consider a single

charging pool for both directions of traffic or be entitled to reduce the overall requirements for power output and hydrogen storage capacity for the relevant categories of vehicles by 50%.

Both derogations cannot be applied simultaneously.

*For TEN-T roads with an average daily annual traffic of less than **3,000** passenger cars and minibuses or **800** trucks and buses, respectively, the maximum distance between charging pools may be increased to **100 km.** Once granted, these derogations shall be reviewed by the Commission **every 2 years**.*

These provisions are crucial for shaping a balanced model for the development of AFI in the EU.

1. The Regulation ensures proportional growth of charging infrastructure in line with market demand dynamics, preventing uneven distribution of capacity between countries and regions. This approach makes it possible to eliminate the imbalances that currently exist within the EU: as of 2025, only about 20% of charging stations in the EU provide the 350 kW capacity required for fast charging of new-generation electric vehicles.

2. The collection and analysis of traffic data is a key tool for improving the efficiency of public spending on TEN-T infrastructure development. Information on average daily traffic intensity, broken down by vehicle category, allows Member States to identify sections with insufficient freight and passenger traffic where investment in charging infrastructure is not economically viable. This allows for the rational application of the derogations provided for in Regulation (EU) 2023/1804 (AFIR), reducing costs on low-traffic routes and directing resources to priority corridors with high traffic, thus ensuring a more balanced and effective allocation of budgetary and donor investments.

Regulation **(EU) 2023/1804** AFIR empowers the EC to present a review (performance assessment) of this Regulation by the end of 2026. Monitoring its implementation will therefore form the basis for this review, in particular with regard to the charging infrastructure needs for heavy-duty vehicles (HDVs).

For Ukraine, these technological and regulatory innovations open up significant potential for stimulating investment in the development of analogues to the European TEN-T network, in particular motorways of international importance. The implementation of pilot projects, including the creation of SSPA along international transport corridors on key routes such as M-05 (Kyiv – Odesa), M-06 (Kyiv – Chop), M-10 Lviv–Krakivets, could be a practical step towards the gradual harmonisation of technical standards, the creation of continuous energy corridors and the transition to a sustainable transport network integrated with the European mobility area. This will ensure synchronisation with the European TEN-T network, enhance traffic safety and open up access to financing through CEF and Ukraine Facility instruments.

2.5. Hydrogen infrastructure and LNG: transition mechanisms to decarbonised mobility and relevance for Ukraine

Regulation (EU) 2023/1804 sets specific quantitative and technical requirements for the deployment of hydrogen and liquefied natural gas (LNG) infrastructure, with a particular focus on the TEN-T strategic transport networks and meeting the needs of heavy-duty vehicles (HDVs).

According to Article 6 of Regulation (EU) 2023/1804, Member States are required to ensure that publicly accessible hydrogen refuelling stations (HRS) are deployed along the TEN-T Core network at intervals of no more than **200 km** by 31 December 2030. Each station must have **a** minimum **capacity of at least 1 tonne of hydrogen per day** and be equipped with dispensers with a pressure of **at least 700 bar**. In addition, at least one hydrogen station is required in each urban node, taking into account the needs of multimodal passenger and freight hubs.

At the same time, Article 8 of Regulation (EU) 2023/1804 sets out requirements for LNG infrastructure, which remains an important transitional fuel in the decarbonisation process. Member States must ensure the deployment of publicly accessible LNG refuelling points along the TEN-T core network by 31 December 2024, provided there is proven demand. The Regulation allows for derogations in cases where investment in such stations is not economically viable due to low traffic intensity or disproportionate costs.

The overall logic of these provisions is to create a step-by-step model for the transition to carbon-free transport. Hydrogen is identified as a key element of the energy transition for long-distance freight transport, while LNG retains its status as a transitional fuel that contributes to reducing emissions in the initial phase. This structure allows for gradual cost optimisation while ensuring the stability of logistics chains.

At the same time, according to the Communication from the European Commission to the European Parliament and the Council on the technological and market readiness of heavy-duty road transport vehicles (Communication from the Commission to and on technological and market heavy-duty vehicles, Brussels, 27.5.2025, COM(2025) 260 final), hydrogen technologies in the transport sector remain promising, but show a high level of technological, economic and market uncertainty.

Despite the EU's strategic support for hydrogen as part of the energy transition, the Commission notes that market uncertainty regarding the choice of dominant technology **(compressed hydrogen H_2 at 350/700 bar, liquid H_2 or hydrogen internal combustion engines — H_2 ICEs)** has not diminished.

This creates systemic barriers to infrastructure planning and carries the risk of creating *stranded assets* — capital-intensive facilities that may lose value due to technological shifts or low demand.

The slow introduction of hydrogen heavy-duty vehicles **(H2 HDVs)** in the EU and the limited number of production models on the market are limiting the scaling up of hydrogen

infrastructure even in Member States. That is why extending the mandatory targets of the AFIR Regulation (EU) 2023/1804 – for example, with regard to liquid hydrogen or the comprehensive TEN-T network – **is currently considered premature**.

At the same time, hydrogen vehicles demonstrate technical advantages for specialised and long-distance transport.

Prototypes of hydrogen trucks have a range of **800–1,000 km**, which exceeds that **of BEVs** and makes them suitable for transcontinental routes and heavy loads.

H_2 technology provides higher specific power and torque, which is an important factor for the heavy-duty transport segment, as well as for military logistics and crisis scenarios.

Also, according to **the** EC, **the total cost of ownership (TCO)** for hydrogen vehicles currently significantly exceeds that of both traditional diesel and battery electric (BEV) counterparts.

This is due to the high cost of fuel cells, hydrogen storage systems and fuel, as well as low infrastructure utilisation.

Original equipment manufacturers **(OEMs)** do not yet have economic incentives for large-scale deployment of hydrogen lines, which exacerbates the structural imbalance **between BEV and H_2** in the transport decarbonisation technology portfolio.

Also, as **of 2025,** strategic support for hydrogen in the EU is gradually shifting towards more technologically mature sectors – industrial production and aviation and maritime transport – through the Sustainable Transport Investment Plan (STIP) and the European Hydrogen Bank.

The EC has already announced the allocation of €300 million by the end of the year to support the production of hydrogen, which will be used to manufacture sustainable aviation fuel (SAF) and marine fuel (SMF).

For Ukraine, this creates a logical basis for the targeted and phased development of hydrogen infrastructure in accordance with Article 6 of Regulation (EU) 2023/1804 (AFIR) – with an initial focus on segments with the greatest energy and economic returns (heavy transport, logistics, maritime and aviation hubs). This approach will allow national initiatives to be aligned with European technological and financial priorities, minimising the risks of inefficient resource allocation.

In the medium term (until 2030), the main focus in the development of AFI in both the EU and Ukraine will obviously remain on electric (BEV) infrastructure, while hydrogen solutions should be implemented on a pilot and targeted basis within high-priority TEN-T transport corridors or strategic industrial clusters. Given market uncertainty and high capital intensity, the introduction of hydrogen facilities in Ukraine should be accompanied by a viability screening mechanism and phased certification.

2.6. Shore-side electricity supply and power supply for stationary aircraft

Regulation (EU) 2023/1804 introduces specific quantitative targets for the deployment of shore-side electricity supply in sea and river ports, as well as electricity supply for stationary aircraft at TEN-T airports. According to Article 9, Member States are required to

ensure a minimum coverage of 90% of ship calls at core and comprehensive ports for container ships (>5000 GT, >100 calls/year), ro-ro passenger and high-speed vessels (>5000 GT, >40 calls) and other passenger vessels (>5000 GT, >25 calls) by 31 December 2029, with the exception of short/emergency calls; for inland waterway ports, Article 10 requires at least one installation in core ports by 31 December 2024 and in comprehensive ports by 31 December 2029. Article 12 sets out requirements for electricity supply at TEN-T airports: at parking stands with contact connection — from 31 December 2024, at remote parking stands — from 31 December 2029, with a transition to renewable and low-carbon energy sources no later than 1 January 2030, with the exception of aerodromes with <10,000 commercial flights/year (at remote parking areas), de-icing parking areas, military zones and general aviation <5.7 t MTOW.

These provisions aim to decarbonise ports and airports, contributing to a 90% reduction in GHG emissions in the relevant sectors, and ensure compliance with Regulation (EU) 2023/1805 on renewable fuels in maritime transport.

The requirements of Regulation (EU) 2023/1804 (AFIR), in particular Articles 9 and 12, establish an obligation for Member States to ensure the deployment of shore-side electricity supply (SSE) in maritime and inland ports, as well as power supply for stationary aircraft at airport parking areas. These provisions are key elements of the environmental decarbonisation of transport infrastructure and contribute to reducing CO_2 emissions from auxiliary power systems in vehicles.

On 5 November 2025, the European Commission adopted a comprehensive transport package designed **to accelerate the deployment of a high-speed rail network in Europe** and increase investment in renewable and low-carbon fuels for the aviation and water sectors. The implementation of the requirements of Regulation (EU) 2023/1804 (AFIR) is closely linked to the EC's Sustainable Transport Investment Plan (STIP), a long-term investment framework that combines political coordination, financing through InvestEU, the Innovation Fund and the Connecting Europe Facility (CEF), and provides for comprehensive planning of infrastructure investments in the transport sector.

STIP plays a synergistic role in achieving the objectives of FuelEU Maritime and ReFuelEU Aviation by providing financial incentives for the modernisation of ports and airports and stimulating demand for the power supply infrastructure required by AFIR. Thus, STIP and AFIR are complementary instruments for implementing the European Green Deal in the transport sector.

For Ukraine, **the STIP** financial **model** could serve as a practical precedent for developing its own investment mechanisms within the Ukraine Facility. In particular, it is advisable to consider the creation of pilot projects for the deployment of shore power supply **in the ports of the Danube region** and **power supply to national airports (for example, in the city of Lviv)**, which will allow testing the model of attracting international financial instruments (InvestEU, Innovation Fund, CEF Transport Blending Facility) in combination with budget resources.

The implementation of such pilot projects will not only ensure the technical testing of AFIR solutions, but also the formation of a national roadmap for the decarbonisation of transport energy, consistent with EU approaches within the STIP.

2.7. National Policy Framework (NPF), data management and reporting

Regulation (EU) 2023/1804 introduces an integrated system for strategic planning, monitoring and reporting on the development of AFI. It provides for the creation **of National Policy Frameworks (NPFs)**, periodic reporting by Member States to the EC and standardised data exchange between operators, public authorities and users, ensuring transparency, consistency of action and monitoring of the achievement of objectives. Although Ukraine is not an EU member state, the development **of the NPF-AFIR Ukraine** strategic document should become the basic platform for coordinating national policy with the TEN-T and CEF mechanisms.

According to Article 14, each Member State must prepare a draft National Policy Framework (NPF) and submit it by 31 December 2024. This document must be subject to public consultation, and the final version must be approved by 31 December 2025, taking into account the recommendations of the European Commission. The framework provides for an assessment of the market for alternative fuels in all modes of transport, the setting of national targets in accordance with Articles 3-13 of the Regulation, and plans and measures to achieve them. Such measures include the creation of financial and non-financial incentives, the removal of administrative barriers in planning and permitting, support for captive fleets, and specialised reviews for ports, airports, rail and inland waterway transport.

It should be noted here that, according to the conclusions of the European Commission's Communication "On the technological and market readiness of heavy-duty road transport vehicles", the key barriers to the implementation of Regulation (EU) 2023/1804 (AFIR) are not so much the cost of the infrastructure itself as the structural constraints in the EU energy system.

The Commission emphasises, in particular, that the most critical factor is the limited **grid hosting capacity,** especially in border and peripheral regions, where the development of AFI requires significant energy capacities.

Another serious barrier is the lengthy administrative procedures for approval, connection and obtaining permits (permission and grid connection procedures), which in some cases take **between 24 and 48 months**, significantly slowing down the implementation of AFI even within the TEN-T Core Network.

Thus, the EC determines that access to the electricity grid and acceleration of connection procedures are priority areas for national reforms in Member States and partner countries, in particular for Ukraine, which is integrating its transport corridors into TEN-T.

For effective adaptation of AFIR, Ukraine should take these conclusions into account by aligning energy planning with transport policy, simplifying licensing procedures and ensuring priority access for AFI facilities to electricity networks based on European principles.

Articles 15-18 of Regulation (EU) 2023/1804 establish a multi-level reporting system that allows for the assessment of the achievement of objectives at national and European levels. Member States are required to submit national progress **reports** every two years, **starting on 31 December 2027.** These reports shall reflect the targets achieved, the level of infrastructure use, the measures taken, the budgets and the amount of investment in accordance with **Annex I**. In addition, data on the number and capacity of charging points for electric vehicles, as well as vehicle registrations by alternating current (AC) and direct current (DC) categories, shall be provided annually in accordance with Annex III. Separately, every three years, an assessment of the potential for flexible charging and bi-directional charging technologies shall be carried out, starting on 30 June 2024. The European Commission analyses the submitted materials and makes recommendations if Member States do not achieve their interim targets or if significant risks of falling behind are identified, and Member States must formally respond to these recommendations within a specified time frame.

Articles 19-20 of Regulation (EU) 2023/1804 introduce an integrated data management system aimed at ensuring transparency, interoperability and continuous monitoring of AFI. This system requires data standardisation and clear identification of service providers. It provides for mandatory labelling of fuel compatibility and charging standards in accordance with **Annex II (EN 16942)**, ensuring open access to static and dynamic infrastructure data - such as location, capacity, operating status and price - via application programming interfaces (APIs) from 14 April 2025. A special Identifier Registration Organisation (IDRO) system will be established to identify operators. National data access points must also be established by 31 December 2024 and European access points by 31 December 2026 to real-time traffic information (as provided for in Commission Regulation (EU) 2022/670), which should also integrate data on charging points, stations and complexes and ensure its presentation to interested parties, in particular end users of data , ensuring compatibility and standardisation of data across the EU.

2.8. Intelligent Transport Systems (ITS) and digital data architecture in the context of TEN-T, AFIR, delegated and implementing EU regulations

Intelligent Transport Systems (ITS) are a key digital element of the TEN-T network infrastructure and a basic prerequisite for the implementation of a sustainable, safe and interconnected transport policy in the EU. They are defined in Article 4(1) of Directive 2010/40/EU as systems that use information and communication technologies to improve the efficiency, safety and environmental performance of road transport. Any implementation of ITS at national level must comply with the provisions of this Directive.

In order to ensure a harmonised exchange of transport data between Member States, the EU has adopted Delegated Regulation (EU) 2022/670, which supplements Directive 2010/40/EU and establishes technical and procedural requirements for the provision of pan-European real-time traffic information services (RTTI).

This document creates a digital data exchange architecture that is directly integrated into the logic of Regulation (EU) 2023/1804 (AFIR), defining the key elements of digital interaction:

1) National Access Points (NAPs)

Each Member State must therefore establish a single national access point for transport data users. The NAP functions as a central portal through which structured information on road conditions, charging and refuelling infrastructure, traffic restrictions and other dynamic data is provided. The NAP format can be implemented as a register, portal or repository (Article 3(1) of Regulation (EU) 2022/670).

2) Standardised data format (DATEX II)

A single European standard, DATEX II (EN 16157 and CEN/TS 16157), is used for the exchange of road infrastructure information, ensuring the technical compatibility of systems in different countries (Articles 4(1) and 6(1)). This format is mandatory for the integration of AFIR data, including information on charging stations, traffic and safety.

3) Alternative fuels infrastructure information (AFI)

Regulation (EU) 2022/670 explicitly stipulates the obligation of recharging and refuelling stakeholders to provide up-to-date data on the location, availability, capacity and operating mode of recharging/refuelling points (Articles 4(1), 7(1)). This ensures openness and transparency of alternative fuels infrastructure for users and operators.

Thus, Regulation (EU) 2022/670 laid the foundation for the digital architecture of the European transport space by creating an interconnected **NAP + DATEX II** system that provides real-time integration between road, energy and information infrastructure.

This digital foundation has paved the way for the introduction of more detailed requirements for alternative fuel infrastructure under Regulation (EU) 2023/1804 (AFIR) and forms **the "digital backbone" of** the European model for traffic and charging network management.

In addition, Delegated Regulation (EU) 886/2013 supplements Directive 2010/40/EU (Article 3(c)) and establishes the necessary specifications to ensure the compatibility, interoperability and continuity of the deployment of data and procedures for the provision of safety-related road traffic information (SRTI) free of charge to users.

Thus, in order to ensure the provision of minimum safety-related universal road traffic information (SRTI) (in accordance with Delegated Regulation (EU) 886/2013), Regulation (EU) 2024/1679 requires the installation **of** technical means on TEN-T roads to detect safety-related events or conditions ( ). This contributes to the resilience, safety and security of the network.

Delegated Regulation (EU) 886/2013 requires public and/or private road operators and/or service providers to exchange the data collected and make it available in DATEX II

format (CEN/TS 16157) or in a fully compatible machine-readable format via an access point .

Thus, Delegated Regulation (EU) 886/2013 SRTI creates the necessary digital foundation for the further integration of AFI systems into the ITS ecosystem.

Digital synergy between Regulation (EU) 2023/1804 AFIR and ITS systems

Regulation (EU) 2023/1804 integrates **Intelligent Transport Systems (ITS)** as the main digital architecture for managing alternative fuel infrastructure, in particular Electric Vehicle Recharging Points and Hydrogen Refuelling Points.

ITS provides a single information and communication space through which data is collected, processed and exchanged between vehicles, operators, energy systems and regulators.

The AFIR Regulation stipulates that mandatory Data Provisions must be implemented through National Access Points (NAPs) established in accordance with Regulation (EU) 2022/670.

This creates direct digital synergy between AFIR and ITS, with both documents functioning in an interdependent ecosystem — *AFIR defines what needs to be transmitted, while ITS establishes how this should be done*.

Key roles of ITS in implementing AFIR requirements

- **Vehicle-to-Infrastructure (V2I) interaction**

Enables real-time information exchange between electric vehicles and charging stations — regarding power, availability, charging cost, and network status.

- **Smart Charging Support**

Promotes automatic load balancing in the network, reduction of peak consumption and integration with Energy Management Systems, in accordance with ISO 15118-20.

- **Data collection and transmission for energy monitoring**

Charging station operators are required to provide data on energy consumption, number of charging sessions and average power via NAP, which ensures transparency and control by state and European authorities.

- **Integration with Smart Enforcement systems**

Data collected by ITS systems can be used for automated monitoring of compliance with technical standards, availability and security of infrastructure AFI, which strengthens compliance with AFIR principles and lays the foundation for a future single European digital transport space.

In addition, new EC regulations - Implementing Regulation (EU) 2025/655 of 2 April 2025, which lays down rules for the application of Regulation (EU) 2023/1804 of the European Parliament and of the Council on specifications and procedures related to the availability and accessibility of data on alternative fuel infrastructure and the corresponding package of Delegated Acts - are a direct continuation and practical implementation of the

mandates set out in Regulation (EU) 2023/1804 (AFIR), in particular the provisions of Article 20 (Data provisions) and Article 21 (Technical specifications). Their adoption marks the transition from the general regulatory objectives of AFIR to specific technical, operational and digital requirements that should ensure full interoperability and transparency of alternative fuel infrastructure within the European Union.

Delegated acts on Smart Recharging and V2G (Vehicle-to-Grid)

In parallel with Implementing Regulation (EU) 2025/655, the EC has adopted a package of Delegated Acts detailing the technical requirements for smart recharging, bidirectional charging and communication between vehicles and the grid (Vehicle-to-Grid, V2G).

These acts implement the provisions of Articles 5 and 21 of the AFIR, establishing mandatory compliance with ISO 15118 standards — the technical basis for Plug-and-Charge and Smart/Bidirectional Recharging functions, which provide automatic user identification, secure payment and real-time energy network balancing.

New and refurbished public charging stations must support ISO 15118-1 to ISO 15118-5 standards (to be installed no later than summer 2025). **From 1 January 2027**, all new public and private charging points must support ISO 15118-20, which sets requirements for smart and bidirectional charging.

This standard is key to the development of an energy-sustainable EU transport system based on the integration of transport, energy and digital infrastructures.

Table 8. Details of the digital requirements of Regulation (EU) 2023/1804 (AFIR): current Delegated and Implementing Regulations

EU requirement	Regulatory EU Act	Description and deadlines
Extended list of AFI data	Delegated Regulation (EU) 2025/671	Extends the list of static and dynamic data that CPOs are required to provide through the NAP from 14 April 2025 (Article 20(2) of Regulation (EU) 2023/1804). Includes detailed GPS coordinates, address, compatibility with vehicle types, payment methods (card/NFC/app), power, green energy share, and Smart Charging/Plug-and-Charge parameters.
Common technical requirements for API	Delegated Regulation (EU) 2025/645	Establishes common technical requirements for APIs (Application Programme Interfaces) to ensure free, unrestricted and unified automated data exchange between operators (CPOs) and users. Applicable from 14 April 2025 (Article 2 of Regulation (EU) 2025/645). The API must be compatible with NAPs and support integration into the Common European Access Point by 31 December 2026.

Data format and frequency	Implementing Regulation (EU) 2025/655	Establishes the mandatory use of the DATEX II data model **DATEX II data model**, referring to CEN/TS 16157-10:2022. **Update frequency:** Static data — no later than 24 hours after the change. Dynamic data (operational status, availability, price) — no later than 1 minute after change (Article 2 of Regulation (EU) 2025/655). Mandatory use of DATEX II begins on 14 April 2026.
Smart Charging and V2G	Delegated Regulation (EU) 2025/656	Introduces mandatory standards for Vehicle-to-Grid (V2G) and Smart Charging communication. **Requirement:** From 1 January 2027, public and private charging points (Mode 3/4) that are installed or refurbished must comply with standard **EN ISO 15118-20:2022** (Article 2.1.2 and Article 2.1.3(b) of Annex II to Regulation (EU) 2023/1804, as amended by Regulation (EU) 2025/656). Plug-and-Charge requires compliance with both standards: EN ISO 15118-2:2016 and EN ISO 15118-20:2022.
WIM/Smart Enforcement	Regulation (EU) 2024/1679	Requires the installation of Weigh in Motion (WIM) systems on average every 300 km on the comprehensive network of the Member State (Article 30(2)(c) of Regulation (EU) 2024/1679). WIM systems are necessary to identify vehicles that are likely to exceed the maximum permitted weights.

In practical terms, these provisions ensure the technical interoperability of infrastructure components, harmonise physical, digital and communication parameters, and establish requirements for inclusiveness and accessibility for all users, including persons with disabilities.

Overall, **the adoption of** Implementing Regulation (EU) 2025/655 and the package of Delegated Acts marks **a new stage in the evolution of AFIR**, aimed at ensuring transparency, data unification and digital compatibility of AFI.

Thus, AFIR and ITS form an interconnected digital transport management model in which each charging station and each vehicle is part of a common data system. This synergy defines the strategic direction of TEN-T development — from physical to data-driven infrastructure that combines energy, mobility and digitalisation.

Comparative analysis: ICT and digitalisation in the EU and Ukraine

Although Ukraine has officially identified the digitalisation of transport system management as a strategic priority — in particular, within the Indicators of the Plan for Ukraine Facility *(section Transport — Reform 1. Comprehensive Planning for Transport Sector Development)*, the results of the study show that there are significant regulatory gaps in terms of harmonising information and communication technologies (ICT) with TEN-T requirements and EU legislation.

Despite political recognition of the importance of digital integration, current national legislation lacks legal mechanisms to ensure the compatibility of Ukrainian transport infrastructure with EU digital systems.

Table 9. Assessment of the compliance of Ukrainian legislation with EU requirements for digital transport infrastructure (ICT, ITS, eFTI, WIM)

EU requirement	EU Regulatory Act	Situation in Ukraine / Provisions of regulatory acts	Gaps and risks
ICT systems and digital infrastructure	Regulation (EU) 2024/1679 (Article 29(1)(c), Article 43(1))	The Law of Ukraine "On Motorways" mentions only "means of technological communication" and "engineering facilities".	**Lack of legal definition:** Ukrainian legislation does not define "digital infrastructure and ICT systems for transport" as an integral part of infrastructure, which prevents their inclusion in projects of common interest (PCI).
ITS (General Framework Directive)	Directive 2010/40/EU (Article 4(1))	DBN B.2.2-12:2019 mentions the need to modernise and develop an automated traffic management system.	**Absence of a framework act:** There is no specific regulatory act that would fully harmonise ITS deployment standards and requirements with Directive 2010/40/EU.
SRTI: Provision of minimum safety-related information	Delegated Regulation (EU) 886/2013 (Article 3(c) of Directive 2010/40/EU; Article 4(1))	No direct implementation of the requirement to provide minimum universal road safety information (SRTI) free of charge.	**Safety and compliance risk:** The lack of mandatory SRTI provision and deployment of technical means to detect safety-related events or conditions hinders the improvement of the resilience and safety of the TEN-T network.
Technical means to detect hazards / SRTI	Regulation (EU) 2024/1679 (Article 30(3))	The legislation does not make it mandatory to install technical means for detecting safety-related events on TEN-T roads.	**TEN-T non-compliance:** The requirement of Regulation (EU) 2024/1679 to install these means must be implemented but is not enshrined in national legislation.
National Access Point (NAP) and Data Format	Regulation (EU) 2022/670 (Article 3(1), Article 6(1)); Regulation (EU) 2023/1804 (Article 20(4)); Implementing Regulation (EU) 2025/655 (Article 1)	There is no legislative mechanism for establishing a NAP and collecting standardised AFI data.	**Critical synchronisation delay:** NAP is a mandatory access point for ITS data (according to Regulation (EU) 2022/670) and AFIR data. Mandatory use of DATEX II (CEN/TS 16157-10:2022) for AFI from 14 April 2026. Ukraine has no implemented mechanism.

WIM (Weigh-in-Motion) / Smart Enforcement	Regulation (EU) 2024/1679 (Article 30(2)(c))	The Law of Ukraine "On Motorways" contains only a general reference to "measuring the weight and dimensions of vehicles".	**Absence of WIM standards:** There is no definition of WIM, mandatory deployment intervals (e.g. on average ≤300 km on the Comprehensive Network) or a mechanism for integrating WIM with digital control systems (smart enforcement).
AFI data exchange: API and extended data	Regulation (EU) 2023/1804 (Article 20(2), Article 20(3)); Delegated Regulation (EU) 2025/645 (Article 1); Delegated Regulation (EU) 2025/671	The legislation does not impose requirements on charging point operators (CPOs) to provide **static and dynamic data** (operational status, price, power, plug-and-charge, smart charging).	**Technological isolation:** CPOs must provide an extended set of data via API. The lack of harmonisation of APIs (Regulation (EU) 2025/645) and the required data types (Regulation (EU) 2025/671) hinders integration into the Common European Access Point.
Smart Charging / V2G	Regulation (EU) 2023/1804; Delegated Regulation (EU) 2025/656 (Article 2.1.2)	The legislation does not set mandatory requirements for the implementation of Smart Charging or V2G (Vehicle-to-Grid) functions.	**Risk of technological gap:** The EN ISO 15118-20:2022 standard for V2G/Smart Charging will become mandatory for new or refurbished public and private EV charging stations (Mode 3/4) from **1 January 2027**.
eFTI (Electronic Freight Transport Information)	Regulation (EU) 2020/1056 (Article 1, Article 4)	The eQueue systems are being implemented and work on e-TTN is ongoing.	**Incomplete implementation:** Full implementation of Regulation (EU) 2020/1056 is necessary to ensure uniform electronic exchange of regulatory information on freight transport in a multimodal context based on certified eFTI platforms.

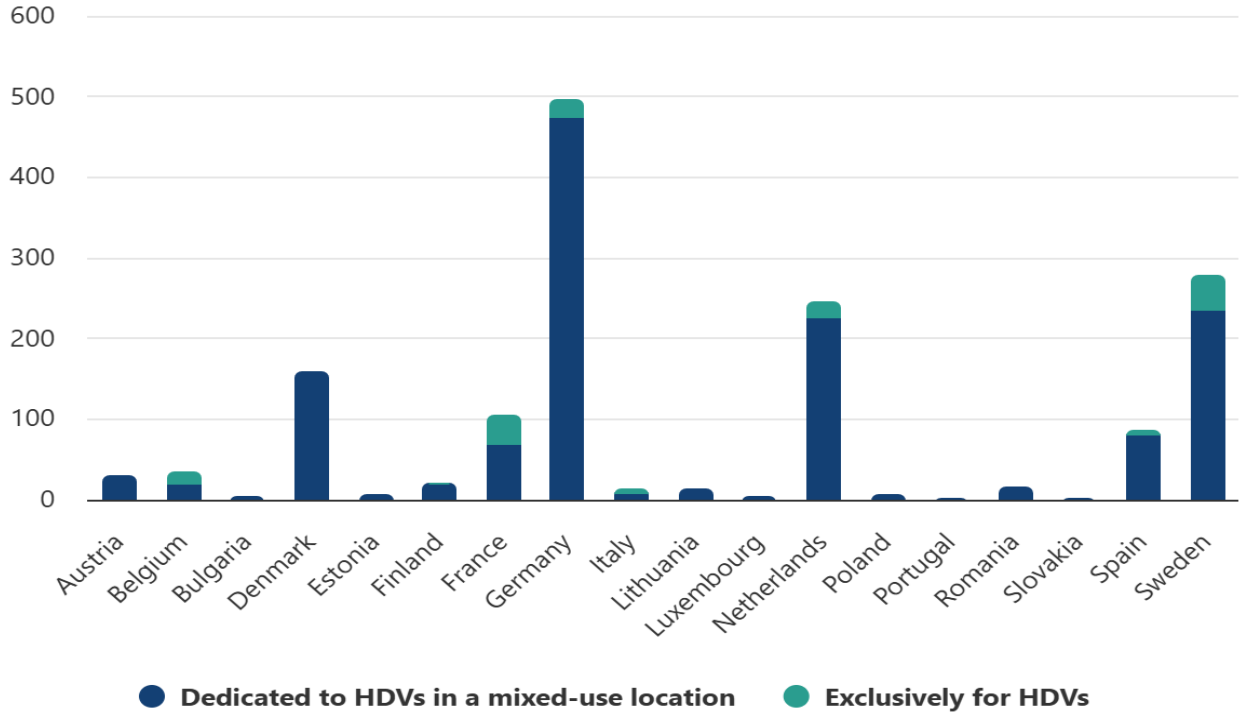
Therefore, the lack of regulatory support for these areas creates a systemic gap between the EU and Ukraine's digital transport management tools, which makes full interoperability impossible, limits integration into the TEN-T network and reduces the potential for access to funding through mechanisms (CEF, AFIF, Cohesion Fund, RRF).

Ukrainian legislation does not provide for a register of identification numbers for at least charging point operators and mobility service providers, and does not designate an authorised person to maintain such a register, as required by Article 20 of Regulation (EU) 2023/1804.

The EC **continuously monitors the deployment of infrastructure** for light (LDV) and heavy (HDV) vehicles using data from National Access Points (NAPs) and regular reports under Article 14 of the AFIR. The pan-European AFIR data gateway (CEAP) is a

pan-European AFIR data gateway that the Commission is setting up by 31 December 2026. Currently, the main and most convenient public source is the EAFO (European Alternative Fuels Observatory).

In addition, the EAFO has recently published **a** new **dataset** on public charging infrastructure for heavy-duty vehicles (HDVs) in 27 EU countries:



The first publication, released on 16 October 2025, marks the start of monthly updates on IZE for HDVs, supporting the EU's monitoring efforts under Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure (AFIR). The EAFO consortium portal provides up-to-date statistics (updated to September 2025) covering the structure of the vehicle fleet (passenger cars, trucks and buses) and the share of vehicles with alternative powertrains — electric (BEV), plug-in hybrid (PHEV), hydrogen (H_2), liquefied petroleum gas (LPG), compressed natural gas (CNG) and liquefied natural gas (LNG).

A separate section is devoted to IZE and refuelling, including the number and types of charging points (AC/DC), hydrogen stations and natural gas supply points. The data is presented in a comparative format for all EU countries, allowing for an assessment of the dynamics of AFI network deployment, the degree of infrastructure saturation, and the ratio between the number of vehicles and charging points.

Overall, **the EAFO consortium's** analytical **indicators** form the basis for monitoring the implementation of Regulation (EU) 2023/1804 (AFIR) and **are** also **used by the EC** to assess the progress of Member States in achieving the mandatory TEN-T targets and planning funding from the CEF fund. The EAFO consortium also **supports the Sustainable Transport Forum (STF)** by assisting in the development of recommendations on various AFI-related issues. The statistics presented also provide a comparative basis for the development of national policies aimed at developing vehicle charging and refuelling

infrastructure and can be used as a reference basis for the preparation of **Ukraine's National Policy Framework (NPF-AFIR Ukraine).**

Ukraine's strategic and legal framework in the context of harmonisation with AFIR

According to the Communication from the Commission to the European Parliament and the Council on the technological and market readiness of heavy-duty road transport vehicles (Communication from to the and technological and market readiness heavy-duty , Brussels, 27.5.2025, COM(2025) 260 final),

The EC notes **the significant advantage of** battery electric vehicles (BEVs) over hydrogen fuel cell/internal combustion (H_2 FCs/ICEs) vehicles in the heavy-duty vehicle segment.

As of the end of 2024, **more than 15,000** heavy electric trucks (BEVs) were registered in EU member states, compared to **only 170 hydrogen vehicles**. This indicates the significant dominance of BEVs in the structure of new registrations and, accordingly, in the investment priorities of original equipment manufacturers (OEMs).

European commercial vehicle manufacturers (including Volvo, Daimler Truck, MAN, Scania, Renault Trucks) are currently directing their main capital investments towards the development of battery systems, fast charging (megawatt charging systems, MCS) and digital energy consumption optimisation technologies, while hydrogen solutions are mainly considered for limited niches - regional and specialised transport.

According to European Commission forecasts, **by 2030, BEVs will account for about 90%** of the total fleet of heavy-duty zero-emission vehicles, equivalent **to 410,000 to 600,000 units.**

The updated range for BEVs already meets the real operational needs of most transport service operators:

- city buses - 300-400 km,
- regional trucks - 400-500 km,
- long-haul trucks - 500 km and more, and new models with a range of 700-800 km are expected to go into series production as early as 2025.

Thus, current trends in technological readiness and market investment in the EU confirm the priority of developing high-power charging (HPC) infrastructure for heavy-duty transport as a key element in meeting the requirements of Regulation (EU) 2023/1804 (AFIR). This necessitates Ukraine to focus specifically on the electrification scenario of AFI development, which ensures compliance with the European trajectory of decarbonisation of the transport sector.

These provisions are important for Ukraine as they form the methodological basis for integrating the alternative fuels management system with the European model.

The Ukrainian legislative and strategic landscape currently contains only partially harmonised documents and action plans that form the basis for the future development of **the National Policy Framework (NPF-AFIR Ukraine)** in the field of AFI. Although a specific document comprehensively covering all the requirements of Regulation (EU) 2023/1804 –

in particular mandatory targets, user requirements, reporting and technical specifications – has not yet been approved, the existing strategic documents set the direction for gradual convergence with these standards.

For example, the Operational Plan for the Implementation of the NTS for 2025-2027 details the practical steps that directly lay the foundation for the development of **the National Policy Framework (NPF-AFIR Ukraine)** in accordance with AFIR requirements.

In particular, Measure 15 (1) provides for *the development and submission of proposals for improving regulatory and legal acts and policy documents aimed at ensuring the efficient use of fuel and energy resources, energy conservation and infrastructure for alternative fuels and energy sources, improving the environmental performance of transport in the areas of road, urban electric, rail, aviation, maritime and inland waterway transport, taking into account European priorities and the provisions of Regulation (EU) 2023/1804 (AFIR) - implementation deadline by the fourth quarter of 2025.*

Measure 15(2) aims to improve the policy and regulatory framework for the operation of alternative fuel infrastructure, harmonised with the principles of AFIR — **implementation deadline: Q4 2027.**

An important element is the Law of Ukraine "On Certain Issues of Using Vehicles Equipped with Electric Motors" (No. 2956-IX), which defines the state policy on the development of electric transport and electric charging infrastructure (ECI). Although, in our opinion, the subject of legal regulation of this law needs to be expanded and systematically corrected, based on the requirements of Section II and Article 92 of the Constitution of Ukraine, it is currently the only document at the legislative level that establishes the priority of state support for the development of infrastructure for electric vehicles, forming the regulatory basis for the further adaptation of Ukrainian legislation to the provisions of AFIR.

Table 10. Key gaps identified in Ukrainian legislation in the field of AFI development that need to be addressed within the NPF

Gap	Requirement of Regulation (EU) 2023/1804	Situation in Ukraine
Absence of NPF	Mandatory existence of a National Framework Policy for coordinating the development of AFI.	**Not established**. This hinders comprehensive strategic planning. NPF is absent. A draft NPF is planned, but only after decisions on data collection and mandatory requirements have been implemented.
Operational/Digital access	Mandatory compliance of public ESAs **with Article 5 of the AFIR** (roaming, payment via terminals, transparency, smart recharging).	**No mandatory requirements have been established**. Only relatively new public electronic payment systems partially comply with these requirements.
Statistics and reporting	Mandatory collection of official statistics on the vehicle fleet and EV infrastructure (for setting targets and reporting).	**No** official statistical requirements. This makes it impossible to set mandatory national targets and prepare national progress reports.
Institutional oversight mechanism	Member States are required to submit national progress reports to the European Commission every two years, starting on 31 December 2027, to monitor the achievement of targets, the	**There is no** authorised body responsible for coordinating the NPF and submitting biennial reports (Article 15 of Regulation (EU) 2023/1804). There is currently no system of state supervision (control) of service quality and consumer rights

	level of infrastructure use, measures taken and investment volumes.	compliance (Article 5 of Regulation (EU) 2023/1804).
Technical specifications	Full adoption of AFIR standards (technical characteristics, power, connectors, definitions).	**Not fully agreed**. Not all AFIR technical standards have been adopted as national standards.

Further analysing the recommendations of the Sustainable Transport Forum (STF) Working Group in Subgroup (3) on best practices of public authorities in supporting the deployment of charging infrastructure, the following recommendations for harmonising Ukrainian legislation can be further highlighted.

1. Removal of administrative barriers and grid connection procedures (TF1)

Context: The TF1 Working Group (*Best Practices Guide for Permitting & Grid Connection Procedures*) has identified that lengthy and complex administrative procedures for coordination, connection and obtaining permits (24-48 months) are a major barrier to the rapid deployment of AFI in the EU.

Recommendations for Ukraine:

- Implement the TF1 methodology to **identify problematic** approval and grid connection **processes** (DSO/TSO) and create **a best practice guide for** permitting procedures.
- Coordinate the work of the Ministry of Development, the Ministry of Energy and the NEURC in order to reduce the time required for AFI approval and grid connection, which is a priority identified by the EC.

2. Harmonisation of contractual terms and public procurement (TF2)

Context: The TF2 (*Development of Templates, Tools and Standard Contract Provisions*) working group has developed standardised templates for contracts, technical requirements and tools to accelerate the implementation of AFI through concession mechanisms and grant programmes.

Recommendations for Ukraine:

- Integrate TF2 standard templates into national public procurement procedures and grant mechanisms (in particular, within the Ukraine Facility).
- Introduce a unified contractual framework for charging infrastructure operators – this will increase transparency and reduce administrative risks at the contract stage.

3. Planning for urban nodes and vehicle fleets (TF3, TF4)

Context: Working groups TF3 (*Infrastructure Roll-Out for Specialised and Captive Fleets*) and TF4 (*Revision of the SUMP Electrification Guide*) aim to implement the AFIR requirements for urban nodes (Article 41 Regulation (EU) 2024/1679).

Recommendations for Ukraine:

- **Integration into SUMP:** Sustainable Urban Mobility Plans (SUMP) for Ukrainian urban nodes should include updated TF4 recommendations on electrification and deployment of charging infrastructure for HDVs.

- **Closed fleets:** Develop a national approach within the NPF to support infrastructure for specialised and closed fleets (taxis, logistics, car sharing), taking into account TF3 recommendations.

4. Accessibility and inclusiveness of infrastructure (TF5)

Context: Accessibility is a mandatory component of NPFs in accordance with Article 14(9) of AFIR and is the subject of TF5 (*Guide on Accessibility*).

Recommendations for Ukraine:

- Implement accessibility standards for all public charging points, ensuring unimpeded mobility for persons with reduced mobility, persons with disabilities and older persons.
- Use the TF5 guidance as a basis for developing national construction and operational standards in the field of AFI.

Thus, **the development of the National Policy Framework (NPF-AFIR Ukraine)** should ensure systematic coordination between transport, energy and digital policies, remove key administrative barriers and form a legal and operational basis for Ukraine's integration into TEN-T and the future revision of AFIR in 2026.

For Ukraine, the implementation of the above-mentioned AFIR provisions also requires synchronising **the** Ukrainian **National Energy and Climate Action Plan (NECP)** for 2025-2030 with EU approaches, creating a transparent monitoring and reporting system, improving data accessibility for users and market operators, and strengthening investor confidence. This, in turn, will open up opportunities to attract funding from the Ukraine Facility and CEF instruments, facilitating Ukraine's faster adaptation to the requirements of Regulation (EU) 2023/1804 and the formation of a modern energy-sustainable transport system.

2.9. Technical standards, interoperability and review mechanisms of Regulation (EU) 2023/1804 (AFIR)

Regulation (EU) 2023/1804 establishes a comprehensive system of technical standards, update procedures and monitoring of the technological readiness of alternative fuel infrastructure. These provisions are aimed at ensuring the compatibility, safety and long-term adaptability of infrastructure within the Single European Transport Area.

According to Article 21, EU Member States are required to apply the technical specifications listed in Annex II to the Regulation, which define standards for all types of alternative fuels infrastructure. In particular, requirements are established for electrical connectors (EN 62196 for electric vehicle charging systems) and hydrogen refuelling stations (EN 17127 for gaseous hydrogen). If gaps are identified, the EC may instruct European Standardisation Organisations (ESOs) to develop new standards, which are then implemented through delegated acts. This approach ensures the flexibility of the system, allowing for a timely response to technological changes and innovations in the industry.

Articles 22-23 define the mechanism for delegating powers to the European Commission for a five-year period with the possibility of extension, and establish the procedure for adopting implementing acts through a special committee of Member States. Article 24 establishes the frequency of reviews of the regulation: the first technical report on the readiness of infrastructure for heavy-duty vehicles (HDVs) must be submitted by 31 December 2024, and a general review of the effectiveness of the regulation must be submitted by 31 December 2026, with subsequent updates every five years. The review *will assess the relevance of traffic thresholds, the effectiveness of payment systems, the impact on competition and progress towards decarbonisation targets*. The update of Regulation (EU) 2023/1804 is expected to focus primarily on the charging infrastructure needs for heavy-duty vehicles (HDVs), including an assessment of the actual capacity, level of availability and technical compatibility of charging points on TEN-T corridors.

The final articles 25-26 provide for the repeal of previous acts, in particular Directive 2014/94/EU and Delegated Regulations (EU) 2019/1745 and 2021/1444, with effect from 13 April 2024, ensuring the direct effect of AFIR in the EU legal framework.

As the share of battery electric vehicles (BEVs) on EU roads grows, the issue of their integration into urban infrastructure is becoming increasingly relevant. The EC pays particular attention to covered parking areas - spaces with an increased level of risk, where fire safety, ventilation and access for emergency services are crucial.

It should be noted that Regulation (EU) 2023/1804 (AFIR) also sets minimum standards for the deployment of recharging stations, including in **publicly accessible covered parking areas such as shopping centres and public car parks.** To further advance this agenda, a new version of Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings was adopted in April 2024.

The revised Directive (EU) 2024/1275 is strategically aligned with decarbonisation goals, emphasising the critical role of the built environment in facilitating the transition to zero-emission vehicles. It focuses primarily on expanding infrastructure to support the uptake of BEVs by promoting pre-connection and installation of recharging points in residential and non-residential buildings across the EU. By seamlessly integrating electric vehicle infrastructure into building design, the Directive aims to improve the convenience and accessibility of charging stations, thereby promoting the transition to clean transport and making a significant contribution to the EU's broader decarbonisation goals. Directive 2024/1275 requires the simplification and acceleration of the procedure for installing charging points in buildings with multiple co-owners, including in terms of obtaining the consent of co-owners.

Working Group 6 of the Sustainable Transport Forum (STF) has developed specific Fire Safety Guidelines for parked electric vehicles and charging infrastructure in indoor spaces and electric vehicle parking areas, aimed at identifying, assess and minimise the risks associated with the possible ignition of BEVs in indoor car parks, as well as the safe installation of charging infrastructure inside such facilities. This guidance combines technical, organisational, structural and preventive measures and aims to create a

harmonised framework for public authorities, car park operators, designers, risk assessment experts, fire services and equipment manufacturers.

The STF guidance emphasises the need for a comprehensive approach: from proper zoning of charging points, adequate ventilation and early detection systems to special design solutions to contain the spread of fire. Particular attention is paid to the role of infrastructure operators: their responsibility to ensure regular maintenance, conduct emergency response training and establish clear procedures for interaction with local emergency services.

For Ukraine, where the development of urban charging networks is only gaining momentum, this Guideline is of particularly high practical value. In the context of active reconstruction of critical infrastructure and the need for harmonisation with EU legislation, the implementation of STF approaches can ensure an adequate level of technological safety and compliance with future AFIR requirements for the integration of charging infrastructure into urban nodes (Urban Nodes).

Given the planned development of the National Policy Framework (NPF-AFIR Ukraine), it is advisable to include the provisions of STF WG6 in Ukrainian building codes, parking design rules and fire safety requirements. This will help to avoid risks, reduce the burden on local authorities and create a safe urban environment for electric vehicle users.

As part of the AFIR review procedure (Article 24), we would like to additionally mention **Electric Road Systems (ERS)** and **Battery Swapping Technology.**

Electric Road Systems (ERS) are designed to power vehicles while they are in motion, which in theory reduces the size of batteries and the need for stationary charging stations. There are currently at least three main technological approaches to implementing ERS: *catenary systems, inductive charging, and ground contact charging (e.g., via a rail conductor).*

In its assessment, the EC notes that, despite the successful demonstration of individual pilot projects in Germany, France, Italy and Sweden, large-scale implementation of ERS is not expected in the near future. The pilots revealed high investment costs, operational and maintenance risks, and the complexity of integrating the technology into existing road infrastructure, which calls into question its economic viability in the current environment.

Given the long time required for the planning, construction and certification of such systems, **ERS will not be able to cover a significant part of the TEN-T network (over 100,000 km) in the short to medium term.** Thus, by 2030, electric road systems are not considered a significant factor in the decarbonisation of heavy transport in Europe, and their potential remains limited to experimental projects.

Battery Swapping Technology

Battery swapping technology is most widespread in China, where it is used for heavy-duty vehicles and demonstrates potential benefits, including increased operational flexibility for fleets and reduced peak loads on the power grid by optimising charging times.

In the EU, however, heavy-duty vehicle (HDV) manufacturers are not currently interested in this technology. The main reasons are technical and operational limitations related to the fact that battery modules in most modern HDV models are fully integrated into the chassis structure, making the replacement process technically complex and expensive. In addition, the lack of standardisation in battery sizes and mountings hinders the creation of a universal exchange system.

Despite this, the EC recognises the potential of battery swapping technology for certain scenarios and plans to continue studying it as part of the revision of Regulation (EU) 2023/1804 (AFIR), taking into account the possibility of technological breakthroughs in standardisation and safety after 2030.

It should be noted separately that the key technological driver for the development of infrastructure for heavy electric vehicles is the MCS (Megawatt Charging System) standard, which is in the final stages of development and is expected to be approved in 2025.

The implementation of this standard is considered by the EC and industry associations as a key element of technical compatibility and scaling of the charging infrastructure for HDVs.

MCS provides for a charging capacity **of more than 1 megawatt (MW),** which allows for fast charging of trucks during mandatory driver breaks (45 minutes in accordance with Regulation (EC) 561/2006). Capacities of up to 1 MW are considered sufficient to meet typical operational needs in short and medium logistics cycles.

In the short to medium term, CCS (Combined Charging System) and MCS are expected to coexist, ensuring a smooth transition from the existing technology base to new high-power charging standards.

In the long term, MCS is expected to completely replace CCS as the basic standard for heavy-duty vehicle (HDV) charging infrastructure on TEN-T networks, in line with AFIR requirements and CEF Transport / AFIF technical guidelines.

For Ukraine, Articles 21-26 are key in terms of harmonising technical standards (in particular, the adaptation of DSTU EN 62196, adopted in March 2025) and implementing climate proofing principles in infrastructure projects. Their implementation creates the basis for attracting funds from EU programmes such as CEF and Ukraine Facility, which already provide for funding of up to €600 million for the development of national equivalents of the TEN-T network and the development of charging infrastructure for electric transport.

In a strategic context, the provisions of the AFIR form the basis for the transition of Ukraine's transport system to a zero-emission model, contributing to increased energy efficiency, reduced emissions and integration into the European clean mobility market.

Ukraine's national legislation shows only partial harmonisation in the area of physical standards, while a critical legal gap (Not Aligned) remains in the areas of strategic planning, digital integration and operational requirements. This inconsistency makes it impossible to implement the dynamic review mechanisms provided for in Regulation (EU) 2023/1804.

Compliance of Ukrainian legislation with AFIR review mechanisms

Regulation (EU) 2023/1804 establishes a set of mechanisms aimed at ensuring **the adaptability** of alternative fuels (AF) infrastructure development **policy** to technological, market and environmental changes.

The mechanisms set out in Articles 21-26 of Regulation (EU) 2023/1804 cannot be effectively implemented in Ukraine until a number of legal and procedural gaps relating to both the technical and institutional components of the alternative fuels infrastructure management system are addressed.

Physical and technical specifications – partial compliance.

Ukraine has achieved a certain level of harmonisation in the field of physical standards, which creates an initial basis for technical compatibility with EU requirements.

The DBN B.2.2-12:2019 (Amendment No. 1) **connector standards** establish the use of type 2 connectors for alternating current (AC) charging points and CCS Combo 2 for direct current (DC), which fully complies with the technical requirements of AFIR.

Fire safety: DBN B.2.2-12:2019 includes a reference to DSTU 9222:2023 "Fire safety. Fire protection of electric vehicle charging systems", which ensures an adequate level of safety during the design, installation and operation of EV charging stations. The requirements for the location of charging stations also take into account fire and sanitary standards, bringing them closer to European practice.

Strategic framework and planning - not harmonised.

Unlike EU countries, where AFIR requires a **National Policy Framework (NPF),** Ukraine lacks a single document that would define mandatory national targets, implementation measures, a reporting system and coordination between ministries. There is also no procedure for the regular review of regulations or strategic documents to take account of technological innovations, as provided for in Article 24 of AFIR.

Table 11. Assessment of the compliance of Ukrainian legislation with the key requirements of Regulation (EU) 2023/1804

AFIR requirement	Situation in Ukraine	Assessment of compliance
Smart Recharging Functions	Ukrainian legislation **does not establish mandatory requirements** for the implementation of smart recharging functions for public EV charging stations. The implementation of these functions is planned only for **Q4 2028**.	**Not harmonised**.
Non-discriminatory access and roaming	Only relatively new public EES partially comply with AFIR requirements. There is no obligation to ensure compatibility with EU digital platforms, roaming and payment via terminals.	**Not harmonised**.
National Access Point (NAP)	**No** legislative mechanism for establishing a NAP and collecting standardised infrastructure data.	**Not harmonised**

Although Ukraine has achieved initial technical harmonisation with AFIR in terms of physical infrastructure parameters, the lack of strategic, operational and digital review mechanisms significantly limits its ability to integrate into the common European alternative fuels infrastructure management system.

Further steps should include the introduction of NPF, a digital monitoring platform (National Access Point) and regulatory performance assessment cycles, which will ensure systematic compliance with AFIR standards and access to EU funding.

Conclusion TO SECTION II

Regulation (EU) 2023/1804 (AFIR) marks a new era in EU policy, replacing Directive 2014/94/EU with a framework of binding, quantifiable targets. Its strategic goal is to ensure full coverage of the TEN-T network with publicly accessible alternative fuel infrastructure by 2030, which is a key step towards reducing emissions in the transport sector by 90% by 2050.

AFIR lays the technological foundation for Europe's transition to electrified heavy-duty vehicles (HDVs) by setting minimum standards for power, distance and interoperability. By 2030, each section of the TEN-T Core Network must have charging pools with a total capacity of at least 3,600 kW every 60 km, and all certified safe parking areas (SSPA) must be equipped with at least four 100 kW charging stations. These parameters directly influence the formation of Ukraine's national policy in the field of AFI, as they become the actual criteria for access to CEF 2.0 and Ukraine Facility funding.

The heavy electric transport market in the EU shows a steady focus on BEV technologies. By the end of 2024, more than 15,000 electric trucks will be registered, compared to 170 hydrogen trucks, and by 2030, 400-600 thousand BEV HDVs (over 90% zero emissions) are expected. At the same time, the Megawatt Charging System (MCS) standards, which are to be finalised in 2025, form the technological basis for fast charging of HDVs during mandatory driver breaks.

Despite this, AFIR identifies systemic challenges even in EU member states, primarily the lack of grid capacity and excessive connection procedures (up to 48 months). These aspects are an important benchmark for Ukraine, which must provide for simplified and accelerated licensing mechanisms (including taking into account Directive 2021/1187 EU).

As of October 2025, Ukrainian legislation shows only partial harmonisation with the provisions of Regulation (EU) 2023/1804 (AFIR). The main regulatory acts ensuring partial adaptation to the AFIR requirements are **Law of Ukraine No. 2956-IX of 24 February 2023** (as amended in July 2025, which establishes a minimum charging infrastructure capacity of ≥ 0.5 kW per electric vehicle by 2030) and **the National Energy and Climate Plan (NECP) 2025–2030**, approved in August 2025, which sets a target of achieving a 14% share of renewable energy sources in the transport sector.

These documents form the basic political and legal framework for the development of electromobility, mainly in the light-duty vehicle segment. At the same time, they do not fully cover the AFIR requirements for heavy-duty vehicle (HDV) infrastructure, hydrogen technologies and shoreside electricity supply systems.

According to **reports by the Energy Community Secretariat** for 2024 and Q3 2025, the level of AFIR transposition in Ukraine is estimated at approximately 40%. The most progress has been made in the legal recognition of charging station infrastructure, the definition of terminology and the introduction of basic technical standards (connector types, minimum power, safety requirements).

At the same time, **regulatory gaps** remain significant. Ukrainian legislation **does not** yet **set quantitative targets for HDV infrastructure** (Article 4 of AFIR), does not contain legal provisions on hydrogen refuelling stations (Articles 6–7), and does not specify requirements for shore-side electricity supply (Articles 9–12). Furthermore, there are no derogation mechanisms for low-traffic areas as provided for in the AFIR, and in terms of **digital integration,** the requirements for **API interfaces, IDRO identification of operators,** and the creation of **a national access point (NAP)** for charging infrastructure data (Articles 19–20) have not been implemented.

There is also a significant lag in strategic planning. Currently, Ukraine lacks the National Policy Framework (NPF) provided for in Article 14 of the AFIR, which would combine targets, indicators, investment instruments and a reporting system into a single monitoring mechanism. The relevant elements are only partially reflected in the updated National Transport Strategy and its operational plan (2025–2027).

Another critical barrier to harmonising Ukrainian legislation with the EU acquis is the lack of full transposition and implementation of Directive (EU) 2024/1275, which establishes mandatory requirements for the installation of charging points in new construction and renovation of buildings.

State building standards (DBN) and other applicable regulatory acts of Ukraine currently do not contain legally binding provisions establishing minimum requirements for electric charging infrastructure for residential and non-residential buildings, as defined by Directive 2024/1275. The absence of such requirements leads to a systemic regulatory gap: charging infrastructure is not integrated into design decisions at an early stage, making it impossible to develop long-term urban infrastructure that is compatible with AFIR and EU standards.

The impact of military action remains an additional deterrent. According to the Energy Community Secretariat (Q3 2025), approximately 40% of energy infrastructure has been damaged or destroyed, complicating the deployment of pilot projects and the practical implementation of AFIR indicators.

Thus, Ukraine is at the initial stage of AFIR regulatory implementation, with partial coverage of technical requirements and legal definitions, but without a comprehensive

system of strategic management, digital data exchange and regulatory mechanisms for the HDV, hydrogen and shore-side electricity sectors. To improve compliance with European standards, it is advisable to develop **a National Policy Framework (NPF)** in the field of alternative fuels, supplement the legislation with requirements for **hydrogen and port infrastructure**, and provide for **an institutional reporting and monitoring mechanism** in accordance with Articles 14–20 of AFIR.

SECTION III. DIRECTIVE 1999/62/EC ON THE CHARGING OF VEHICLES FOR THE USE OF ROAD INFRASTRUCTURE (EUROVIGNETTE): LEGAL BASIS, TARIFFING MECHANISMS AND DIRECTIONS FOR ADAPTATION IN UKRAINE

3.1. Purpose, scope and political context of Directive 1999/62/EC.

Directive 1999/62/EC of the European Parliament and of the Council of 17 June 1999 on the charging of vehicles for the use of certain infrastructures *(as substantially amended by Directive (EU) 2022/362 of 24 February 2022)* aims to establish a harmonised, transparent and environmentally oriented road pricing system within the European Union.

It is also one of the key instruments for implementing the European Green Deal and the Sustainable and Smart Mobility Strategy, ensuring the gradual transition of the transport sector to a low-carbon economy.

The **main** objective of Directive 1999/62/EC is to fully implement the **user pays** and **polluter pays** principles , which should ensure the financial sustainability of the transport network, create fair competition between modes of transport and encourage the transition to clean technologies in the road transport sector.

To achieve this goal, Directive 1999/62/EC (as amended):

1) introduces environmental differentiation of rates, providing for different levels of payments depending on the emission class of the vehicle (CO_2 class or Euro category), which should stimulate the renewal of the vehicle fleet and increase the share of low-carbon transport;

2) unifies the structure of road payments, distinguishing three components:

- infrastructure charge (to cover construction and maintenance costs),
- payment for external costs (CO_2 emissions, local pollution, noise),
- congestion charge;

3) establishes a transition from time-based payment models (user charges/vignettes) to distance-based charging for heavy goods vehicles on the TEN-T core network, with the aim of ensuring a more accurate reflection of actual infrastructure use;

4) defines mechanisms to ensure transparency, non-discrimination and competition, including restrictions on mark-ups and maximum levels of charges, which prevent unjustified differences between users depending on their country of registration.

Thus, Directive 1999/62/EC establishes **an updated legal framework for road charges in the EU**, aimed at ensuring the financial sustainability of transport infrastructure, meeting climate targets, harmonising rules in the internal market and creating economic incentives for the transition to climate-neutral mobility (zero-emission vehicles).

3.2. The link between Directive 1999/62/EC and the TEN-T network and the evolution of the road charging model in the EU

The amended Directive 1999/62/EC establishes an updated road pricing system for the TEN-T network, moving EU Member States from fragmented national practices to a single harmonised charging model based on the user pays and polluter pays principles.

The application of Directive 1999/62/EC covers the entire TEN-T network defined by Regulation (EU) 2024/1679, as well as *any other additional sections of their network of motorways* that are not part of the Core Network. This approach ensures the harmonisation of road charges across the EU and removes barriers to cross-border traffic.

EU Member States may apply both **tolls** and **user charges**, but the EU is gradually moving from time-based charging models to distance-based charging. According to the updated requirements, from 25 March 2030, time-based charges (vignettes) must be abolished for heavy goods vehicles on the TEN-T Core Network, unless Member States can demonstrate that the transition would be disproportionate or that there is a risk of traffic being diverted to lower-level roads. For countries that applied charges **until 24 March 2022, a transitional combined model (tolls + user charges) is allowed,** subject to justification.

For the first time in European law, Directive 1999/62/EC systematises financial instruments within the framework of infrastructure charges, in particular **the mark-up mechanism.** They may be applied on congested or environmentally sensitive sections of the network, provided that **the revenue generated is invested in the same TEN-T transport corridor**. For cross-border projects, mark-ups may only be applied by mutual agreement between the neighbouring countries, and their level may exceed the basic limit of 25% (up to 50%) to ensure the financial viability of joint investments.

Thus, Directive 1999/62/EC not only establishes a fair economic model for road charging within the TEN-T, but also **creates a self-sufficient financial mechanism capable of supporting the sustainable development of transport infrastructure.**

For Ukraine, these provisions **set the guidelines** for the development of a national system of infrastructure charges on TEN-T sections subject to modernisation in accordance with Regulation (EU) 2024/1679 and the requirements of Regulation (EU) 2023/1804 (AFIR). At the same time, it is advisable to consider the potential use of surcharges, combined schemes and targeted allocation of revenues as instruments for co-financing investments in road, charging and service infrastructure.

3.3. The role of Directive 1999/62/EC in financing alternative fuel infrastructure

Directive 1999/62/EC, which regulates the charging of vehicles for the use of road infrastructure, explicitly provides for the possibility of using road charges as a tool to **finance the development of AFI**, in particular charging facilities for low- and zero-emission vehicles.

The regulator specifies that the application of additional charges or specially designated surcharges **does not violate the principles** of the Directive, provided that they are used for the construction, operation or modernisation of energy or fuel facilities located on or along the road network and are applied to all users on a non-discriminatory basis. Such provisions are considered **part** of **the road** electrification **policy**, which aims to accelerate the transition to clean modes of transport without the need to wait for separate budget programmes or subsidies. The introduction of charges based on CO_2 emissions **is intended to ensure that the transport sector contributes to the EU's climate and energy targets for 2030 and beyond**.

The Directive also explicitly states that revenues from infrastructure charges and external cost charges, or their financial equivalent, **should be used for the benefit of the transport sector** and to optimise the transport system as a whole. This includes **improving the CO_2 and energy efficiency of vehicles** and **developing alternative infrastructure** for transport users.

Thus, Directive 1999/62/EC **considers infrastructure for electric vehicles not as an ancillary or optional service along roads, but as a full-fledged element of the road use system**, the development of which can be financed by users through flexible charging mechanisms. This means that tolls and special surcharges can be applied not only to road maintenance, but also to the deployment and maintenance of charging stations.

For Ukraine, this primarily **opens up the possibility of forming mixed models for financing electric charging infrastructure on TEN-T corridors**, both within the infrastructure charging system and through targeted payments for the use of charging services.

Directive 1999/62/EC introduces a number of provisions and incentives aimed at encouraging the use of electric vehicles (classified as zero-emission vehicles) and financing the necessary infrastructure, including EV charging infrastructure, as detailed below.

Table 1. Provisions of Directive 1999/62/EC on the promotion of electric vehicles and the development of IES

Element	Connection with IEVs / electric vehicles	Comment
Mandatory variation of charges by CO2 class for heavy-duty vehicles	Member States are required to vary infrastructure charges and user charges for heavy-duty vehicles (HDVs) according to their CO2 emission class (Article 7ga(1)). This requirement is mandatory, except where an external CO2 charge applies (Article 7ga(5)).	This measure, introduced by the 2022 amendments, aims to contribute to the EU's climate and energy goals by encouraging the use of vehicles with lower CO_2 emissions.
Promotion of zero-emission vehicles (electric vehicles)	Zero-emission vehicles for light commercial vehicles fall into CO_2 class 5 (Article 7ga(2)(e)). They are subject to the highest reduction in fees: from 50% to 75% compared to the fee for Class 1 (Article 7ga(3)(d)).	Member States are allowed to temporarily (until 31 December 2025) grant full exemption from road charges for zero-emission motor vehicles (Article 7ga(1)). Significant discounts (up to 75%) are also provided for light motor vehicles (Annex VII).

External CO2 charge and its role before/during the Emission Trading System (ETS)	Member States may introduce an external-cost charge reflecting the cost of CO_2 emissions (Article 7c(1), Article 7cb(1)). This charge may be applied until CO_2 emissions are regulated by more appropriate instruments, such as harmonised carbon-based fuel taxes or the inclusion of road transport in the emissions trading system.	The external CO_2 charge may be combined with an infrastructure charge differentiated by CO_2 class (Article 7cb(2)).
Avoiding double carbon pricing	The mandatory application of CO_2 variation (Article 7ga) *is not mandatory* if another carbon pricing instrument for road transport is applied at Union level (Article 7ga(11)).	This provision aims to ensure legal certainty and avoid double charging if, for example, another carbon pricing instrument such as the extension of the ETS to road transport is adopted.
Assessment of consistency with Directive 2003/87/EC (ETS)	The Commission is required to assess the effectiveness of CO2 charges and their consistency with Directive 2003/87/EC (on the ETS) and Directive 2003/96/EC (taxation of energy products) (Article 7cb(4), Article 7ga(8)).	If amendments to Directive 2003/87/EC or 2003/96/EC result in the effective internalisation of external CO2 costs from road transport, the Commission is empowered to adjust the reference values for the external CO_2 charge (Annex IIIc) by means of delegated acts (Article 7cb(4), Article 9d).
Differentiation for light commercial vehicles (LCVs) and electric vehicles	Member States may differentiate charges for LTZs (including passenger cars) according to their specific CO_2 emissions and environmental performance (Article 7gb(1)). For vans and minibuses, this variation in the annual user charge rate becomes mandatory from 1 January 2026, where technically feasible (Article 7gb(2)).	Encouraging the use of cleaner LCVs is important as they account for two-thirds of the negative environmental and health impacts of road transport. Member States are also allowed to apply reduced rates or exemptions for zero-emission LCVs, taking into account the additional weight associated with zero-emission technology.
Financing of EES infrastructure	The Directive allows Member States to apply regulatory charges specifically designed to finance the construction, operation, maintenance and development of facilities that provide energy to low- and *zero-emission* road vehicles during their operation (Article 9(1a)(b)).	This creates a legal basis for financing the critical infrastructure necessary for the electrification of road transport, independently of the financing of the road infrastructure itself. These charges must be applied on a non-discriminatory basis.

Thus, Directive 1999/62/EC acts as **an instrument for the internalisation of environmental costs in the transport sector**. Not only does it allow for the levying of charges that directly finance infrastructure for alternative fuels (AFI), but it also requires that

a significant portion of the revenue from road charges (external cost charges) be directed towards **the development of alternative infrastructure** and the improvement of CO_2 and energy efficiency in transport. This ensures that the financial mechanisms of road charges directly contribute to the transition to environmentally friendly transport and the development of the necessary infrastructure.

3.4. Status and gaps in national legal regulation of road charges in Ukraine

Legal regulation of road user charging and road transport infrastructure financing in Ukraine is currently based on a combination of sectoral laws and subordinate acts that **form individual elements of the system** but do not provide a comprehensive model similar to that provided for in Directive 1999/62/EC.

The main legislative act is the Law of Ukraine "On Motorways", which, among other things, defines the basic provisions regarding road tolls (Section VI).

This law **forms the basis for the introduction of the "user pays" model,** but:

- it does not contain provisions on tariff differentiation depending on the environmental class of vehicles (CO_2 / Euro-class), as required by Directive 1999/62/EC;
- does not provide for a separate mechanism for targeted financing of charging stations or infrastructure for electric vehicles at the expense of road tolls, although the logic of AFIR and Eurovignette allows for this.

Also, the Law of Ukraine "On Concessions" (No. 155-IX of 03.10.2019) creates a legal basis for attracting private investment in road projects, but the process of its update also indicates **the need to adapt to** the **public-private partnership models** used within TEN-T in EU countries.

The updated Law of Ukraine "On Public-Private Partnership" (No. 4510-IX of 19.06.2025) (PPP), which came into force on 31.10.2025, establishes the legal basis for cooperation between state bodies and private investors on the basis of a PPP agreement. The provisions of this Law are **generally relevant to the development of transport infrastructure**, including motorways and related infrastructure for electric mobility.

At the level of subordinate legislation, **there are two resolutions** of the Cabinet of Ministers of Ukraine dated 23 December 2020 No. 1312 "On approval of the maximum fee for a single trip on a public road built under a concession agreement", which establishes the maximum amount of a single payment for travel on a concession road, and No. 11 of 5 January 2021, "On Approval of the Procedure for Free Travel on Motorways Built under Concession Terms and the Amount of Compensation to the Concessionaire," which defines the procedure for free travel and compensation mechanisms for concessionaires.

An analysis of these regulatory acts indicates that both acts **reflect the desire to create a basic model for toll roads**, but do not provide for either differentiation of tariffs

based on CO_2 class or the possibility of applying surcharges to finance charging infrastructure or service areas, as permitted under Directive 1999/62/EC.

The government's schedule for implementing international commitments contains a list of regulations that need to be updated or developed to bring them closer to the European model of road pricing.

These include a draft law on charging heavy goods vehicles, as well as planned amendments to the Budget Code of Ukraine and the Code of Ukraine on Administrative Offences.

Separately, amendments are planned to the government resolution defining the list of motorways on which tolls may be introduced. These initiatives indicate a transition from fragmented regulation to the formation of a comprehensive road toll system. However, in its current version, Ukrainian legislation does not yet contain mechanisms equivalent to environmental differentiation of tariffs, external cost charges or surcharges for the development of alternative fuel infrastructure, as provided for in Directive 1999/62/EC.

Table 2. Comparison of Ukraine's and the EU's approaches to road pricing and the promotion of low-emission transport based on Directive 1999/62/EC.

Aspect of comparison	EU legislation (Directive 1999/62/EC as amended)	Ukrainian legislation (current status and plans)
Harmonisation status (charges and fees)	Directive 1999/62/EC is in force, establishing the latest requirements for infrastructure pricing.	Ukrainian legislation, in particular with regard to Section III (Charges and fees for use), **is not harmonised** with Directive 1999/62/EC.
TEN-T: Regulation of user charges	There is an obligation to gradually phase out time-based user charges on the Core TEN-T network by **25 March 2030** for heavy goods vehicles (HGVs) (Article 7(10)).	Ukrainian legislation defines the general principles of toll roads (mainly concession roads), but does not contain specific regulatory requirements or deadlines for phasing out time-based charges on international transport corridors (TEN-T).
TEN-T: Application of the *"polluter pays"* principle	The Directive requires the application of external-cost charges, which may include costs related to CO_2 emissions (Article 2(9)(c)).	National legislation regulates concession roads by setting a maximum single journey charge (0.023 to 0.133 EUR/km, depending on the vehicle category), but does not provide for mechanisms to introduce external cost charges for CO_2 or emissions-related environmental differentiation.
Link to the ETS / CO_2 differentiation	Mandatory variation of infrastructure charges and user charges for heavy goods vehicles according to their **CO_2 emission class** has been introduced (Article 7ga(1)). There are clear provisions on assessing consistency with the Emissions Trading Scheme (ETS, Directive 2003/87/EC) to **avoid double counting of** carbon prices (Article 7ga(11), Article 7cb(4)).	The current legal framework does not contain mechanisms for differentiating road charges by CO_2 class or a direct reference to integration with a potential Ukrainian or European ETS for road transport.

Promotion of electric vehicles (zero-emission vehicles)	**Mandatory and significant discounts/benefits** for zero-emission vehicles (ZEVs) (Article 7ga(1), Article 7ga(3)(d)). Possibility of full exemption for ZEVs until the end of 2025, and discounts of up to 75% for light vehicles (Annex VII).	Current regulations on toll roads (concessions) do not provide for special tariff discounts for electric vehicles or other low-emission vehicles for commercial operations. Exemptions are only granted for special-purpose and emergency services (CMU Resolution No. 11).
Financing infrastructure for alternative fuels	The Directive allows Member States to levy **regulatory charges** specifically intended to finance the construction, operation, maintenance and development of facilities that provide energy to low- and zero-emission vehicles *while in motion* (Article 9(1a)(b)).	Ukrainian legislation provides for the possibility of financing road service facilities (including petrol stations, which is a broad concept but not focused on ZEV charging). The financing of the construction of engineering and transport infrastructure (motorways, communication lines, heat, gas, water and electricity supply facilities) may be carried out within the framework of public-private partnerships/concessions, but there is no specific mechanism for regulatory charges, as in the Directive, for the targeted financing of charging/refuelling infrastructure.

In addition, we would like to mention **the State Road Fund (SRF)** as an instrument for financing road infrastructure, which operates as part of a special fund of the State Budget of Ukraine in accordance with Article 24-2 of the Budget Code of Ukraine. Its status equates it to other state-level special-purpose funds such as **the State Regional Development Fund or the State Decarbonisation Fund.** The sources of the SRF are defined in the Budget Code as revenues from excise taxes, import duties, part of the fuel excise tax, as well as state borrowings and funds raised under state guarantees. It should be noted that in 2024, these revenues will be temporarily directed to the general budget fund as an exception that does not change the basic structure of the fund. Currently, the financial and organisational plan that regulates the targeted use of budget resources to ensure the functioning, restoration and development of Ukraine's road and border motorway infrastructure in 2025 is the Procedure for the use of funds provided for in the state budget for the development of the network and maintenance of public motorways in 2025, approved by Resolution of the Cabinet of Ministers of Ukraine No. 174 of 18 February 2025.

The funds **of the State Road Fund are exclusively earmarked** and are used for the preparation and implementation of investment projects in the field of construction, reconstruction, capital and current repair of motorways of national importance, as well as for the maintenance of local roads through the relevant subvention.

An important element is the role of the Road Fund in supporting public-private partnerships (PPPs) and concession projects: the Road Fund may be used to fulfil the state's long-term obligations to private partners, in particular to pay for the operational readiness of road facilities. However, the amount of such obligations cannot exceed 30% of the annual

revenues of the Road Fund allocated to national and local roads. The procedure for the distribution of funds is determined by the Cabinet of Ministers of Ukraine.

In addition, the DDF acts as the main financial instrument for securing the state's long-term obligations within the framework of public-private partnerships (PPPs) and concession agreements. The Fund's resources are used to pay the private partner or concessionaire for operational readiness, which is a key mechanism for compensating investments in capital-intensive road infrastructure projects. This approach allows for the integration of EU requirements for quality, safety and continuity of service, as enshrined in the Directives and Regulations for the TEN-T network and related instruments (AFIR, Eurovignette, etc.), into projects.

Conclusion to SECTION III

Directive 1999/62/EC (Eurovignette Directive) is a key regulatory element of the European sustainable transport architecture, combining financial, environmental and institutional logic in road infrastructure management. It ensures the transition from fragmented national models to a unified charging system that integrates the "user pays" and "polluter pays" principles into the operation of the TEN-T network.

An analysis of the current road pricing system in Ukraine shows that it is in its early stages of development and currently only provides for the basic **implementation of the "user pays" principle.** The introduction of tolls on concession roads is provided for by law, but the current model remains technologically neutral – rates are not differentiated according to the level of emissions from vehicles or their environmental category. This distinguishes it from the approaches established by the updated Directive 1999/62/EC (the so-called Eurovignette Directive), which bases tariffs on environmental indicators, primarily CO_2 emissions.

In practice, the road toll system in Ukraine has never been applied on a large scale, so its launch and subsequent integration into the European model will require the creation of effective enforcement mechanisms, in particular automated systems for recording traffic, checking weight parameters, recording distance travelled and collecting payments in real time.

In addition, the European legal model provides for a gradual transition from uniform road toll rates for all vehicles to CO_2-differentiated tariffs. According to the Directive, users of vehicles with higher emission levels pay higher charges, while electric vehicles and other vehicles with zero or low emissions receive mandatory discounts. In Ukraine, such an approach is not yet in place: the current exemptions apply mainly to certain categories of service vehicles (police, ambulances, etc.), but do not apply to electric vehicles or environmentally friendly transport as a systemic class.

One of the key differences is the absence in the national road charging system of an external-cost charge, an additional fee for the negative impact of transport on the environment (CO_2 emissions, NOx, noise pollution, etc.). In the EU, this instrument is an

integral part of the implementation of the polluter pays principle and is directly linked to the functioning of the EU Emissions Trading System ( ) in the transport sector. In Ukraine, road pricing is not yet integrated into climate policy, which reduces its incentive effect in the field of transport decarbonisation.

Another significant difference is **the lack of a direct link between road charges and the financing of infrastructure for electric vehicles**. Directive 1999/62/EC (Article 9(1a)(b)) allows Member States to allocate part of the revenue from infrastructure charges to the development of a network of charging stations, thereby supporting the implementation of Regulation (EU) 2023/1804 (AFIR).

In Ukraine, however, the SSF accumulates revenues mainly from excise duties, customs duties and fees for exceeding weight parameters, but does not have environmentally differentiated components related to emission class or engine type. Although concession or public-private partnership (PPP) projects may include elements of charging infrastructure, there is no separate regulatory mechanism that would allow the targeted use of part of the revenue from road charges for the development of a network of electric charging stations.

For Ukraine, the implementation of the provisions of Directive 1999/62/EC is not only a technical task, but also a strategic step towards decarbonising the transport sector, attracting CEF/AFIF investments and establishing a transparent mechanism for financing transport infrastructure development. The transition to a CO_2-oriented road toll system, the introduction of distance-based charging, and the creation of legal and financial mechanisms to support charging infrastructure will form the basis for harmonising national policy with European standards.

Therefore, the harmonisation of the Ukrainian road pricing system with the requirements **of Directive 1999/62/EC** provides for a gradual transition from fiscal logic to **a climate-financial model**, which must simultaneously:

- ensure fair payment for infrastructure use,
- encourage emission reductions,
- create stable sources of funding for the modernisation of roads and electric mobility infrastructure.

Ultimately, adapting the European Eurovignette model will enable Ukraine not only to improve the efficiency of road management, but also to transform road pricing into an effective climate policy tool that stimulates innovation, fair competition and the green transformation of transport in line with the objectives of the European Green Deal.

SECTION IV. INTEGRATION OF THE SAFE AND SECURE PARKING AREA (SSPA) SYSTEM WITH ALTERNATIVE FUEL INFRASTRUCTURE (AFI): THE EUROPEAN MODEL AND THE UKRAINIAN CONTEXT

4.1. Purpose and scope of Regulation (EU) 2022/1012

Delegated Regulation (EU) 2022/1012 supplementing Regulation (EU) 561/2006 of the European Parliament and of the Council on standards governing the level of service and reliability of safe and secure parking areas, as well as procedures for their certification, forms the basis for the creation **of a system of safe and secure parking areas (SSPA)** as a mandatory element of the TEN-T infrastructure. It aims to improve the safety of drivers and cargo, improve rest conditions and integrate energy and digital solutions into road infrastructure. SSPA standards are directly related to AFIR, as these locations are designated for the placement of high-power electric charging stations for freight transport.

The document details the standards for SSPA, establishing a dual approach **- security level** and **service level -** and aims to create a unified certification system for parking areas across the TEN-T network, which includes mandatory requirements for:

- lighting, video surveillance, fencing, access control, security, sanitary conditions (**Article 8a of Regulation (EC) 561/2006**);
- sanitary, communication and information infrastructure that ensures a comfortable and safe rest for drivers;
- public information and digital integration through open platforms that allow users to find certified SSPA, view security levels and occupancy rates in real time.

The Regulation also establishes **a single certification procedure** that ensures the recognition of certified areas in all EU Member States. This mechanism creates a harmonised system of access to information on SSPA at EU level, ensuring uniform standards and quality control of services

.

Therefore, the scope of Delegated Regulation (EU) 2022/1012 covers:

- the definition of parking area security and service levels;
- the procedure for their certification;
- requirements for informing users via digital means;
- interconnection with AFIR for the integration of charging stations into certified SSPA[11]

Thus, Regulation 2022/1012 creates a regulatory infrastructure framework, while AFIR provides an energy superstructure that ensures the integration of high-power charging stations for HDVs.

At the same time, the Law of Ukraine "On Motorways", DBN V.2.3-4:2015 "Motorways. Part I. Design Part II. Construction" and GBN V.2.3-37641918-549:2018 "Motorways.

[11] Regulation (EU) 2023/1804 (AFIR) officially recognises only those parking areas certified in accordance with Regulation (EU) 2022/1012 as SSPA.

Parking areas for vehicles and rest areas for road users. General design requirements" (GBN 549) consider parking areas as road service facilities with a basic set of functions, while Regulation (EU) 2022/1012 defines highly secure, multifunctional rest areas for HDV drivers with an emphasis on the safety of goods and drivers.

Table 1. Fundamental differences between the SSPA (EU) system and national rest areas

Characteristic	Regulation (EU) 2022/1012 (SSPA)	GBN B.2.3-37641918-549:2018
Purpose of Regulation (EU) 2022/1012	**Safety and security.** Main focus on the protection of goods and HDV drivers engaged in interregional and cross-border transport, in accordance with Directive 561/2006 on rest periods.	**Service.** Provision of short-term stopping and resting places for road users.
Classification	Two-component system: **mandatory minimum service level** + **one of four safety levels** (Bronze, Silver, Gold, Platinum).	Classification by location type: interurban and site-specific.
Role in TEN-T/AFIR	SSPA is **a mandatory integration point for** high-power EV charging (min. 100 kW for HDVs by 2027) according to AFIR.	There is no direct link to EU mandates on AFI or HDV charging integration.

4.2. Classification of security and service levels (Level of Security / Service) SSPA

Regulation (EU) 2022/1012 establishes a two-component system of standards that a parking area must meet in order to obtain a Secure and Safe Parking Area (SSPA) certificate: a mandatory minimum level of service and one of four levels of security.

Minimum Level of Service

The minimum level of service is mandatory for all secure and protected parking areas (SSPAs), regardless of their security certification level. It defines a basic set of requirements aimed at ensuring adequate working, rest and hygiene conditions for commercial transport drivers, as well as creating a comfortable infrastructure during long international journeys.

According to Section A of Annex I to Delegated Regulation (EU) 2022/1012, the minimum level of service covers the following components:

Table 2. SSPA minimum service level requirements: conditions for drivers and infrastructure standards

Area	Requirements (according to Annex I, Section A)
Gender-specific sanitary facilities	Separate toilets and shower facilities for men and women must be available and in working order. Showers must be equipped with hot water. Hand soap must be provided free of charge. Toilets, shower facilities and washbasins must be cleaned and inspected daily at regular intervals.
Food and drink	Food and beverages should be available for purchase **24 hours a day, 7 days a week**. **A dining room for drivers** should be available.
Communication	Internet access should be **free of charge**, **with** communication points and emergency alert systems available.
Power supply	Electrical sockets must be available for use. In addition, electrical equipment for **refrigerated vehicles** must be available **by 31 December 2026**.

Inclusiveness and accessibility	All facilities must be accessible to persons with reduced mobility**.**

In addition, each certified parking facility must provide round-the-clock sanitary and service facilities, which increases the level of safety and social responsibility of transport infrastructure operators.

A comparison of the standards shows that Ukrainian standards (DBN/GBN) regulate the basic construction and functional aspects of sites, but do not meet the operational and quality standards set out in the EU Minimum Service Level (Regulation (EU) 2022/1012).

Table 3. Comparative analysis of EU and Ukrainian requirements for driver rest area infrastructure

Aspect	EU requirements (Regulation (EU) 2022/1012)	Ukrainian requirements (DBN/GBN 549)	Gap
Lighting quality (Lux)	Min. 15-25 lux (perimeter/entrance).	Average horizontal illumination 6 lx.	Critical (EU requirements are 2.5–4 times higher).
Sanitary conditions (Details)	Hot water (shower, taps), free soap, daily cleaning schedule are mandatory.	Requirement for a sanitary area and toilets. No detailed requirements for hot water, free soap or cleaning schedule.	Operational
Food	24/7 availability of food and beverages.	Availability of places for heating/cooking food, dining area. No requirement for 24/7 availability.	Operational
Communication (Internet)	Free Internet access.	Not regulated as a mandatory element of the infrastructure of recreation areas.	Digital
Power supply for refrigerators	Mandatory availability of electrical equipment for refrigerated vehicles until 31 December 2026.	No relevant requirements in DBN/GBN.	Critical (Technical/HDV)
Emergencies	Contact details for emergency services, at least in the national language and English.	Requirements for displaying route maps and general information. No requirement for English language/pictograms for emergency services.	Operational/ Multilingual

Levels of Security

The SSPA must comply with all standards **of one of the four security levels**, which set requirements *for security equipment and procedures*.

Table 4. SSPA security levels and basic infrastructure and monitoring requirements

Security Level	Perimeter and Lighting	Control and Monitoring	Entry/Exit and Data

1. Bronze Level	Marked with **visual deterrents** (on the ground) indicating the boundary. Perimeter lighting: **at least 15 lux**.	Physical or remote surveillance checks are carried out **at least once every 24 hours**.	CCTV at all entrances/exits (min. 720 pixels). CCTV data is stored for **30 days**.
2. Silver Level	Protected **by a fence that prevents passage**. Perimeter lighting: **20 lux**. The perimeter is equipped with **continuous video surveillance**.	Physical or remote checks are carried out **at least twice every 24 hours**. User assistance is available **around the clock**.	Equipped with **barriers** with a **voice communication** system and **a ticket sales system**.
3. Gold Level	Physical barrier with a height of **at least 1.8 metres**. Free zone of 1 metre between the barrier and the parking area. Perimeter lighting: **25 lux**. The entire perimeter is monitored by **continuous CCTV**.	Regular CCTV performance checks at least **every 24 hours**. Mandatory **synchronisation of CCTV and access files**.	Entry/exit points are equipped with barriers with **intrusion protection** and **traffic lights**. Mandatory **number plate recognition technology**. Protection against pedestrian intrusion: **turnstiles** with a height of at least 1.80 metres. The parking management system is adapted to **DATEX II data** transmission.
4. Platinum Level	**A continuous barrier** at least 1.8 metres high with **deterrents to prevent climbing**. Perimeter lighting: **25 lux**.	**Round-the-clock remote monitoring** of CCTV camera images by an external monitoring and alarm reception centre. Mandatory **intrusion alarm** with alarm transmission (audible/visual).	Equipped with **gates or barriers** with intrusion protection, **supplemented with bollards (parking posts)**. **Two-stage** exit **verification system** (number plate verification + additional driver/escort identification method). Parking management system adapted to **DATEX II data** transmission. **Secure advance booking** option.

The requirements of Regulation (EU) 2022/1012 are much more detailed and focused on ensuring decent working conditions for drivers, while the current Ukrainian building codes contain only basic technical provisions. In particular, the SSPA Gold and Platinum safety standards significantly exceed national requirements for safety, infrastructure and comfort in rest areas.

The most significant difference lies in the SSPA's requirements for physical protection, monitoring and digital integration. GBN 549 requires **only basic facilities for** road service **areas**.

Table 5. Comparison of physical and technological security requirements for parking areas: SSPA (EU) standards and Ukrainian national standards

Requirement / Aspect	Regulation (EU) 2022/1012 (SSPA Standards)	Ukrainian legislation (DBN V.2.3-4:2015, GBN 549)	Degree of harmonisation and gaps
Safety classification system	Four levels: Bronze, Silver, Gold, Platinum.	Classification based only on location (intercity, site-specific) and capacity (RTZ).	**Not harmonised.** No standardised, verified security level system.
Physical barrier/fence	**Gold/Platinum:** Solid physical barrier with a height of at least 1.8 m, with a free zone of 1 m. **Platinum** requires deterrents to prevent climbing.	On roads of categories I-III, areas are separated by a safety island with a width of at least 2.7 m, or by a fence if the island is smaller. On roads of category I, a mesh fence is installed at the edge of the right-of-way.	**Low level of harmonisation.** Ukrainian standards define barriers mainly for traffic safety (first group fences), but do not set requirements for height (1.8 m) or anti-climbing devices to prevent crime.
Lighting (Lux)	**Bronze:** Perimeter lighting of at least **15, lux**. **Silver/Gold/Platinum:** Perimeter lighting of at least **20-25 lux**.	The grounds have stationary lighting. Average horizontal illuminance – no less than **6 lx**.	**Not harmonised.** The minimum EU requirements for lighting are significantly higher (2.5–4 times).
Video surveillance (CCTV)	**Bronze/Silver/Gold/Platinum:** CCTV (720p HD cameras) is mandatory. **Gold/Platinum** requires continuous monitoring of the entire perimeter without any inaccessible areas.	There are no requirements for mandatory video surveillance, its minimum resolution (720p HD), recording frequency or coverage area.	**Not harmonised.** SSPA technical requirements are completely absent.
CCTV data storage	Mandatory minimum storage period – **30 days** (or longer if required by national/EU legislation).	There are no requirements for the storage period of video surveillance data.	**Not harmonised.**
Access control and monitoring	**Gold/Platinum:** Mandatory licence plate recognition (LPR) technology. **Platinum** requires **a two-step** driver/passenger **verification system** and 24/7 remote monitoring by an external centre.	"Appropriate technical means of traffic management" are used. There are no requirements for LPR, two-step verification, or centralised monitoring.	**Not harmonised.**
Procedures and staff training	Mandatory staff training (including incident management, supervision, technology) for 6 months. Mandatory development of a security plan and business continuity plan (**Gold/Platinum**).	Personnel and security procedures are not regulated by DBN or GBN 549.	**Not harmonised.**

The fundamental difference between the EU and Ukraine approaches lies in the paradigm shift in infrastructure development. The EU has moved from the concept of short-

term rest for drivers to the creation of a highly reliable infrastructure asset - Safe and Secure Parking Areas (SSPA), which combine security, service and digital monitoring functions.

Accordingly, Ukrainian legislation needs to be harmonised with Regulation (EU) 2022/1012, as current building codes (DBN/GBN) remain insufficient for certification **even at the minimum Bronze level of SSPA** – in particular due to the lack of clear requirements for lighting levels, sanitary conditions, video surveillance and access control systems.

This is critical for Ukraine's integration into the TEN-T network, as only SSPA-certified facilities can be designated as mandatory charging infrastructure locations for heavy-duty vehicles (HDVs) in accordance with the requirements of Regulation (EU) 2023/1804 (AFIR).

4.3. SSPA certification procedures and interaction with Regulation (EC) 561/2006.

SSPA certification is a key element of EU social legislation in the field of road transport. It is directly related to ensuring adequate and safe working and rest conditions for drivers engaged in international and interregional transport.

The legal basis for the establishment and certification of SSPA is laid down in Regulation (EC) 561/2006 on road transport, which harmonises aspects of social legislation in road transport. The details of the requirements, safety levels, service standards and certification procedures are set out in Commission Delegated Regulation (EU) 2022/1012, which essentially functions as an implementing act to Regulation 561/2006.

Regulation (EC) 561/2006 obliges employers and carriers to provide drivers with adequate daily and weekly rest periods, which in many cases take place while on the road. Therefore, the availability of certified areas for the safe parking of vehicles with basic amenities is **a prerequisite for compliance with EU social legislation.**

In accordance with Article 8a(1) of Regulation (EC) 561/2006, Member States must ensure the availability of parking areas that can be certified as SSPA in accordance with specified levels of safety and quality of service. It was precisely **to specify** these requirements that Regulation (EU) 2022/1012 was adopted, establishing clear technical, infrastructure and organisational criteria, as well as a certification procedure.

Regulation 2022/1012 **is** thus **an executive instrument** for the implementation of Article 8a of Regulation 561/2006, **ensuring the practical application of** EU social legislation provisions on driver rest and cargo safety.

Mandatory standards for SSPA certification

To obtain SSPA certification status, a parking area must simultaneously meet two sets of requirements, as described above, set out in Annex I to Regulation (EU) 2022/1012:

- Minimum level of service (Section A)

- One of the safety levels (Section B)

SSPA certification procedure (EU)

The SSPA certification procedures are set out in Article 8a(1) of Regulation (EC) 561/2006 and detailed in Annex II to Commission Delegated Regulation (EU) 2022/1012 (Article 2). They provide a single harmonised system of accreditation, auditing and control, which ensures compliance with established safety and service quality standards.

Institutional and qualification basis:

Certification bodies

Only bodies that meet the requirements of Annex II to Regulation (EU) 2022/1012 are authorised to carry out SSPA certification. They must be accredited in accordance with ISO 17021 and have proven competence in the field of quality management system auditing.

Auditors

Auditors must have a contractual relationship with an accredited certification body and undergo special training on the latest version of the SSPA standards, which includes theoretical and practical training. In addition, they must be fluent in English and the official language of the country in which the audit is conducted, in accordance with the principles of professional independence enshrined in ISO 17021.

Information for the European Commission.

Bodies wishing to carry out SSPA certification shall submit proof of their accreditation to the European Commission. After verification, their details shall be entered in the official register of certification bodies on the web portal referred to in Article 8a(1) of Regulation (EC) No 561/2006.

Audit, validity and compliance monitoring:

Initial audit

The certification audit is carried out directly at the facility and covers verification of compliance with all requirements of the Minimum Service Level and the selected security level (Bronze, Silver, Gold or Platinum).

Certificate validity

The SSPA certificate **is valid for three years** from the date of issue.

Recertification

An area operator wishing to renew their certification must submit an application no later than three months before the expiry date of the certificate. In exceptional circumstances, a one-time renewal of the certificate for a period of up to six months is permitted, which must be notified to the European Commission.

Unannounced audit

During the three-year period of validity of the certificate, the certification body is required to carry out **at least one unannounced (sudden) audit** to verify continued compliance with the standards without prior notice to the operator.

Removal of non-conformities and withdrawal of the certificate:

Identification of deficiencies.

If the audit finds that the SSPA does not comply with one or more requirements of the Regulation, the operator is given **a period of time specified by the auditor to correct the non-conformities.** The duration of the corrective period depends on the severity of the identified violations.

Certificate revocation

If, after the specified period has expired, the non-conformities have not been eliminated, the certification body shall withdraw the certificate. In this case, the operator is obliged to immediately stop using the SSPA markings in any information or advertising materials.

Complaints mechanism

Each accredited certification body must provide an online platform for SSPA users to submit complaints, with subsequent processing of appeals and reporting to the Commission.

Review of standards and updating of procedures

In accordance with Article 3 of Regulation (EU) 2022/1012, the EC is required to assess the effectiveness of the current SSPA standards and certification procedures **by 7 April 2026**. The assessment shall take into account:

- technical progress in the field of safety, digital systems and monitoring;
- changes in the social working conditions of drivers;
- the need for continuous improvement in safety and service levels.

The results of the assessment may serve as a basis for updating technical annexes, revising safety level requirements, and clarifying the accreditation procedures for certification bodies.

Ukrainian legislation regulating the development of road infrastructure (DBN V.2.3-4:2015; GBN V.2.3-37641918-549:2018), **does not contain any provisions** establishing mandatory multi-level safety classification, independent certification procedures or interaction mechanisms similar to the EU SSPA system, which is a critical gap.

Table 6 Comparative analysis of Ukraine's legislative compliance with EU requirements for SSPA certification

Aspect of comparison	EU legislation (Regulation (EU) 2022/1012)	Ukrainian legislation (DBN V.2.3-4:2015, GBN 549)	Conclusion: regulatory non-compliance

Mandatory certification	Mandatory certification according to SSPA standards (Article 8a(1) of Regulation (EU) 561/2006).	No system for certifying recreational facilities according to safety levels.	**Complete disconnect.** There is no legal mechanism for e safety confirmation.
Emphasis on social rights	Direct link to Regulation (EC) 561/2006 (harmonisation of drivers' rest periods).	Rest areas are part of the road and must comply with building standards (DBN V.2.3-4:2015, section 14.2).	**Functional gap.** Ukrainian standards regulate construction parameters, not social rights/safety.
Institutional framework (Audit)	Mandatory accreditation of certification bodies according to **ISO 17021**. Mandatory training of SSPA auditors.	Accreditation of DBN/GBN control bodies does not provide for international standards focused on cargo safety and driver rest (ISO 17021).	**Complete disconnect.** No independent, specialised and accredited control system.
Monitoring and sanctions	The certificate is valid for 3 years. Mandatory **unannounced audit**. Clear grounds for **revoking the certificate** (failure to meet minimum service/safety requirements).	Quality control of works takes place at the construction/acceptance stage (e.g. Table 21.1 DBN V.2.3-4:2015). There are no mechanisms for revocation or unannounced audits based on safety standards.	**Critical gap.** Impossibility of verifying and holding operators accountable.
Information transparency	Mandatory publication of up-to-date information on SSPA on **a single official website** (Article 8a(1) of Regulation (EC) 561/2006). Mandatory **online complaint mechanism.**	No centralised public system for verifying and publishing up-to-date information on safety levels and services for users.	**Digital divide.**

It should also be noted that Directive (EU) 2008/96/EC, as amended by Directive (EU) 2019/1936 (RISM), clearly integrates the issue of safe parking into the system of mandatory road infrastructure safety management procedures.

The concept of **Safe and Secure Parking Areas** **(SSPA)** is considered an integral part of safety management that must be taken into account at all stages of a road project's life cycle.

- **Road Safety Impact Assessment (RSIA)** - at the initial stage of planning infrastructure projects, the RSIA should take into account the availability and accessibility of safe parking areas necessary to reduce the risks associated with driver fatigue and unauthorised stops.

- **Road Safety Audit (RSA)** - at the Detailed Design Stage, the RSA should include a review of the provision of safe parking and rest areas.

- **Targeted Road Safety Inspections -** during such inspections, which are carried out on the basis of the results of a Network-wide Road Safety Assessment, a separate criterion is the availability, technical condition and safety level of parking areas, including their lighting, video surveillance and access to basic services.

Thus, the SSPA certification system in the EU **ensures a high level of transparency, accountability and technological reliability.** Its key principles – independence of certification bodies, regular monitoring and open data – form the basis for a single trust system within the TEN-T, where driver safety and cargo protection are considered a common European value.

According to the analysis, there is still a double legal gap in this area in Ukraine.

Firstly, there are no standards and classification criteria for SSPA as provided for in Regulation (EU) 2022/1012, which defines the technical requirements, security levels and certification system for such areas. The absence of standards and certification systems for SSPA, which would guarantee compliance with safety requirements, service levels and minimum infrastructure equipment, makes it impossible to implement the provisions of Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure on the TEN-T network.

Secondly, RISM safety management procedures (RSIA, RSA, TRSI) have not been implemented, which ensure strategic planning and integration of SSPA requirements throughout the entire life cycle of TEN-T road projects, from conceptual design to operational monitoring.

This creates an institutional gap between the Ukrainian and European models of road infrastructure management and directly limits Ukraine's access to EU funding instruments, in particular the Connecting Europe Facility (CEF) and Ukraine Facility, which support the development of alternative fuel infrastructure specifically at certified TEN-T sites.

For Ukraine, the implementation of similar procedures will be a necessary condition for integration into the EU's social and infrastructure space, as well as for the possibility of further recognition of national SSPA within the EU's common certification system.

4.4. Integration of SSPA with alternative fuel infrastructure (AFI).

Regulation (EU) 2023/1804 establishes mandatory requirements for the deployment of electric charging infrastructure specifically at certified **SSPA**. This approach aims to create conditions for **night-time charging of heavy-duty vehicles (HDVs)** during drivers' daily or weekly rest periods, which is an integral part of EU social legislation in the field of road transport.

The placement of high-power charging points at SSPA is intended not only to ensure **the energy accessibility and climate neutrality of road transport**, but also to increase **the commercial attractiveness** of these areas for international carriers, stimulating the development of cross-border logistics services on the TEN-T network.

In accordance with **Article 29(1)(h) of Regulation (EU) 2024/1679**, certified SSPA are **a mandatory element of the TEN-T road infrastructure**. Thus, the interaction between

AFIR, Regulation (EU) 2024/1679 (TEN-T) and Regulation (EU) 2022/1012 (SSPA) forms **a single regulatory architecture** within which secure parking areas perform a dual function: **energy (AFI deployment)** and **social security (rest conditions for drivers)**.

Table 7. Mandatory requirements of Regulation (EU) 2023/1804 (AFIR) for the deployment of electric charging infrastructure within the SSPA on the TEN-T network:

Parameter / Requirement	Quantitative target	Minimum individual power of ECS	Deadline
Minimum number of stations (Phase 1)	At least **two** publicly accessible charging stations for heavy electric vehicles	At least **100 kW** per station	**31 December 2027**
Minimum number of stations (Phase 2)	At least **four** charging stations for HDVs	At least **100 kW** per station	**31 December 2030**

Ukrainian standards (GBN V.2.3-37641918-549:2018) treat rest areas exclusively as road service facilities, **without establishing** safety certification **criteria**, requirements for video surveillance systems, digital information technology, or mandatory placement of alternative fuel infrastructure (AFI). This approach creates a significant legal gap between the Ukrainian and European models, in which SSPA are considered a functional element of TEN-T, combining safety, digitalisation and energy sustainability of the road network.

Furthermore, Ukrainian legislation does not contain mandatory requirements for the implementation of smart charging, electric vehicle roaming and compatibility with EU digital platforms for public electric charging stations (ECS). In addition, the technical standards provided for in Article 21 of Regulation (EU) 2023/1804, in particular regarding interoperability, data accessibility and communication standards, have not yet been harmonised with national regulations. This creates barriers to the integration of Ukrainian charging infrastructure into the EU's single digital space and prevents operators from participating in trans-European energy networks.

Conclusion to SECTION IV

The analysis shows that the absence in Ukraine of EU-harmonised requirements for safe and secure parking areas (SSPA) as defined by Delegated Regulation (EU) 2022/1012 **creates a systemic regulatory gap** that prevents the full implementation of Regulation (EU) 2023/1804 (AFIR). The current DBN and GBN regulate only **the basic engineering aspects of the construction of rest areas**, but do not cover the critical elements of safety, certification, accessibility and technical compatibility required for integration into the TEN-T network.

The most significant consequence is that Ukraine is currently unable to meet a key AFIR requirement: **the deployment of high-power charging infrastructure for heavy-duty vehicles (HDVs) is only permitted at certified SSPA sites**. In the absence of such a system, no Ukrainian site covered by DBN or GBN can be considered AFIR-compliant and therefore cannot be included in TEN-T or in the list of projects eligible for EU funding.

This creates a double strategic risk:

- Ukraine is unable to meet the AFIR targets for 2027–2030 (two HDV stations at SSPA by 2027, four by 2030),

- the country may be restricted in its access to CEF and Ukraine Facility funding, where compliance with EU standards is a prerequisite.

In addition to institutional and financial constraints, the lack of regulation of the SSPA creates significant social and security risks, as Ukrainian regulations do not contain minimum requirements for video surveillance, physical security, lighting levels, driver rest conditions and control procedures. This violates EU standards on driver labour and safety (Regulation (EC) 561/2006) and makes Ukrainian sites unsuitable for international transport at the appropriate level.

In summary, harmonisation of the SSPA system in accordance with Regulation (EU) 2022/1012 should be considered a critical and urgent element of Ukraine's integration into TEN-T and a key prerequisite for the implementation of AFIR. Without the introduction of multi-level certification, the updating of DBN/GBN and the creation of a national security system for SSPA, Ukraine will not be able to ensure compliance with EU requirements and attract the necessary investments for the development of HDV infrastructure on strategic transport corridors.

SECTION V. REGULATION (EU) 2021/1153: INSTITUTIONAL AND FINANCIAL FRAMEWORK FOR THE IMPLEMENTATION OF TEN-T AND THE INTEGRATION OF UKRAINE INTO THE EUROPEAN TRANSPORT AREA

5.1. Purpose and scope of Regulation (EU) 2021/1153

As a key EU financial instrument, Regulation (EU) 2021/1153 of the European Parliament and of the Council of 7 July 2021 **establishes** the Connecting Europe Facility (CEF), which aims to develop integrated, sustainable and interoperable infrastructure in three sectors: **transport, energy and digital**.

Regulation (EU) 2021/1153 (as amended by Regulation (EU) 2024/1679) establishes the legal, financial and organisational framework for the functioning of the CEF for the period of **the Multiannual Financial Framework (MFF) 2021-2027**.

The document defines:

- the objectives of the CEF;
- the structure of sectors and forms of financing;
- the rules for providing EU assistance;
- the principles for selecting projects of common interest (PCI).

The CEF is **a multi-sectoral instrument** that promotes economic growth, job creation and competitiveness through targeted investments in high-priority infrastructure, in particular dual-use transport infrastructure that supports both civil and military mobility.

Financial assistance under the CEF is provided to projects of common interest (PCI) that contribute to the development of TEN-T.

Programme objectives: transport, energy, digital infrastructure

The CEF aims to establish, develop, upgrade and complete trans-European networks in three key sectors, as well as to promote cross-border cooperation in the field of renewable energy.

1. Transport sector

Promoting projects of common interest (PCI) that ensure the development of efficient, interconnected and multimodal transport networks in accordance with the provisions of Regulation (EU) 2024/1679, which replaced Regulation (EU) 1315/2013.

Financing the adaptation of TEN-T sections for **dual use** (civil-military) to improve both civil and military mobility.

Focus of funding – Core Network: cross-border connections, elimination of missing links, development of urban nodes, multimodal logistics hubs and access to ports and airports.

It should be noted that within the CEF, the concept of a Project of Common Interest (PCI) covers strategic infrastructure initiatives that are of cross-border importance and

contribute to the achievement of EU objectives in the fields of transport, energy and digital interaction.

According to the definitions in Regulation (EU) 2021/1153 (CEF), a PCI is defined as a project established:

- in Regulation (EU) 1315/2013 (predecessor to Regulation (EU) 2024/1679) - in relation to projects of common interest in the field of TEN-T transport infrastructure;
- in Regulation (EU) No 347/2013, which defines projects of common interest in the field of energy networks (TEN-E);
- or in Article 8 of Regulation (EU) 2021/1153, which establishes general criteria for the selection and financing of projects of common interest in the field of digital connectivity infrastructure

For the transport sector, PCIs include cross-border sections of TEN-T, missing links, as well as multimodal logistics hubs, nodes and intelligent transport systems (ITS) that ensure the functionality and continuity of the TEN-T network.

2. Energy sector

Support for cross-border renewable energy projects that contribute to decarbonisation and the formation of an internal energy market.

Strengthening energy security and integrating the energy networks of EU Member States.

Achieving the target of 15% interconnection of electricity networks by 2030, as envisaged by EU policy.

3. Digital sector

Developing digital communications infrastructure within the EU.

Coverage of major TEN-T transport routes with 5G networks and creation of "5G corridors".

Expanding access to very high capacity networks (VHCN).

Support for the digitalisation of the transport and energy sectors, in particular traffic management systems (ITS, ERTMS, RIS, SESAR).

CEF budget, requirement for climate-oriented spending

The CEF mechanism will operate throughout the 2021-2027 period and will be implemented through annual and multiannual work programmes.

Funds are allocated by sector, taking into account the principle of "climate relevance".

The total financial envelope for the implementation of the CEF for the period 2021-2027 is €33.71 billion (in 2018 prices). An important strategic requirement is that the CEF must allocate 60% of its total financial envelope to achieving climate objectives, in line with the EU's overall goal of integrating climate measures into sectoral policies. €25.807 billion has been allocated to the transport sector. €1.559 billion has been reserved for the completion of key cross-border TEN-T rail projects. In addition, additional resources are

earmarked for alternative fuels infrastructure (AFI) and the digital integration of transport hubs.

For the next financial period (2028-2034), the Commission has proposed doubling the previous CEF budget, attracting more than €51 billion in new funding for cross-border connections, including high-speed railways and military mobility.

The CEF directly supports the achievement of the strategic objectives of the European Green Deal and the Fit for 55 package, contributing to the long-term decarbonisation of the transport sector and the EU's energy transition.

5.2. Legal and institutional framework for Ukraine's participation in the Connecting Europe Facility (CEF)

Regulation (EU) 2021/1153 defines a broad list of entities eligible for funding under **the Connecting Europe Facility (CEF)**, provided that their activities contribute to the objectives of the programme, in particular the development of TEN-T, the decarbonisation of transport and digital integration.

The CEF operates on the principle of openness to public, international and private participants, with a focus on projects of common interest (PCIs) that have a cross-border effect or are relevant to the EU internal market.

Categories of eligible participants

1. EU Member States

Member States may apply for funding on their own or in partnership with other countries, international organisations or private entities.

For transport projects covering several Member States, confirmation of coordination between them is mandatory.

2. International organisations, joint undertakings and authorities

Eligible participants include:

- public or private enterprises,
- public authorities (central, regional, local),
- joint ventures established in accordance with the legislation of Member States,
- international organisations (including those operating in the transport or energy sectors).

Such entities may submit applications with the consent of the relevant EU Member State in whose territory the project is being implemented.

3. Legal entities from third countries

The CEF is also open to third countries associated with the programme in accordance with intergovernmental agreements.

Legal entities established in countries that do not have CEF-associated status may participate in exceptional cases if their participation is necessary to achieve the objectives of a project of common interest (PCI) in the transport, energy or digital sectors.

Ukrainian context

1. Legal status of associated countries

The CEF is open to:

- countries that are candidates for EU membership (including Ukraine);
- potential candidates;
- European Neighbourhood Policy (ENP) countries.

Participation is based on framework agreements on participation in Union programmes, which define the principles, financial contribution and rights to benefits in accordance with Articles 7(4)(b) and 8(3)(c) of the Regulation.

2. Ukraine as an associated country

The CEF plays a critical role for Ukraine as it provides investment funding for the integration of the national transport system into the TEN-T network and, having the status of a candidate country and inclusion in the TEN-T indicative maps, is eligible to participate in EU programmes, including the CEF.

Launched in 2018, the EU-Ukraine Transport Dialogue provides a forum for strategic reflection, policy discussion and further deepening of transport relations. Since Russia's illegal war against Ukraine, the EC has focused on diversifying supply and transport routes, as well as on connectivity and transport relations with Ukraine, in particular through the EU-Ukraine Solidarity Routes initiative.

The legal basis for participation is defined by the Framework Agreement between Ukraine and the European Union on the general principles of Ukraine's participation in Union programmes (Protocol III), which establishes the mechanism for access to Union programmes.

Ukraine's participation in the CEF programme was ratified by Law of Ukraine No. 3469-IX of 21 November 2023, which opened up opportunities to apply for grant funding from the EU budget.

In practice, Ukraine is already using CEF mechanisms to attract funding in the field of cross-border and border infrastructure:

- **CEF-2022 and CEF-2023** supported the modernisation of the Mostyska I/II and Uzhhorod–Lviv (1435 mm) railway sections,
- the development of **service and parking areas** for freight transport (Reni, Lviv region, and others).

3. Funding restrictions for third countries

The Regulation clearly states that association with TEN-T does not guarantee automatic funding from the EU budget.

The CEF does not cover the costs of projects located outside the territory of the Union, unless expressly provided for by specific EU acts.

For Ukraine, this means the need to:

- create an internal legal mechanism for determining projects of common interest (PCI),
- harmonise technical and procedural standards with Regulations 2024/1679 (TEN-T) and 2023/1804 (AFIR).

Application and approval procedures for Member States

CEF is implemented through Work Programmes adopted by the European Commission for each sector.

Applications

- are carried out within the framework of calls for proposals;
- the applicant may be one or more Member States, as well as private or international organisations in agreement with the relevant Member State.

Member State approval

- if the application is not submitted by a Member State, the written consent of the country concerned is required;
- a Member State may also authorise a specific category of applicants to submit proposals without prior agreement.

Evaluation of applications

- is carried out in accordance with the criteria set out in the work programmes;
- for transport projects, it is mandatory to coordinate with the work plans of European corridors and the opinion of the European TEN-T coordinator;
- The Commission also assesses the economic necessity of grant support (whether implementation is possible without a CEF grant).

Institutional management structure of the CEF

1. The European Commission

- is responsible for planning, monitoring and overall management of the programme;
- adopts work programmes and ensures their implementation;
- reports every two years on the implementation of the CEF and publishes an interactive map of funded projects;
- manages the programme through direct management in accordance with the EU Financial Regulation.

2. Executive agencies (in particular CINEA)

The EC delegates the implementation of part of the programmes to the European Climate, Infrastructure and Environment Executive Agency (CINEA) in accordance with Article 69 of the Financial Regulation.

CINEA carries out operational management, application evaluation and project monitoring in the transport, energy and digital sectors.

3. European Investment Bank (EIB) and InvestEU

The CEF supports blending operations that combine EU grants with loans or guarantees in accordance with Regulation (EU) 2021/523 (InvestEU).

Such mechanisms are implemented through the EIB or national development banks, ensuring a multiplier effect of investments.

In the transport sector, the EU's share in blending operations may not exceed 10% of the total CEF budget.

5.3. Connection with the TEN-T network and key provisions relevant for adaptation in Ukraine

The role of CEF in the implementation of TEN-T

The CEF is the basic financial instrument for the implementation of the TEN-T, as defined in Regulation (EU) No 1315/2013 (predecessor to Regulation (EU) No 2024/1679).

Through the CEF, the EU provides **targeted funding for** Projects of Common Interest (PCI) aimed at developing, modernising and completing the Core Network and Comprehensive Network of TEN-T.

CEF funding is a tool for the practical implementation of the strategic provisions of TEN-T - it transforms the regulatory and spatial architecture of the network into specific investment projects that eliminate bottlenecks, ensure cross-border connectivity and integrate intelligent transport systems.

Key TEN-T provisions governing CEF funding

Priority for Core and Comprehensive Network projects

The CEF primarily finances actions aimed at developing the Core Network, in particular its cross-border sections, as well as measures to improve the quality of the Comprehensive Network at points of connection with the main TEN-T corridors.

This focus reflects the overall objective of TEN-T to create a high-quality, continuous and multimodal transport infrastructure across Europe.

Elimination of critical gaps and bottlenecks (Missing Links /Bottlenecks)

The CEF gives priority to projects aimed at eliminating bottlenecks and missing links that hinder the continuity of the TEN-T.

A **"missing link"** is an unfinished or missing transport section that is of strategic importance for connecting the core or comprehensive network to the international TEN-T corridors.

A cross-border link is a project of common interest that ensures the continuity of TEN-T between two or more Member States, or between a Member State and a third country (in particular Ukraine).

Thus, the CEF directly supports the development of cross-border sections of the TEN-T between the EU and Ukraine, which are recognised as indicative priorities in accordance with Regulation (EU) 2024/1679.

Relevance for adaptation in Ukraine

Ukraine participates in the Connecting Europe Facility (CEF) programme on the basis of the AGREEMENT between Ukraine, on the one hand, and the European Union, on the other hand, on Ukraine's participation in the Union programme "Connecting Europe Facility".

In accordance with Article 1 of the Agreement, Ukraine has been granted the status of an associated country, which ensures its participation in three CEF sectors:

- transport (point 3(2)(a)(i) of Regulation (EU) 2021/1153),
- energy (paragraph 3(2)(b)),
- digital (paragraph 3(2)(c)).

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This gives Ukraine the right to submit project proposals for European Commission grants, usually up to 50% of their cost, and for dual-use or cross-border projects, up to 85%, subject to a separate decision by the EC.

The agreement remains in force until the completion of all projects financed under the CEF and provides for the protection of the EU's financial interests and compliance with fund management and audit rules.

Content and practical significance of Ukraine's participation

According to Regulation (EU) 2021/1153, the CEF's tasks in the transport sector are to support Projects of Common Interest (PCI) that contribute to the creation of an integrated, environmentally sustainable, multimodal transport system that is compatible with the requirements of TEN-T and the principles of the European Green Deal.

Such projects must ensure:

- effective connections between the Core and Comprehensive TEN-T networks;
- interoperability of transport and digital systems;
- environmental sustainability and gradual decarbonisation of transport;
- digitalisation of transport infrastructure (ITS, DATEX II, Smart Charging).

For Ukraine, this means a transition from participation in indicative TEN-T maps to full involvement in EU programme funding, covering:

- cross-border links,
- projects of common interest (PCI),
- development of AFI infrastructure for freight transport in SSPA zones,
- digital integration of management systems (ITS, NAP, C-ITS).

Institutional framework and national strategic documents

The STRATEGY for the development and expansion of border infrastructure with European Union countries and the Republic of Moldova until 2030, as well as the operational plan for its implementation (2024-2030), define the following priorities:

- the development of TEN-T border transport corridors,
- increasing the throughput capacity of border crossing points,
- creation of a network of service areas,
- attracting funding from the CEF and AFIF budgets for the implementation of such projects.

The implementation of this strategy creates a regulatory framework for the practical integration of Ukraine into the TEN-T Core Network, in particular in the following areas:

Lviv - Krakivets, Yagodin - Lublin, Chop - Budapest, Reni - Galatz, Kyiv - Chisinau, etc.

European Commission assessment and next steps

In its Report on Ukraine's progress within the 2024 Enlargement Package, the European Commission highlighted the positive dynamics of Ukraine's association with the CEF, but at the same time pointed to the need to accelerate the implementation of the Border Infrastructure Strategy.

The EC stressed that the implementation of this Strategy is critical for:

- prioritising investments in border crossings and transport hubs,
- ensuring the continuity of the TEN-T network on Ukrainian territory,
- expanding access to CEF-Transport and AFIF funding in 2025-2027.

5.4. The role of Regulation (EU) 2021/1153 in financing alternative fuel infrastructure (AFI)

An analysis of Regulation (EU) 2021/1153 shows that it is primarily aimed at achieving the objectives of the European Green Deal, including the decarbonisation of transport, improving energy efficiency and developing alternative fuels infrastructure (AFI).

1. Financial implementation of mandatory AFIR targets

1.1. Direct financing of AFI as a performance indicator

The CEF recognises the development of AFI as one of the key performance indicators (KPIs) of the programme.

Among the official indicators of the European Commission are:

"The number of alternative fuel supply points built or upgraded with CEF support."

Thus, the deployment of AFI is a priority area for investment within CEF-Transport and reflects the practical implementation of the requirements of Regulation (EU) 2023/1804 (AFIR).

1.2. Ensuring spatial coverage in accordance with AFIR

AFIR sets mandatory quantitative and spatial parameters for the development of AFI (electricity, hydrogen, LNG infrastructure) along the TEN-T networks.

CEF is the main financial mechanism ensuring the achievement of these parameters, in particular:

- installation of charging stations with a capacity of ≥150 kW on each section ≤60 km along the TEN-T Core Network;
- the installation of hydrogen refuelling stations at a distance of no more than 200 km;
- development of shore-side electricity in sea and river ports.

Thus, AFI infrastructure is becoming an integral part of TEN-T, and its development is funded as a priority component within the CEF.

1.3. Support for "works"

The CEF finances not only studies, but also direct engineering works – the design, procurement, installation and commissioning of AFI elements.

In the context of AFIR, this covers:

- the installation of electric charging or hydrogen stations;
- connecting them to power grids and digital monitoring systems;
- integration of payment, security and load management systems.

2. Financing infrastructure for heavy-duty vehicles (HDVs) and SSPA

CEF plays a crucial role in financing heavy-duty vehicle (HDV) charging infrastructure, which must be integrated into Safe and Secure Parking Areas (SSPA) along the TEN-T.

According to the requirements of Regulation (EU) 2023/1804 (AFIR):

- **by 31 December 2027,** each SSPA must be equipped with at least two publicly accessible charging stations for HDVs **with a capacity of ≥100 kW**;
- **by 31 December 2030** — at least four such stations.

The development of SSPA and AFI is carried out in close cooperation with Delegated Regulation (EU) 2022/1012, which sets standards for the safety, service and certification of parking facilities.

CEF provides funding for integrated projects that combine:

- AFI energy infrastructure (ISE),
- parking areas for drivers to rest,
- digital access, reservation and security management systems.

3. Synergy between the transport, energy and digital sectors

CEF supports synergy projects that combine transport, energy and digital infrastructure. This enables the implementation of Smart Charging and Connected and Automated Mobility (CAM) requirements.

3.1. Digital infrastructure

CEF finances the development of 5G corridors along the main TEN-T routes (Articles 39 and 42 of Regulation (EU) 2021/1153), which create the technical basis for:

- automated transport systems,
- real-time traffic management,
- data transfer between AFI stations, transport and control centres.

3.2. Smart Charging and digital data exchange

The AFIR Regulation stipulates that all publicly accessible EES must support Smart Charging functions and be connected to National Access Points (NAPs) in DATEX II format.

By financing ICT components (ITS, 5G, IoT platforms), CEF ensures:

- integration of AFI into energy consumption management systems,
- standardised data exchange between operators,
- transparent tariffs and real-time user access.

4. Relevance for Ukraine

For Ukraine, as an associated country participating in the CEF, this mechanism is a key source of funding for infrastructure modernisation in line with AFIR and TEN-T standards and is a tool for transitioning from indicative inclusion in TEN-T to real integration into the EU's common energy transport space.

Table 1. Regulatory framework of Ukraine ensuring participation in CEF and integration into TEN-T/AFIR

Ukrainian legislation	Scope of application of CEF/TEN-T/AFIR	Key provisions and link to the EU acquis
Law of Ukraine No. 3469-IX of 21 November 2023 (On the ratification of the Agreement on Ukraine's participation in the Union's Connecting Europe Facility programme)	Legal basis for associated participation in CEF.	Provides the legal right to submit applications for funding for projects of common interest (PCI) in the areas of transport, energy and digital infrastructure, which is critical for the deployment of AFI and the integration of TEN-T.
Agreement between Ukraine and the EU on participation in the CEF programme	Defines the conditions for associated participation (financial contributions, right to submit applications, project selection).	Allows legal entities established in Ukraine to participate in CEF competitions, which is necessary for financing large infrastructure projects on the Core and Extended Core Network.
CMU Resolution No. 1337-r of 24 December 2024 (Strategy for the development and expansion of border infrastructure until 2030)	Defines CEF investment priorities in border infrastructure.	Directly targets funding for cross-border links with the EU and Moldova, modernisation of railway infrastructure (1435 mm gauge) and development of service areas/parking areas (requiring AFI/SSPA equipment in accordance with AFIR).
CMU Resolution No. 1550 of 27 December 2024 (National Transport Strategy of Ukraine until 2030)	Strategic integration of Ukraine's transport infrastructure system into TEN-T and climate goals.	Establishes the strategic goal of integration into TEN-T and approximation to European standards. This is the framework for the implementation of AFIR requirements for urban nodes and AFI on TEN-T.
Law of Ukraine No. 2956-IX of 24 February 2023 (On the Energy Security System and overcoming fuel dependence)	Regulation of the development of electric charging infrastructure (AFI).	Legislatively enshrines the priority of EEV development. Imposes restrictions on the purchase of buses with internal combustion engines for public transport in large cities (from 2028/2030), which stimulates demand for AFI, the financing of which may be covered by the CEF.
Law of Ukraine No. 3991-IX of 08.10.2024 (On the Basic Principles of State Climate Policy)	Defines state policy in the field of decarbonisation and infrastructure adaptation.	Sets targets for achieving climate neutrality. This ensures that CEF projects comply with EU requirements for **climate proofing** and overall decarbonisation targets.
Law of Ukraine No. 3038-VI of 17.02.2011 (On the Regulation of Urban Development Activities)	Regulation of permitting and planning procedures.	Defines the procedure for obtaining urban planning conditions and restrictions and technical conditions. These procedures are subject to simplification and time limits in accordance with Directive (EU) 2021/1187, which is critical for the rapid implementation of CEF projects.
DBN B.2.2-12:2019 Amendment No. 1 (Planning and	Technical standards for planning EV charging stations in	Establishes requirements for the design of EV charging stations, including the need to install **high-power direct current (DC) EV charging stations with a capacity of ≥ 150 kW** for heavy

Development of Territories)	populated areas and on roads.	goods vehicles. Determines the required area for EV charging stations (25 m² per parking space). This is the Ukrainian equivalent of the AFIR technical requirements.

Conclusion on SECTION V

The Connecting Europe Facility (CEF), defined by Regulation (EU) 2021/1153, is the EU's central financial instrument for implementing the Trans-European Transport Network (TEN-T) and supporting integrated, sustainable and interoperable infrastructure in the transport, digital and energy sectors. Its key function is to finance Projects of Common Interest (PCIs), with at least 60% of the budget allocated to achieving climate neutrality, eliminating bottlenecks and developing cross-border links.

In addition, the CEF plays a decisive role in supporting economic growth, increasing competitiveness and developing dual-use infrastructure that ensures civil and military mobility.

For Ukraine, participation in the CEF, ratified by Law No. 3469-IX, creates a real mechanism for financial and regulatory integration into the TEN-T network, expanding access to EU grants (up to 50%, and up to 85% for cross-border projects). Of particular importance is that the CEF supports the development of alternative fuel infrastructure (AFI) through the AFIF, including high-power electric charging and hydrogen stations, as well as their integration into safe and secure parking areas (SSPA). At the same time, the CEF finances digital infrastructure — WIM, ITS, DATEX II, 5G corridors — which form the operational basis for meeting the requirements of AFIR and TEN-T.

The effective realisation of Ukraine's potential participation in the CEF requires a thorough adaptation of the national infrastructure planning and management system to EU standards. There are three key areas:

(1) creation of a National Coordination Point for CEF/TEN-T for centralised project support and interaction with the European Commission and CINEA;
(2) harmonisation of strategic documents — the National Transport Strategy, regional development plans and road policies — with the TEN-T (2024/1679), AFIR (2023/1804) and CEF Regulations;
(3) unification of technical, design and digital standards (TEN-T design parameters, SSPA, WIM, DATEX II, Smart Charging), without which it is impossible to meet the funding criteria and interoperability requirements.

Thus, CEF is not only a tool for accessing funding, but also **a framework for institutional and regulatory convergence with the EU**, which determines the necessary direction of reforms: from technical harmonisation and digital standards to integrated planning and sustainable development of Ukrainian transport infrastructure.

SECTION VI. INSTITUTIONAL AND LEGAL ADAPTATION OF THE PROCEDURES OF DIRECTIVE (EU) 2021/1187 TO ACCELERATE THE DEPLOYMENT OF AFI INFRASTRUCTURE IN UKRAINE ON THE TEN-T NETWORK

6.1. Purpose, subject matter and scope of Directive (EU) 2021/1187

The main **purpose** of Directive (EU) 2021/1187 of the European Parliament and of the Council of 7 July 2021 on streamlining measures to facilitate the implementation of the Trans-European Transport Network (TEN-T) is to **simplify and accelerate** permit-granting procedures necessary for the implementation of TEN-T projects.

Directive (EU) 2021/1187 establishes **uniform minimum standards** for the organisation of permitting processes in Member States with the aim of reducing administrative delays, ensure consistency in the decisions of competent (authorised) authorities, and create a predictable regulatory environment for investors and contractors of TEN-T projects.

The key objective of this Directive is **to remove administrative barriers that hinder the timely implementation of projects of common interest (PCI)** by improving the efficiency, transparency and legal certainty of authorisation procedures. The Directive also aims to ensure that authorisation procedures are consistent with the objectives of sustainable development, climate neutrality and integrated infrastructure development within the TEN-T network.

The main objectives of Directive (EU) 2021/1187 cover the following aspects:

1. **Reducing the duration of permitting procedures:** setting a maximum duration for all permitting procedures, which should not exceed **four years** (with the possibility of justified extension), **excluding judicial appeals**. This provision aims to increase the predictability of processes and reduce delays at critical stages of TEN-T project implementation.

2. **Granting priority status to TEN-T projects:** granting priority status to projects implemented within the TEN-T in national permitting and approval procedures. This approach ensures that applications are given priority consideration, promotes more efficient use of administrative resources and is consistent with the EU's objectives for the timely completion of the Core Network by 2030.

3. **Establishment of a designated competent (authorised) authority:** introduction of **a single contact point** to coordinate all permit procedures, develop **a detailed permit-granting plan ( )** specifying deadlines, responsible authorities and key milestones, and monitor compliance with deadlines.

4. **Strengthening the coordination of cross-border projects:** improving coordination mechanisms for **cross-border infrastructure projects**, including the

possibility of establishing **a joint authority**, developing joint time schedules and involving **European coordinators** to improve coordination between Member States.

Although the Directive is procedural in nature and does not establish financial instruments or sources of funding, its provisions **indirectly increase the investment attractiveness** of TEN-T projects by reducing administrative risks and providing legal certainty for public and private investors.

The scope of Directive (EU) 2021/1187 defines the categories of infrastructure projects to which its procedural requirements for streamlining and accelerating permit-granting procedures within the implementation **of TEN-T** apply.

According to **Article 2 of Directive (EU) 2021/1187**, its scope covers the following types of projects:

1. **Projects located on pre-identified sections of the core network.**
This category includes sections identified in **the Annex to Directive (EU) 2021/1187**, which are of particular importance for the functional integrity of TEN-T.

They cover:

- **Cross-border links** - sections connecting the transport infrastructure of two or more EU Member States (or between the EU and neighbouring third countries, in particular Ukraine).
- **Missing links** are critical infrastructure sections whose absence hinders the continuity of the main network's transport corridors.

2. **Other projects within core network corridors.** The Directive also applies to infrastructure projects implemented along specific core network corridors, **provided** that **the total cost of the project exceeds €300 million**.

3. **Projects related to cross-border public procurement.** Directive (EU) 2021/1187 establishes provisions on **the application of the law of one Member State** to joint organisations or joint entities involved in the implementation of cross-border TEN-T projects, which helps to avoid legal conflicts and duplication of administrative procedures.

Exclusions from the scope of application:
In accordance with **Article 2(3) of the Directive**, its provisions **do not apply** to projects relating **exclusively** to **telematic applications, new technologies or innovations**, as defined in **Articles 31 and 33 of Regulation (EU) 1315/2013** (as of 2021). Such projects do not involve the physical construction or reconstruction of infrastructure and are therefore not subject to authorisation procedures.

Although Ukraine formally belongs to third countries**, the provisions of** the Annex to Directive (EU) 2021/1187 **defining** pre-identified sections of the core network **are** of direct relevance to the Ukrainian border**, as these sections are** critical for ensuring the functional integrity of the TEN-T in a cross-border context **with European Union Member States.**

According to **Article 2 of the Directive** and its **Annex**, **the** identified **cross-border links** relevant to Ukraine cover the following facilities within **the Core Network Corridors**:

1. **Core Network Corridor Mediterranean Corridor**

- **Rail link:** *Budapest – Miskolc – UA border (Rail)* — route from Budapest (Hungary) via Miskolc to the Ukrainian border.

- **Road connection:** *Vásárosnamény – UA border (Road)* — road section from Vásárosnamény (Hungary) to the border with Ukraine.

2. **Main network corridor •Rhine – Danube**

- **Rail connection:** *Košice – UA border (Rail)* — railway line from Košice (Slovakia) to the Ukrainian border.

The relevance of implementing the provisions of Directive (EU) 2021/1187 for Ukraine has increased significantly following the entry into force of Regulation (EU) 2024/1679, which officially extended the geographical scope of TEN-T to Ukraine. This decision by the European Union reflects the strategic importance of Ukraine as an integral link in ensuring the continuity of EU-Eastern Europe transport corridors and the integration of the transport services market.

In accordance with the provisions of the Regulation, Ukrainian routes are integrated into four main TEN-T corridors, namely:

- North Sea – Baltic Corridor (via Lviv – Kyiv – Mariupol);
- Baltic Sea – Black Sea – Aegean Sea Corridor (to Lviv);
- Rhine – Danube Corridor ( ) (to Lviv);
- Baltic Sea – Adriatic Sea Corridor (to Odesa via Lviv – Chisinau).

This expansion increases the need to implement the procedural mechanisms provided for in Directive (EU) 2021/1187, in particular with regard to reducing the time required to issue permits, strengthening coordination between competent authorities and creating an effective institutional mechanism for managing TEN-T projects.

Although Directive (EU) 2021/1187 does not provide for direct financial instruments, its provisions on granting priority status to TEN-T projects (Article 3) and establishing a designated authority (Article 4) are critical for speeding up the administrative procedures that determine the success of investment projects on extended TEN-T sections.

In addition, the Directive plays a systemic role in ensuring Ukraine's compliance with its obligations in the field of alternative fuels infrastructure (AFI), which, in accordance with Regulation (EU) 2024/1679 and Regulation (EU) 2023/1804 (AFIR), has become a mandatory component of the TEN-T core transport network. Its implementation creates the conditions for the development of electric vehicle charging infrastructure, hydrogen refuelling stations and sustainable transport logistics hubs along the Ukrainian sections of the network.

6.2. Connection to the TEN-T network and key provisions relevant for adaptation in Ukraine

The key procedural requirements of the Directive, which form the basis for the development of relevant legislative and institutional proposals in Ukraine, reveal significant discrepancies and gaps in the national legal framework.

Table 1. Comparative analysis of key procedural provisions of Directive (EU) 2021/1187 and the status of their implementation in Ukraine (as of October 2025)

Provisions of Directive (EU) 2021/1187	Content of the provision	Degree of implementation in Ukraine and comparison
Priority status (Article 3)	Granting TEN-T projects automatic priority status in all national permitting and approval procedures.	**Low.** Ukraine does not have a special legally enshrined priority status for TEN-T projects, despite strategic commitments.
Maximum duration of authorisation procedures (Article 5)	Establishment of a maximum four-year time limit for all authorisation procedures, excluding judicial appeals.	**Low.** Ukrainian legislation does not have a fixed four-year limit. This poses a threat to the timely implementation of TEN-T projects. For example, Law No. 4510-20 specifies deadlines only for certain stages of the tender/qualification selection process (e.g., 30/35/45 days for submitting proposals, 10 working days for checking documents), but does not limit the overall term for administrative permits (including land allocation, EIA, technical conditions).
Designated Authority (Article 4)	Introduction *of a single contact point* for coordinating all permit procedures, developing a detailed permit-granting plan and monitoring deadlines.	**Partial.** Ukraine does not have a single national designated authority for TEN-T, although there are analogues (e.g., the Agency for Restoration under the Ministry of Development or the PPP Agency under the Ministry of Economy) for individual PPP projects. This requires the creation of a mandatory adapted plan for a specific project (Article 6(4)).
Organisation of procedures (Article 6)	Establishment of clear stages: project notification → maturity check (up to 4 months) → submission of a detailed plan.	**Partial.** The procedures regulated by the Law of Ukraine "On Regulation of Urban Development" (No. 3038-VI) are partially similar, but do not include a mandatory stage of maturity assessment and submission of an adapted plan. The law (No. 4510-20) provides for the preparation of a concept note and a feasibility study, but there is no mechanism for providing the investor with a clear, detailed and legally binding adapted plan (timeline) for all permitting procedures.
Cross-border coordination (Article 7)	Requirement for Member States to cooperate, develop joint *time* schedules and the possibility of establishing *joint authorities*.	**Low.** Coordination exists mainly at the level of international agreements. There are no special joint authorities for TEN-T, although the Law of Ukraine "On International Territorial Cooperation of Ukraine" (No. 3668-20) provides for forms of cross-border (Article 7) and transnational (Article 8) cooperation, including *European territorial cooperation groupings* (Article 1, paragraph 3).

Public procurement (Article 8)	Allows the application of the public procurement law of one EU Member State to joint entities in cross-border projects (as a derogation from Directives 2014/24/EU and 2014/25/EU).	**Low.** The Law of Ukraine "On Public Procurement" (No. 922-19) applies, which adapts *the* EU *acquis* on general procurement, but does not contain specific rules for cross-border TEN-T projects requiring the application of Article 8 of the Directive (as a derogation from EU Directives 2014/24/EU and 2014/25/EU).
Monitoring and reporting (Article 10)	Requirement to collect data on the average duration of procedures and report to the EC	**Low.** Ukraine has no mechanisms in place for collecting and analysing data on the time required for all stages of AFI project implementation on TEN-T.

Therefore, a comparative analysis shows that Ukraine's procedural framework only partially complies with the requirements of Directive (EU) 2021/1187**,** and key elements such as the priority status of TEN-T projects, the designation of a single designated authority and the establishment of maximum time limits for authorisation procedures are currently missing. As a result, the implementation of TEN-T projects in Ukraine remains administratively complex and unpredictable in terms of time, which limits their investment attractiveness and creates risks of delays in fulfilling international obligations to the EU**.**

6.3. The role of Directive (EU) 2021/1187 in increasing the investment attractiveness of AFI projects

Directive (EU) 2021/1187 is primarily a procedural instrument aimed at streamlining, simplifying and accelerating permit-granting procedures for the implementation of TEN-T projects.

Although it does not establish direct financial instruments or support mechanisms, its impact on attracting investment in the development of alternative fuels infrastructure (AFI) – including electric charging stations (ECS) – is indirect but systemically decisive.

Directive (EU) 2021/1187 creates a favourable administrative environment for investors by reducing regulatory risks and increasing the predictability of project implementation. This, in turn, contributes to more effective mobilisation of both **private capital** and **EU funds**, in particular through **the Connecting Europe Facility (CEF)**.

Key mechanisms for promoting investment

1. **Reducing administrative delays and risks.**

According to **Article 5 of the Directive**, the maximum duration of all authorisation procedures may not exceed **four years**, excluding judicial appeals. This provision ensures **the predictability of the project cycle** and minimises the risks of administrative delays, which is particularly important for large AFI infrastructure projects within the TEN-T that require long-term financial commitments.

2. **Priority status for TEN-T projects (Article 3).**

The granting **of priority status** to projects implemented within the TEN-T (including AFI) guarantees their **priority consideration in national authorisation procedures**. This

significantly reduces the risk of investment delays or blockages due to bureaucratic obstacles, increasing the confidence of institutional investors and international financial organisations.

3. **Institutional integration with TEN-T and AFIR policies.**

According to **Regulation (EU) 2024/1679** and **Regulation (EU) 2023/1804**, charging and refuelling infrastructure for alternative fuels has become **a mandatory component of the TEN-T core network**.

Compliance with these requirements, in particular regarding:

- the **installation** of **electric charging stations for heavy-duty vehicles** in **safe and secure parking areas (SSPA)**,
- achieving **minimum AFI accessibility standards** by 2030/2040, requires **a** significant **reduction in administrative burdens**. Directive (EU) 2021/1187 sets out **the procedural framework** for this process, ensuring consistency between the administrative, technical and financial mechanisms for implementing AFI projects.

The link between Directive (EU) 2021/1187 and digital infrastructure and the development of intelligent transport systems (ITS)

Directive (EU) 2021/1187 has an indirect but key impact on the development of digital infrastructure, which is an integral part of the functioning of alternative fuels infrastructure (AFI). It **creates favourable administrative conditions for the integration of digital solutions into the TEN-T transport, energy and telecommunications infrastructure**, ensuring the implementation of the concept of a "single digital transport area" in the EU.

1. Synergy between sectors within the CEF

The deployment of AFI is based on the principle of "synergy across sectors", initiated within the Connecting Europe Facility (CEF). The Directive facilitates this process **by creating the administrative conditions for parallel planning of projects in the fields of transport, energy and digital technologies**. This approach ensures effective coordination of investments in charging infrastructure, energy networks and 5G communication systems along TEN-T transport corridors.

2. Digitalisation of infrastructure and information interfaces

Regulation (EU) 2024/1679 recognises digital infrastructure as a key element of TEN-T and information and communication technologies (ICT systems) as a prerequisite for the interaction of transport, energy and logistics facilities.

In this context:

- Regulation (EU) 2023/1804 (AFIR) obliges electric charging station operators to provide static and dynamic data on the status of infrastructure through National Access Points (NAPs) established in accordance with Directive 2010/40/EU (ITS Directive).
- These digital interfaces enable the unified exchange of data between AFI operators, vehicles and public authorities, forming a single ecosystem of Intelligent Transport Systems (ITS).

3. Facilitating the accelerated deployment of 5G corridors and AFI

The establishment of shortened and predictable timeframes for issuing permits (Articles 4–5 of Directive (EU) 2021/1187) not only speeds up the construction of charging stations (ECS), but also facilitates the deployment of 5G corridors along the main TEN-T transport arteries.

This creates a single technological infrastructure in which energy, transport and digital components function in an integrated manner — from electric vehicle charging systems ( ) to communication platforms for traffic management and safe and secure parking areas (SSPA).

Thus, the implementation of the provisions of Directive (EU) 2021/1187 **creates a comprehensive administrative mechanism** that simultaneously increases the investment attractiveness of AFI projects and promotes the integration of digital technologies and ITS solutions into transport infrastructure. Ensuring procedural consistency with the requirements of TEN-T, AFIR and CEF forms the basis for the development of a unified energy-digital ecosystem along Ukrainian transport corridors, which is a key prerequisite for the sustainable and "smart" recovery of the sector.

6.4. The status of legal regulation of the use of public road right-of-ways and the need to improve permitting procedures

A comprehensive analysis of the current legislation of Ukraine also reveals **significant gaps in the legal regulation of the use of public road right-of-ways** for the placement of road infrastructure elements and road service facilities, such as rest areas and IZEs.

These problems are caused by **imperfect and outdated provisions** of **current regulatory acts** governing the use of public road right-of-ways. The lack of a modern legal mechanism for approval, licensing and control of activities within the right-of-way leads to the chaotic placement of road service facilities, complicates reconstruction and creates additional risks to road safety. Therefore, there is **a need to improve the legal mechanisms for the approval, placement and operation** of entrances, exits, transition and speed lanes, as well as to regulate the procedure **for crossing the right-of-way with engineering communications and networks**.

Thus, in accordance with the provisions **of Article 71 of the Land Code of Ukraine**, road management lands include lands within the right-of-way on which road structures and equipment are located. **Article 31 of the Law of Ukraine "On Transport"** establishes that lands under public roads are provided to road organisations for use in accordance with the law. At the same time, **there is virtually no mechanism for obtaining approval from the public road management authority** – although it is formally mentioned in **Article 37 of the Law of Ukraine "On Motorways"** and **Article 26 of the Law of Ukraine "On Road Traffic"**, the procedure for such approval has not been approved since 2012.

After the expiry of **Ukravtodor Order No. 414 of 29 September 2005** "On Approval of the Procedure for Issuing Permits for the Placement, Construction, Reconstruction and Operation of Service Facilities on Road Economy Lands", no activities related to the issuance of relevant permits have been carried out. Although **paragraph 64 of the Law of**

Ukraine "On the List of Permits in the Sphere of Economic Activity" provides for the issuance of permits by state authorities for motorway roads, **the procedure for issuing such permits is absent**. As a result, **the Restoration Agency** (as the successor to Ukravtodor) is forced **to refuse to issue permits** to **business entities** for the placement of service facilities due to the absence of a regulatory procedure, as confirmed by court practice (case No. 540/1320/20 of the Kherson District Administrative Court).

In fact**, the construction of road service facilities, parking lots, petrol stations**, etc. is carried out without permits from the road management authority, which negatively affects **the integrity** of **the road infrastructure**, **makes it impossible to reconstruct roads within the existing right-of-way,** and **worsens road safety**. According to the State Agency for Infrastructure Restoration and Development of Ukraine, **there are more than 4,600 road service facilities located** along **state** roads alone, of which **about 60% do not meet the requirements of DBN V.2.3-4:2015** in terms of the arrangement of driveways, exits and transition-speed lanes, creating potential risks of serious traffic accidents. Similar violations are also observed on **local** roads.

State building standards **(DBN V.2.3-4:2015)** establish requirements for **creating safe road traffic conditions** in areas where road service facilities are located. However, compliance with these standards is often impossible due to **the lack of a proper procedure for approving the location of facilities** within the right-of-way. An additional problem is **the lack of a defined fee for issuing permits** and a mechanism for transferring this fee to the relevant budget.

It should be noted separately that **the laying of engineering communications and networks along the right-of-way** of public roads **is prohibited by** DBN V.2.3-4:2015 (only their intersection is allowed). This restriction has a technical justification - the existence of **protection zones** established by regulatory acts (Resolutions of the Cabinet of Ministers No. 1455 of 27 December 2022 and No. 135 of 29 January 1998), which makes it impossible to maintain roads safely and carry out work on widening, snow protection and the construction of pedestrian or bicycle infrastructure.

Thus, **the use of motorway right-of-way** for the construction of entrances, exits, transition and speed lanes, as well as the crossing of engineering networks, is fragmented and **requires clear legislative regulation**. The lack of legislative regulation and **an order for issuing permits** approved by the Cabinet of Ministers of Ukraine creates a regulatory vacuum that complicates the implementation of state policy in the field of **safe and sustainable development of road infrastructure**, as well as **Ukraine's integration into the European TEN-T network**, where similar procedures are regulated under **Directive (EU) 2021/1187**.

Conclusions to Section VI

An analysis of the provisions of Directive (EU) 2021/1187 shows that Ukraine, despite its political integration into TEN-T, remains normatively unprepared to apply key EU procedural mechanisms that ensure the rapid and coordinated implementation of infrastructure projects. This Directive was created to ensure that any TEN-T project — from

a new road to a charging station for heavy goods vehicles — goes through the permitting procedures quickly, predictably and without inter-agency "gaps".

In Ukraine, however, the situation is fundamentally different: permitting procedures remain lengthy and scattered across different authorities, and the legal system does not contain any mechanisms that would allow for the simplifications provided for in European legislation. This creates a real risk of disrupting the AFIR implementation schedule and makes full participation in the CEF impossible.

No fixed deadlines or priority for TEN-T projects

European legislation clearly sets a deadline of no more than four years for all permitting procedures for TEN-T infrastructure projects. This approach ensures investment predictability and protects projects from administrative delays.

In Ukraine, however, there is no mechanism to limit the duration of procedures or guarantee priority status for TEN-T projects. In fact, infrastructure projects go through "normal" procedures, which often take years, and for AFI infrastructure, this means indefinite delays.

There is no single authority responsible for licensing procedures

One of the key requirements of the Directive is the creation of **a** so-called Single Contact Point — an institution that accompanies a project from start to finish, regardless of how many authorities are involved.

There is no such institution in Ukraine. There is no authority that:

- coordinate all stages of the permitting procedures,
- ensure interaction between ministries, the State Emergency Service, energy operators, and local authorities,
- monitor deadlines and compliance with EU standards.

As a result, project activities are scattered among dozens of entities, and responsibility is blurred.

Lack of cross-border coordination mechanisms

TEN-T provides for joint responsibility of two or more countries for projects in corridors. The EU has provided special mechanisms for such cases, allowing parties to apply joint legal procedures or choose the legislation of one of the countries for certain procedures.

There are no such provisions in Ukrainian legislation. This makes it impossible to:

- coordinated installation of AFI at border crossing points,
- joint planning of TEN-T corridors at the borders with the EU,
- rapid approval of projects in cross-border areas.

Insufficient integration of digital infrastructure into road legislation

The modern TEN-T is not just about roads. It is about digital systems, smart charging, ITS, WIM, eFTI, 5G corridors, and energy integration.

However, the Law of Ukraine "On Motorways" does not even contain a definition of digital infrastructure, does not recognise ICT as an element of the road transport system, and does not provide a legal framework for the inclusion of digital systems in projects of common interest (PCI).

This creates a barrier to:

- the integration of intelligent transport systems (ITS),
- digital AFIR modules (NAP, DATEX II, API),
- the participation of digital components in CEF funding.

Legal uncertainty regarding the use of roadside verges

It is noteworthy that Ukraine still lacks a legally established procedure for the use of public road right-of-ways. This creates several problems at once:

- the inability to quickly install AFI along TEN-T corridors,
- chaotic development that blocks the expansion or reconstruction of roads,
- conflicts in coordinating access to road service facilities.

In the context of AFIR, this means that it is virtually impossible to fulfil the obligation to install charging infrastructure along the Core Network.

Conclusions

The lack of transposition of Directive (EU) 2021/1187 creates a complex procedural barrier for Ukraine. Until the national system has fixed deadlines, a single coordinating body, mechanisms for cross-border interaction, and a clear legal framework for digital infrastructure, the country will not be able to:

- comply with AFIR and TEN-T requirements,
- ensure investment predictability for AFI and SSPA,
- roll out infrastructure projects at a pace comparable to that of Member States,
- claim full CEF support, including AFIF.

Harmonising the provisions of the Directive and creating a single procedural mechanism should be considered **an urgent systemic priority**, without which integration into TEN-T will remain declarative rather than practical.

SECTION VII. BEST PRACTICES OF THE EUROPEAN UNION IN THE DEVELOPMENT OF ELECTRIC VEHICLE CHARGING INFRASTRUCTURE ALONG THE TEN-T NETWORK-T NETWORK AND HARMONISATION OF UKRAINIAN LEGISLATION WITH THE EU ACQUIS

7.1. Analytical review of EU best practices in the development of the AFI network

As part of the preparation of this study and the development of legislative recommendations for the implementation of Regulation (EU) 2023/1804 (AFIR), this section contains an analytical review of the best practices of EU Member States.

As part of the EC's Sustainable Transport Forum (STF) initiative, a group of experts has developed common principles for **planning, financing and monitoring the development of the AFI network**, which ensure the unity of the European electric mobility space, reflect practical mechanisms for implementing the AFIR and form the basis for the draft **National Policy Framework (NPF-AFIR Ukraine).** Their value lies in the creation of a comprehensive system of planning, digital integration, unified technical standards and transparent administrative procedures – these are the elements that determine the success of the deployment of charging infrastructure networks in EU Member States.

The best practices of EU Member States show that the effectiveness of alternative fuel infrastructure (AFI) development depends not only on the level of funding, but above all **on integrated strategic planning, digital harmonisation, the removal of administrative barriers and effective coordination between national and local authorities.** These are the components that need to be taken into account when adapting Ukrainian legislation to the European acquis in the field of electric mobility and alternative fuels.

To ensure a clear logic of presentation and practical focus of this section, the analysis of selected aspects of EU best practices will be presented in a structured format that combines regulatory, analytical and applied components.

The material is systematised in the form of **a comparative analytical table** containing four interrelated blocks:

Scope of application	EU best practice	Provisions of the EU Regulation	Detailed justification / Recommendation for Ukraine

We believe that this approach makes it possible to:

- **Ensure a direct correlation** between the practical mechanisms for implementing AFIR in EU Member States and the relevant legal provisions of Regulation (EU) 2023/1804.
- **Identify specific examples** that can be **directly adapted to Ukrainian legislation**, indicating the relevant regulatory interventions.
- **Translate analytical conclusions into policy and legislative recommendations** in line with the European Commission's approach to transport and sustainable development.

- Ensure **transparency and uniformity** of information presentation for further use in legislative work, within the framework of preparing **the National Policy Framework (NPF-AFIR Ukraine)**.

Thus, the proposed format performs **a dual function**: **analytical** *(identification of EU best practices)* and **regulatory** *(preparation of legislative proposals to harmonise the Ukrainian legal field with the EU acquis)*.

7.2. Strategic planning and policy integration (NPF and coordination with energy)

Table 1. European approaches to AFI strategic planning: the relationship between NPF, SUMP and institutional coordination

Scope	EU best practice (Best Practice)	Provisions of the EU Regulation	Detailed justification / Recommendation for Ukraine
Integrated strategies (NPF/SUMP)	Development of a long-term, integrated mobility and energy strategy (NPF) and Sustainable Urban Mobility Plans (SUMP). The NPF should include a market assessment, AFIR targets (Articles 3–13) and measures to achieve them.	**(Regulation (EU) 2023/1804) (Article 14)** – NPF is mandatory by 31 December 2025. **(Regulation (EU) 2024/1679) (Article 40)** – SUMP is mandatory for urban nodes by the end of 2027.	**The** Ukrainian **National Policy Framework (NPF-AFIR Ukraine)** must cover all modes of transport and include measures to remove administrative barriers, which is a direct requirement of AFIR. The NPF must be developed and submitted to the EC during 2026.
Coordination with networks	Mandatory consultation with **distribution system operators (DSOs) / transmission system operators (TSOs)** to ensure **"Grid Friendly Charging"** and optimise investment plans. Consultations with all stakeholders (energy, construction, digitalisation) help to select priority "designated areas" with optimised or simplified permitting requirements (streamlined/simple permitting).	**(Regulation (EU) 2023/1804) (Article 15(3))** – requires an assessment of how the deployment of AFI will contribute to the flexibility of the energy system.	A legal obligation should be introduced for public authorities to coordinate tenders with DSOs/TSOs to select locations with sufficient *grid hosting* capacity. This will minimise the critical risks identified by the EC.
Deployment models	Use of combined models: **1) Strategic**, **2)** Coverage-based to ensure territorial unity, and **3)** *Usage-based*.	An indirect requirement arising from the need for NPF to cover all territories and respond to market dynamics.	CPOs should be required to share dynamic usage data (Utilisation rates) with government agencies to optimise future tenders.

7.3. Regulatory efficiency and best practices for tendering

Table 2. Practical EU tools for simplifying licensing procedures and improving the efficiency of AFI management (based on STF recommendations).

Scope	EU Best Practice	Provisions of the EU Regulation	Detailed justification / Recommendation for Ukraine
Removal of administrative barriers	Application of the **"One-step principle"** and **Pre-permitting** (prior obtaining of permits for	(Regulation (EU) 2023/1804) (Article 14(10)) – NPF	The duration of permitting procedures (24–48 months) is a critical barrier. Network connection

	connection to the network by the authorities).	should include measures to remove obstacles to planning and permitting.	procedures should be simplified (as recommended by TF1 STF) and the terms of concessions/leases of public land should be extended *(e.g. to 20 years, as in Croatia)* to reduce investment risks.
Reducing investment risks and terms	Granting long-term concessions/licences (e.g. 10–20 years) to ensure return on investment, especially in HPC (High Power Charging). Using financial security instruments such as 3rd party or Group-level guarantees.	AFIR power requirements (400–600 kW on the Core Network) require significant initial capital expenditure.	Legislate the possibility of granting long-term lease/concession rights for AFI facilities on TEN-T.
Service quality and monitoring	Establish **a** clear **performance mechanism** in contracts. Key indicator: **uptime** (percentage of time when the station is available and operational).	(Regulation (EU) 2023/1804) (Article 5(3)) – requirements for reliability and quality of service.	Require CPOs to continuously monitor and report on uptime as a criterion for assessing the performance of the concession agreement.
Energy integration	Encourage the use of **renewable electricity (RES)** and integration with *battery* storage for *peak-shaving services*.	(Regulation (EU) 2023/1804) (Article 20(2)(c)(iv)) – obligation of CPOs to provide information on whether **the** electricity supplied **is 100% renewable**.	Add this requirement to the NPF and tender conditions. Consider the possibility of including requirements for **PV panels** at new HPC hubs.

7.4. Digital integration and technical harmonisation within AFIR

Table 3. European digital compatibility standards for charging infrastructure (based on AFIR and EU Delegated and Implementing Regulations 2025/645, 2025/655, 2025/656)

Scope	EU best practice (Best Practice)	Provisions of the EU Regulation	Detailed justification / Recommendation for Ukraine
Digital infrastructure and NAP	Creation of **a National Access Point (NAP)**, which is a digital platform based on ITS architecture. AFI data must be available free of charge and without restriction via API.	**(Regulation (EU) 2023/1804) (Article 20(4))** – NAP is mandatory by **31 December 2024**. (Directive 2010/40/EU) (Article 4(1)) – ITS is the basis of the TEN-T digital infrastructure.	Ukraine should accelerate the creation **of the NAP** (currently planned only for Q4 2028) and introduce the definition of **"Digital infrastructure and ICT systems for transport"** as an integral part of road infrastructure.
V2G/Smart Charging Standard	Mandatory support for *Smart Recharging* functions and **EN ISO 15118-20:2022** standard for bidirectional charging (V2G).	**(Delegated Regulation (EU) 2025/656) (Art. 2, Annex II)** – ISO 15118-20:2022 mandatory from **1 January 2027** for new/upgraded public and private Mode 3/4 charging points.	Amend national legislation (in particular Law No. 2956-IX) and technical standards to make ISO 15118-20 mandatory by **1 January 2027**.
Data format and frequency	Use of the **DATEX II** standard and compliance with strict requirements for data update frequency.	**(Implementing Regulation (EU) 2025/655) (Art. 1, 2)**: **DATEX II** (CEN/TS 16157-10:2022) mandatory from **14 April 2026**. **Dynamic data** –	Harmonise Ukrainian data exchange systems (via NAP) with DATEX II by April 2026 and introduce mandatory *Service-Level Agreements (SLAs)* for

		updates within **1 minute**. **Static data** – updates within **24 hours**.	CPOs regarding data update frequency.
Technical requirements for API	The API must be technically compatible with NAP, user-friendly (*usability*) and contain **a publicly available detailed technical plan**.	**(Delegated Regulation (EU) 2025/645) (Art. 1)** – establishes general technical requirements for the API. Applicable from **14 April 2025**.	Define and approve minimum technical requirements for the API that comply with (Delegated Regulation (EU) 2025/645) to ensure automated and unified data exchange.

7.5. Infrastructure for heavy-duty vehicles (HDVs), closed fleets and inclusiveness.

Table 4. European practices for the deployment of AFI for heavy-duty vehicles, logistics fleets and users with special needs (based on STF-TF3 and TF5 recommendations)

Scope	EU best practice (Best Practice)	Provisions of the EU Regulation	Detailed justification / Recommendation for Ukraine
HDV infrastructure (Technology)	Focus on **Battery Electric Vehicles (BEVs)** as they dominate the market (over 90% of ZEV HDVs by 2030). Combination of depot charging (100–150 kW) and public high-power charging ( ) up to **1 MW (MCS)**.	**(Regulation (EU) 2023/1804) (Article 4)** – sets quantitative targets for HDV infrastructure (3600 kW on Core TEN-T every 60 km by 2030).	Ukraine should focus on the electrification scenario (MCS) and include HDV targets in the NPF, given that ERS (Electric Road Systems) and Battery Swapping are not priorities until 2030.
Hydrogen infrastructure (H_2)	The development of hydrogen (Article 6 of Regulation (EU) 2023/1804) should be targeted, given the high market uncertainty and high TCO (Total Cost of Ownership).	(Regulation (EU) 2023/1804) (Article 6) – HRS (Hydrogen Refuelling Stations) should be located every **200 km** on the Core TEN-T with a capacity of **1 tonne/day**.	It is recommended to introduce ***viability* screening** mechanisms for each potential hydrogen facility to avoid the risk of stranded assets.
Closed fleets	The authorities should create conditions for reliable ***overnight recharging*** for high-mileage drivers (taxis, *ride-hailing*) and facilitate dialogue for the integration of AFI into **depots/logistics hubs**.	(Regulation (EU) 2023/1804) (Article 14(4)) – NPF should include measures to support *captive fleets*.	Establishment *of a* "*right to charge*" for drivers who do not have access to private parking. Acceleration of procedures for obtaining permits for depot charging.
Inclusiveness	Ensuring the inclusiveness and accessibility of infrastructure for persons with reduced mobility (elderly people, persons with disabilities). It is recommended to apply **PAS 1899:2022** and relevant guidelines.	(Regulation (EU) 2023/1804) (Article 14(9)) – NPF should include measures to ensure the accessibility of AFI.	This requirement is mandatory and must be implemented through the relevant DBN/DSTU.

7.6. Ireland's best practices in developing electric vehicle charging infrastructure along the TEN-T network and harmonising legislation with the EU acquis

Ireland demonstrates one of the most comprehensive and coordinated approaches to implementing the requirements of Regulation (EU) 2023/1804 (AFIR) and developing infrastructure for electric vehicles along the TEN-T road network. In a context of a limited geographical market and high decarbonisation requirements, the country has been able to create a model that combines strategic planning, institutional coordination, digital integration and private sector support. This experience is highly relevant for Ukraine, as it demonstrates how public policy can ensure the rapid and high-quality deployment of AFI without excessive administrative burden and with a high level of compliance with EU standards.

Institutional model and inter-agency coordination

A key structural innovation in Ireland was the creation of **a** special **office for zero-emission vehicles**, Zero Emission Vehicles Ireland (ZEVI). The office operates within the Department of Transport (DoT) and acts as the central body responsible for shaping government policy on electric mobility and the development of AFI. Since its creation, ZEVI has become a platform that brings together the capabilities of Transport Infrastructure Ireland (TII), the National Transport Authority (NTA) and ESB Networks (ESBN). This model of interagency cooperation ensures coordinated investment planning, regulatory development, zoning coordination and energy network integration.

Another element **of** the Irish system is **the EV Planning Working Group,** which includes representatives from the transport, construction, energy and justice departments, as well as electricity network operators. The group's task is to remove legal and procedural barriers that arise during the construction of charging stations, their connection to the grid, and the development of urban and regional mobility plans.

Local authorities also play an important role**.** They develop their own regional strategies for the development of charging infrastructure, which allows national goals to be adapted to local needs and traffic levels. Ireland has effectively created a three-tier model of AFI management***: national, sectoral and local.***

Deployment of TEN-T infrastructure through grant programmes

To accelerate the development of AFI along TEN-T, Ireland uses grant mechanisms developed in accordance with EU state aid rules. One of the key programmes is the National Road Construction Grant Scheme to support the development of high-power charging stations for electric vehicles across Ireland's National Road Network - LDV 1 (En-Route Grant Scheme), which aims to encourage the installation of high-power charging pools for electric passenger cars along major motorways.

The programme sets out specific parameters that are fully compliant with AFIR: the placement of a high-power charging pool every **60 km**, a minimum total power of **1200 kW** per location and the availability of at least four **150 kW** charging points. This approach allows for the creation of a uniform, predictable infrastructure and also reduces risks for private investors, as the state partially compensates for the costs of installing the equipment.

The next step will be the implementation of **the** Heavy Duty Vehicle **1 Scheme**, which will replicate a similar financing mechanism, but taking into account the specifics of freight transport: high-power charging stations, increased parking areas and safe logistics. It is planned that the HDV infrastructure will be integrated with existing TII rest areas and service centres.

Removing barriers to connecting to the power grid and licensing procedures

One of the biggest challenges for Europe as a whole is ensuring sufficient grid capacity for high-power charging stations. In Ireland, this issue is being addressed through **a mechanism for pre-screening grid connection capabilities, which was introduced by ESB Networks in 2023**. Thanks to this mechanism, charging station operators receive real-time information about the available capacity in a specific section of the network, the approximate cost of connection and the time frame, which allows them to plan investments accurately and avoid delays.

At the same time, ZEVI is working with the departments responsible for construction and spatial policy to simplify planning regulations. The aim is to reduce project approval times, eliminate duplication of procedures and ensure transparency in interactions between private operators and public authorities.

Data standardisation and digital interoperability

To meet AFIR's commitments on data transparency and accessibility, Ireland is creating a national digital architecture that will enable the exchange of information between charging station operators, public authorities and the European Commission.

Transport Infrastructure Ireland is to be granted **IDRO** status**,** which will enable the standardisation of identification codes for charging station operators and e-mobility service providers. In parallel, ZEVI and TII are developing a Data Exchange Platform, a national platform for collecting and exchanging data in near real time. The platform will ensure integration with the Common European Access Point, which will be established in accordance with Article 20 of the AFIR.

End-user focus and universal design

Ireland pays considerable attention to the accessibility of charging infrastructure. In 2024, Universal Design Guidelines were published, covering requirements for the ergonomics of charging equipment, accessibility of sites, information systems and payment methods. The guidelines are mandatory for all facilities receiving state support, ensuring the same level of accessibility regardless of geography or operator. In addition, an online portal is being created to verify compliance with standards before funding begins.

Stimulating demand and developing the domestic market

The Irish government actively supports demand for electric vehicles. Given that most LDV charging takes place at home, the state finances the installation of home chargers and also allocates grants for apartment buildings, including investments in cable infrastructure. Along with this, there are tax incentives and corporate benefits that facilitate the transition of businesses to electric transport.

This set of measures ensures stable growth in the electric vehicle market, making infrastructure investments more predictable for the private sector.

Analytical conclusion

The Irish experience shows that success in meeting AFIR requirements lies in creating a comprehensive management system where institutional coordination, digital

interoperability, uniform TEN-T development, high accessibility standards and demand stimulation mechanisms work in sync. This approach differs not only in terms of the volume of funding, but above all in the quality of strategic planning and the state's ability to create predictable conditions for investors.

We believe that this experience can serve **as a benchmark** for Ukraine **in the process of developing** a National Policy Framework (NPF-AFIR Ukraine), harmonising the regulatory framework, integrating the road network into TEN-T and creating modern infrastructure for electric transport.

7.7. Best practice: integration of charging infrastructure into the national railway network (example of Bulgaria)

General description of the initiative

Bulgaria has launched an important strategic initiative to integrate electric vehicle charging infrastructure into the national railway network, implemented by **the National Railway Infrastructure Company** (**NRIC**) in cooperation with **the Ministry of Transport and the Ministry of Energy**. This approach is based on the use of existing state energy and transport assets to create **a single national fast charging network** in accordance with the provisions **of Regulation (EU) 2023/1804 (AFIR)** and the principles of **the Sustainable Transport Forum (STF)**.

Key elements of the practice

Access to the power grid. Charging stations are connected directly to the national power grid via the NRIC (National Railway Infrastructure Company) infrastructure, which ensures a stable and efficient power supply without the need to build new substations.

Optimal locations. The placement of charging points at railway stations — natural transport hubs — ensures high accessibility for interregional travel and supports the TEN-T multimodal mobility concept.

Fleet maintenance. The network is focused not only on private cars, but also on public transport fleets (captive fleets) — electric buses, urban logistics, taxis. This approach is in line with STF recommendations for AFI integration for commercial and municipal operators.

High power. In the first stage of construction (35 stations), each facility provides a total power of over 600 kW, allowing fast charging of both passenger cars and electric buses.

Strategic use of existing infrastructure

The Bulgarian model **demonstrates the effective use of dual-purpose public infrastructure** owned by the national operator. The involvement of the railway network made it possible to ensure a quick start to the programme without additional land procedures and significant costs for energy connection. In addition, the location of stations at railway stations and transport hubs ensures territorial balance — the infrastructure is being deployed not only in the capital Sofia, but also in regional centres and remote areas.

This approach allows for synergy between energy, transport and digital policies, contributing to the implementation of the "One Network – Multiple Modes" principle within TEN-T.

The Bulgarian initiative was launched with **a Memorandum of Cooperation and Interaction, which serves as a model for inter-agency cooperation.**

Table **5.** Inter-agency Cooperation Model and analogy for Ukraine

Bulgarian participants	Ukrainian analogues and their role
Electricity System Operator (ESO)	**NPC Ukrenergo** (Transmission System Operator) or a large state-owned energy operator.
ESO Charge (subsidiary of ESO)	A specialised state-owned or private operator responsible for the construction and operation of the EZS.
National Company "Railway Infrastructure" (NRIC)	**JSC Ukrzaliznytsia** (owner/balance holder of railway infrastructure).
Key document	**Memorandum of cooperation**, which officially unites the energy and transport sectors.

Potential for Ukraine

International motorways of national importance, which are part of **the TEN-T network in Ukraine**, in many cases **run along railway tracks or near major railway junctions** *(e.g. the M 06 Chop – Lviv motorway).*

This feature creates **a unique opportunity to integrate charging infrastructure with existing railway facilities** – depots, stations, traction substations, and logistics terminals.

We believe that this approach will make it possible to:

- **significantly reduce the cost of connecting to the grid** (as railway junctions already have access to high-voltage lines);
- **reduce project implementation times** by using existing land and communications;
- **ensure uniform territorial coverage** of TEN-T corridors not only in large cities but also in small settlements;
- **increase the investment attractiveness of AFI projects**, especially in the format of public-private partnerships.

Best practice for Ukraine

- **Integration with JSC Ukrzaliznytsia.** In Ukraine, JSC Ukrzaliznytsia has a significant portfolio of facilities connected to powerful power lines, which creates the conditions for the rapid implementation of a similar initiative. This is in line with the STF's recommendations on coordinating AFI planning with distribution and transmission system operators (DSOs/TSOs).

- **Institutional cooperation.** It is advisable to initiate a joint memorandum between the Ministry of Energy, the Ministry for Development of Community and Territory of Ukraine, and Ukrzaliznytsia JSC to combine technical and financial potential for the development of the EZS infrastructure.

- **Expanding coverage.** The new network should be designed to meet the needs not only of passenger cars (category M1), but also buses (M2/M3) and vans and trucks (N1–N3), which are critical for urban logistics and interregional transport.

Conclusions

We believe that the Bulgarian initiative **is a successful example of an integrated AFI development model** that implements the key principles of the EC in the field of sustainable mobility, which:

- Combines the resources of state-owned energy and transport companies.
- Utilises existing public assets (rail infrastructure) to accelerate the deployment of charging capacity.
- Contributes to the achievement of national decarbonisation goals and compliance with AFIR requirements.
- Ensures accessibility, territorial balance and moderate tariffs for users.

For Ukraine, leveraging the proximity of road and rail infrastructure can significantly accelerate the implementation of the EV charging network, ensuring technological and economic efficiency, as well as integration into the European electric mobility space.

7.8. Best practice: implementation of Vehicle-to-Grid (V2G) technology (examples from the Netherlands and Sweden)

The essence and advantages of V2G technology

Vehicle-to-Grid (V2G) technology is a bidirectional system of interaction between an electric vehicle (EV) and the power grid, which allows not only to charge the vehicle, but also **to return electricity back to the grid**. This approach creates additional **flexibility in the energy system**, ensures **a balance between supply and demand**, and promotes **the optimal use of energy from renewable sources**.

Key benefits:

- **Stabilisation of the power grid.** Electric vehicles are charged during off-peak hours (e.g. when solar or wind power stations are operating at full capacity) and can be discharged during peak loads.
- **Clean energy storage.** EVs act as mobile energy storage devices, allowing excess generation to be stored and used when needed.
- **Economic benefits.** Fleet operators, municipal services and private EV owners can generate income by providing energy balancing services.

European pilot examples

A. Utrecht, Netherlands

The city has pioneered the implementation of **a large-scale V2G system** based on car-sharing fleets.

- The implementation is being carried out as part of the *Utrecht Energized* project, in collaboration with **the Renault Group**, **We Drive Solar**, **MyWheels** and the municipality.
- **Fifty bidirectional chargers** are used for a fleet of **50 Renault 5 E-Tech electric vehicles**, with a subsequent expansion to 500.
- 35% of the city's roofs are equipped with solar panels, allowing maximum use of local generation through the V2G infrastructure.

B. Gudiksvall, Sweden

Volkswagen, **Vattenfall** and **Ambibox** are implementing a pilot project based on **bidirectional direct current (DC) transmission**.

- Testing involving **200 Volkswagen ID. EVs** assesses technical reliability, user experience and potential owner income.
- The use of DC/AC inverters ensures efficient energy exchange between the battery and the grid, allowing EVs to function as **an active element of the energy supply system**.

Regulatory challenges

Pilot projects demonstrate the potential of V2G, but widespread implementation requires harmonised standards and regulations:

- There are over **850 different** energy network **operators** in the EU with different communication protocols (OCPP, ISO 15118).
- Uncoordinated tax regimes, different connection tariffs and rules for bidirectional meters.
- The **need** for **smart meters** and digital integration.

The EC and **Renault Group** emphasise the importance of:

- developing **uniform technical standards for V2G**;
- introducing **tax incentives** for market participants;
- simplifying certification procedures for charging devices.

Best practice for Ukraine

In the context of **military action and regular emergency power cuts** caused by the destruction of energy infrastructure by Russian shelling, V2G technology is becoming **particularly relevant for Ukraine**.

1. Energy resilience in crisis conditions.

The use of V2G will allow:

- provide **backup power to critical infrastructure** (hospitals, administrations, warming centres) in the event of power outages;
- stabilise local power systems during generation shortages;
- create mobile "energy buffers" in municipal vehicle fleets and logistics centres.

2. Institutional and regulatory steps.

- Include V2G pilots in the National AFI Policy Framework (NPF-AFIR).
- Amend the Law on the Electricity Market to legalise bidirectional energy exchange between EVs and the grid.
- Introduce pilot projects with **"smart" charging hubs** in Kyiv, Lviv, Dnipro, and Kharkiv in cooperation with local energy companies.

3. Economic feasibility.

The development of V2G will ensure:

- **a reduction in electricity losses** and grid load;
- **a reduction in the need for expensive stationary batteries**;
- creation of **new sources of income** for fleet operators and private EV owners.

Therefore, **Vehicle-to-Grid** technology is one of the promising tools for Ukraine in the context **of strengthening energy security**, **recovery from destruction,** and **gradual integration into the European energy space**. Its implementation will not only stabilise the energy system in crisis conditions, but also become one of the key areas **for the implementation of AFIR and the EU Green Deal**.

Conclusion to SECTION VII

An analysis of selected practices of European Union member states in the field of IZE development shows that the success of the European model is based not only on the financing and construction of charging stations, but above all on a systematic approach. EU countries demonstrate that the key prerequisites for sustainable electric mobility are strategic planning, digital integration, predictable regulatory policy, and efficient licensing procedures that allow AFI to be deployed at a pace compatible with AFIR requirements.

For Ukraine, this experience is an important benchmark that shapes the roadmap for modernising legislation and public administration in the field of electric mobility. The first priority is to develop a National Policy Framework (NPF-AFIR Ukraine) to synchronise state institutions, energy network operators and local authorities in a single system for planning and implementing AFI. This strategic decision will enable a transition from fragmented initiatives to a comprehensive electric vehicle infrastructure architecture integrated into the TEN-T network.

Digital and technical harmonisation is of particular importance. AFIR requirements for NAP, open APIs, ISO 15118-20 and dynamic data are not a formality — they define the

basic conditions for the functioning of a network that can be scaled, integrated and managed in real time. Ukraine must complete the creation of its national digital infrastructure in the coming years, ensuring its full compatibility with European ITS systems.

European experience also highlights the importance of minimising investment risks through a predictable system of access to electricity grids, long-term infrastructure management models, clear reliability standards (Uptime) and competitive grant mechanisms.

Ireland's experience in overcoming obstacles to connecting to power grids is particularly valuable for Ukraine. The Grid Connection Screening mechanism allows investors to plan projects without delays, and simplified planning procedures remove administrative barriers. In the context of Ukrainian realities, this is the key to the large-scale deployment of AFI, especially in regions with limited power grid capacity, and the adaptation of such approaches is a critical prerequisite for attracting private investment and accessing CEF and AFIF funding.

The Irish experience also shows that the development of AFI along TEN-T is effective when clear financial instruments are in place. The LDV 1 (En-Route Grant Scheme) programme, which incorporates AFIR parameters into grant criteria (1200 kW every 60 km), creates a predictable and investment-attractive market. The launch of the HDV 1 Scheme for heavy goods vehicles is the next step that Ukraine can replicate when developing infrastructure for freight transport on TEN-T corridors.

The synergy of state assets is another important lesson. The Bulgarian model proves that the integration of transport and energy companies can accelerate network development significantly. In Ukraine, the infrastructure of JSC Ukrzaliznytsia has similar potential and could become a systemic partner in the deployment of powerful charging stations along the TEN-T.

The importance of V2G technologies for Ukraine should be emphasised separately. In conditions of energy instability, electric vehicles can become an element of distributed energy and strengthen the resilience of critical infrastructure. The inclusion of V2G in the NPF-AFIR and the adaptation of legislation will allow Ukraine to form an innovative energy management model that is not currently used in most EU countries.

Overall, the analysis shows that the path to Ukraine's successful integration into the European electric mobility space lies in combining strategic vision, digital compatibility, high-quality regulatory mechanisms, smart use of state assets, and technological innovation. Implementing these guidelines will enable Ukraine not only to meet the requirements of the AFIR, but also to create a modern, sustainable and competitive infrastructure that will form the foundation for the country's post-war recovery and energy security.

LEGISLATIVE PROPOSALS AND POLICY RECOMMENDATIONS FOR HARMONISATION WITH EU REQUIREMENTS AND ELECTRIC VEHICLES CHARGING NETWORK DEVELOPMENT

BASED ON THE CONCLUSIONS OF SECTION I.

1. Regulatory and strategic differences (classification and hierarchy)

Need for change

Regulation (EU) 2024/1679 (TEN-T) establishes a three-level, functional-strategic hierarchy of the network with fixed legal obligations and implementation deadlines: *Core Network by 2030, Extended Core Network by 2040 and Comprehensive Network by 2050.* Each level is an institutional and political category that determines the priority of funding, planning and control.

Ukrainian legislation (the Law of Ukraine "On Motorways") uses a four-level administrative-territorial classification: international, national, regional and territorial roads. This structure is suitable for internal management, but does not reflect the TEN-T strategic model and does not contain a legal mechanism for classifying objects as Core Network or Extended Core Network. Furthermore, Ukrainian legislation does not contain the concept of European Transport Corridors (ETCs), but uses the outdated concept of "International Transport Corridors" (ITCs).

This hinders the legal definition of the status of Ukrainian sections as TEN-T-compatible and the prioritisation of investments. In addition, Regulation (EU) 2024/1679 elevates the status of alternative fuel infrastructure (AFI) to an independent mandatory component of TEN-T transport infrastructure Associated Equipment, rather than an auxiliary element of engineering equipment or road service, as in Ukrainian legislation. The absence of relevant categories creates a legal vacuum that complicates the legal definition of the status of Ukrainian sections as part of TEN-T, hinders the full use of CEF/AFIF financing mechanisms, and limits the ability to report to the EC.

Legislative proposals:

1.1. Introduction of the TEN-T hierarchy.

Amend the Law of Ukraine "On Motorways" with a new article or amend Article 8 to establish a three-level functional hierarchy of motorways (Core network, Extended core network, Comprehensive network) in accordance with the requirements of Regulation (EU) 2024/1679, as well as introduce the concept of European Transport Corridors (ETCs). It is necessary to legally establish that special requirements for planning, technical parameters and implementation deadlines apply to sections included in the TEN-T network.

1.2. Expanding the definition of road transport infrastructure and associated equipment.

Amend Article 1 (Definition of Terms) by defining the concept of "Road Transport Infrastructure" and its components, including the mandatory "Associated Equipment" (Article 29(1)(g) of Regulation (EU) 2024/1679). This equipment should include:

- Alternative fuel infrastructure (AFI).

- Safe and secure parking areas (SSPA).
- Weigh-in-motion (WIM) systems.
- Digital infrastructure and ICT systems for transport.

In addition, a comprehensive review and transposition of the terminology of Regulation (EU) 2024/1679 into the national legal system is necessary.

1.3. Strategic planning for road development.

Develop and approve, taking into account the provisions of the Law of Ukraine "On Motorways" and the Concept of the National Strategic Planning System, approved by the Order of the Cabinet of Ministers of Ukraine No. 853-r of 13 August 2025, the "National Strategy for the Development of the Road Network of Ukraine" (working title), which, among other things, provides for the integration of the TEN-T direction and the development of the network.

1.4. Ukraine's technical requirements for the quality of new or upgraded road surfaces

For the purposes of monitoring and planning road maintenance, introduce the mandatory use of the International Roughness Index (IRI) as a key indicator of the technical and operational condition of motorways included in the Core Network and Extended Core Network and which is de facto an "entry ticket" to recognition of a road as TEN-T-compatible.

1.5. Official translation of Regulation (EU) 2024/1679

It is recommended that Regulation (EU) 2024/1679 be included in the list of EU acquis acts subject to official translation.

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2. Design requirements for motorways

Need for changes

Regulation (EU) 2024/1679 establishes strict, legally binding standards for the Core Network and Extended Core Network, mandatory by 2030 and 2040, respectively. Ukrainian DBN V.2.3-4:2015 "Motorways" allows for compromises, as physical separation is mandatory only for Category I roads (I-a and I-b), while for Category II and III roads, which may be part of the TEN-T, physical separation is not mandatory, and also do not contain mandatory requirements for complete physical and functional separation of traffic (in particular, "No Crossings at Grade") for international corridors, which directly violates the basic TEN-T design standard for the Core/Extended Core Network (Regulation (EU) 2024/1679, Article 31).

Legislative proposals

2.1. Requirements for interchanges

Amend regulatory acts, construction and industry standards to stipulate that sections classified as TEN-T network must comply with the requirement of ‘No Crossings at Grade’. It is necessary to stipulate that existing single-level crossings must be eliminated or converted into two-level interchanges during reconstruction, major repairs or new construction.

2.2. Median strips and barriers

Introduce into regulatory legal acts, construction and industry standards provisions on the mandatory presence of a dividing strip and mesh fencing at the edge of the right-of-way, making this mandatory for the entire length of roads classified as part of the TEN network, to ensure complete functional isolation of traffic from local traffic and animals.

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3. Implementation of the Life-Cycle Management model

Need for change

The Ukrainian model remains largely reactive and fragmented ("build – operate – repair (after wear and tear or destruction)"), while Regulation (EU) 2024/1679 requires a transition to a preventive and integrated Life-Cycle Management model. There is no obligation to calculate maintenance and modernisation costs throughout the entire life cycle of an asset (Life-Cycle Costing), nor are there any requirements for assessing greenhouse gas (GHG) emissions and climate resilience (Climate Proofing) for PCI projects.

Legislative proposals

Develop amendments to regulatory acts (recommended to the Law of Ukraine 'On Motorways') and subordinate acts that would introduce mandatory assessment of road transport infrastructure costs throughout their life cycle (Life-Cycle Costing), as provided for in Regulation (EU) 2024/1679 for the TEN-T network.

Description of changes:

3.1. Implementation of an integrated life-cycle approach to the planning, development and operation of TEN-T road transport infrastructure based on the principles of resource efficiency and resilience

Legally enshrine the requirement (in accordance with Articles 5, 46, and 49 of Regulation (EU) 2024/1679) to include long-term maintenance planning and the calculation of all costs (maintenance, modernisation, risk adaptation) in the project documentation at the stage of technical and economic justification (TEJ) and design of new construction/reconstruction of road transport infrastructure belonging to the TEN-T network.

Establish that the purpose of design is not only to ensure the minimum initial cost of construction, but also to minimise the use of resources and optimise costs throughout the entire life cycle of the infrastructure (Life-Cycle Approach), as well as the obligation to integrate planning for the resilience of infrastructure to climate change, natural hazards and intentional disruptions (cyber attacks, sabotage) (Article 46 of Regulation (EU) 2024/1679).

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4. Climate Proofing and Impact Assessment

Need for change

Regulation (EU) 2024/1679 introduces a mandatory Climate Proofing procedure for Projects of Common Interest (PCI). This requires an assessment of vulnerability to climate

change, calculation *of life-cycle* greenhouse gas (*GHG*) *emissions,* and compliance with *the Do No Significant Harm (DNSH)* principle. However, the Law of Ukraine "On Environmental Impact Assessment" (EIA) does not contain requirements for Climate Proofing and DNSH. Environmental impact assessment focuses on local environmental impacts rather than integrated climate analysis. The absence of DNSH is critical as it is a prerequisite for obtaining EU funding (CEF, AFIF).

Legislative proposals

Amendments to the Law of Ukraine "On Environmental Impact Assessment" (No. 2059-VIII) and/or a special regulatory act governing PCI to implement a mandatory Climate Proofing procedure.

Description of changes

4.1. Mandatory Climate Proofing procedure

Establish that for all projects that fall under the definition of a Project of Common Interest (PCI) (if the procurement process for the EIA was not initiated before 18 July 2024), a climate proofing check is mandatory.

4.2. Life-Cycle GHG Emissions Assessment

Add to the requirements for the content of the EIA report (in accordance with Directive 2011/92/EU) a mandatory calculation of greenhouse gas (GHG) emissions throughout the project's life cycle (Life-Cycle GHG Emissions). This should become an integral part of the socio-economic cost-benefit analysis (Socio-economic CBA).

4.3. Climate Risk Assessment

Establish an obligation to assess the vulnerability of infrastructure facilities to projected climate change (heat, floods, landslides) and to integrate adaptation and mitigation measures.

4.4. Implementation of the "Do No Significant Harm" (DNSH) principle

Establish compliance with the "Do No Significant Harm" (DNSH) principle (as defined in Regulation (EU) 2020/852) as a mandatory condition for the approval of projects applying for state aid or EU funding (in particular through CEF/AFIF mechanisms), in line with the requirements of Regulation (EU) 2024/1679 and Directive (EU) 2021/1187 (which applies to TEN-T permit procedures).

4.5. Implementation of the provisions of the EC Technical Guidance on Climate Screening of Infrastructure (2021–2027)

These guidelines can serve as a methodological basis for Ukraine to integrate climate criteria into national infrastructure projects, even though they were developed for EU instruments (InvestEU, CEF, CPR funds, RRF). Its approaches allow Ukraine to create its own climate assessment system adapted to the national context and to integrate climate resilience requirements into building codes, standards and strategic plans.

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5. Projects of Common Interest (PCI) and their approval procedures under Regulation (EU) 2024/1679 and related directives

Need for change

Projects of Common Interest (PCI) are transnational infrastructure initiatives that are crucial for achieving the strategic objectives of TEN-T. They involve the participation of several countries (EU Member States and/or neighbouring third countries). PCIs can be implemented at all three hierarchical levels of TEN-T and cover the entire project lifecycle, including feasibility studies, authorisation procedures, construction, operation, maintenance and ex-post evaluation. The status of PCIs is determined primarily by their contribution to European Added Value, which is now more structured and linked to the four strategic objectives of TEN-T (efficiency, cohesion, sustainability and user-friendliness). Regulation (EU) 2024/1679 and Directive (EU) 2021/1187 establish special institutional and procedural mechanisms for the accelerated granting of permits for PCIs, as these projects are of strategic importance. Ukrainian legislation currently lacks a legal mechanism for determining preventive security screening to assess the risks of third countries' influence on critical infrastructure, support and authorisation of PCIs, which creates a systemic gap for the integration of Ukrainian infrastructure initiatives into TEN-T mechanisms and limits access to European funding. In addition, the Ukrainian system has **a reactive function** (e use of existing roads for military transport in wartime), while the EU requires **preventive integration** of military standards at the planning stage.

Legislative proposals

Description of changes:

5.1. Definition of the concept of "Projects of Common Interest" (PCI)

Develop systemic changes to the Law of Ukraine "On Motorways", the Law of Ukraine "On International Territorial Cooperation of Ukraine" or adopt a separate resolution of the CMU, which will introduce the definition of "Project of Common Interest (PCI)" (Article 3(41) of Regulation (EU) 2024/1679). Also, since climate requirements are inextricably linked to PCI status, changes need to be made to create a legal mechanism for their recognition. In this regard, it is proposed to define the criteria for assessing PCIs, including: socio-economic cost-benefit analysis (CBA), climate proofing assessment, and compliance with the "Do No Significant Harm" (DNSH) principle.

5.2. Authorisation procedure

Create a mechanism that legally establishes the status of a project as a PCI that meets the "European Added Value" and contributes to the achievement of the objectives set out in Article 4 of Regulation (EU) 1315/2013 (cohesion, efficiency, sustainability).

5.3. Creation of an institutional mechanism (One-Stop-Shop Authority)

Identify a single national authorised body (One-Stop-Shop Authority), for example, based on the Ministry of Development or the Recovery Agency, by amending its Regulations, which will perform the following functions:

- Contact Point for PCI project initiators (Article 4(7)(a) of Directive (EU) 2021/1187).

- Supervision of the time frames for authorisation procedures.
- Ensuring the completion of the authorisation procedure within a period not exceeding four years (Article 5(1) of Directive (EU) 2021/1187).

5.4. Protection against risks associated with third countries (Security Screening)

The EU considers the extension of the TEN-T network to Ukraine after 2022 primarily as a geopolitical and security issue aimed at ensuring the sustainability of European infrastructure and supporting military logistics. Thus, in order to harmonise with Regulation (EU) 2024/1679, Ukraine needs to introduce mandatory preventive security screening at the legislative level and develop an appropriate procedure for assessing the risks of third countries' participation in strategic TEN-T projects.

5.5. Integration of Military Mobility (Dual-Use)

Amend planning legislation to require that the design and construction of TEN-T facilities that coincide with the military transport network take into account the requirements for dual-use infrastructure (taking into account *the Military Requirements for Military Mobility within and beyond the EU*). This means that it may be necessary to go beyond the standard civil technical requirements set out in Regulation (EU) 2024/1679 to ensure the mobility of heavy military equipment and large-scale assets.

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6. Harmonisation of Digital and Monitoring Requirements

Need for change

TEN-T requires mandatory digital integration and monitoring (ITS, eFTI, WIM), while Ukrainian legislation considers WIM and ICT as secondary "engineering elements". The absence of legally defined concepts in the field of digitalisation in Ukrainian legislation hinders Ukraine's integration into the digital components of TEN-T and intelligent transport systems (ITS), which contradicts the requirements of Regulation (EU) 2024/1679 (Article 29(1)(c)) and makes it impossible to include them in projects of common interest (PCI)

Legislative proposals

1. **Definition of digital infrastructure and ICT systems for transport**: amend the Law of Ukraine "On Motorways" (No. 2862-IV) the concept of **"digital infrastructure and ICT systems for transport"**, including AFI, ITS, 5G and SSPA monitoring systems, as an integral part of road infrastructure, in accordance with Article 29(1)(c) of Regulation (EU) 2024/1679. This will ensure that digital infrastructure projects (necessary for the functioning of the EES) are automatically included in the scope of the accelerated procedures of Directive 2021/1187

2. **WIM as a Mandatory Element**: Amend the Law of Ukraine "On Motorways" to legally define Weigh-in-Motion (WIM) systems as an integrated and mandatory element of transport infrastructure (Associated Equipment) on the TEN-T Core/Extended Core Network, and not just as a control measure.

2. eFTI (Electronic Freight Transport Information): Initiate the implementation of Regulation (EU) 2020/1056 on eFTI, establishing a legal framework for the use of certified digital platforms for the exchange of regulatory information on freight transport. This is critical for multimodal logistics in cross-border corridors.

BASED ON THE CONCLUSIONS OF SECTION II

1. Adoption of a National Policy Framework (NPF) and designation of an authorised body responsible for coordinating the NPF and reporting

Need for change

The current national legal framework demonstrates only partial harmonisation with AFIR, mainly in the area of physical standards, while there is a critical legal gap in terms of strategic planning, digital integration and operational requirements. The low level of transposition of Regulation 2023/1804, the lack of defined IZE development goals, and the absence of integrated strategic planning at the national and local levels hinder the systematic development of the network. Regulation (EU) 2023/1804 (AFIR) requires Member States to develop and adopt a National Policy Framework (NPF) by 31 December 2025. This document is the basic platform for coordinating objectives, indicators and investment instruments. Ukraine does not have an NPF, which makes it impossible to carry out comprehensive strategic planning and regular reporting to the European Commission (EC), which is to take place every two years, starting on 31 December 2027. In addition, Ukraine lacks an authorised body responsible for coordinating the NPF and submitting biennial reports, and no state supervisory (control) body in the field of IEE, the procedure for its implementation, or a mechanism for consumer protection has been established.

Legislative proposals

Description of changes (Short-term priorities (4th quarter of 2026)

1.1. Develop and approve, taking into account the provisions of the Concept of the National Strategic Planning System, approved by the Cabinet of Ministers of Ukraine on 13 August 2025 No. 853-r and **in accordance with Article 14 of the AFIR, the National Policy Framework (NPF)** as a basic document for the integration of the AFIR and TEN-T (***working title: National Strategy for the Development of Alternative Fuels Infrastructure in the Transport Sector (NPF-AFIR Ukraine***).

It is recommended to start its development in the near future with the aim of submitting it to the EC as part of the EU membership negotiations in 2026.

This strategy should include, among other things, the following mandatory elements:

1) an assessment of the current state and future development of the alternative fuels market in the transport sector, as well as the development of alternative fuels infrastructure, taking into account intermodal access to alternative fuels infrastructure and, where

appropriate, cross-border continuity and the development of alternative fuels infrastructure on islands and in the most remote regions;

2) national targets and objectives in accordance with Articles 3, 4, 6, 8, 9, 10, 11 and 12 of the AFIR Regulation, for which mandatory national targets are set out in the Regulation;

3) policies and measures necessary to ensure the achievement of the mandatory targets and objectives referred to in point 2);

4) measures planned or adopted to promote the deployment of alternative fuel infrastructure for own fleets, in particular charging stations and hydrogen refuelling stations for public transport services and charging stations for car sharing;

5) measures planned or adopted to encourage and facilitate the deployment of charging stations for light and heavy-duty vehicles in private locations not accessible to the public;

6) measures planned or adopted to promote the development of alternative fuel infrastructure in urban centres, in particular with regard to publicly accessible charging points;

7) measures planned or adopted to promote the development of a sufficient number of publicly accessible high-power charging points;

8) measures planned or adopted to ensure that the deployment and operation of charging points, including the geographical distribution of bidirectional charging points, contribute to the flexibility of the energy system and the penetration of renewable electricity into the electricity system;

9) measures to ensure that publicly accessible charging and refuelling points for alternative fuels are accessible to elderly people, persons with reduced mobility and persons with disabilities in accordance with the accessibility requirements of Directive (EU) 2019/882;

10) measures planned or adopted to remove potential barriers to the planning, permitting, procurement and operation of alternative fuel infrastructure;

11) an overview of the current status, prospects and planned measures for the deployment of alternative fuel infrastructure in seaports, other than liquefied methane and shore-side electricity for seagoing vessels, such as hydrogen, ammonia, methanol and electricity;

12) an overview of the current status, prospects and planned measures for the deployment of alternative fuel infrastructure, including targets, milestones and necessary funding, for hydrogen or battery-powered trains on TEN-T railway sections that cannot be electrified;

13) an overview of the current status, prospects and planned measures for the deployment of alternative fuel infrastructure at airports, other than the power supply of stationary aircraft, such as electric charging and hydrogen refuelling of aircraft;

14) an overview of the current status, prospects and planned measures for the deployment of alternative fuel infrastructure in inland waterway transport, such as electricity and hydrogen.

Non-mandatory elements of the strategy:

1) an overview of the current status, prospects and planned measures for the deployment of alternative fuel infrastructure in seaports, such as for electricity and hydrogen, for port services as defined in Regulation (EU) 2017/352 of the European Parliament and of the Council (31);

2) national targets and measures to promote the development of alternative fuel infrastructure along road networks that are not included in the TEN-T core network or the TEN-T comprehensive network, in particular for publicly accessible recharging points;

3) measures to ensure the availability of charging and refuelling infrastructure throughout the territory of the Member State, with particular attention to rural areas to ensure their accessibility and territorial cohesion;

4) measures to ensure that the density of publicly accessible alternative fuel infrastructure available at national level takes into account population density;

5) national targets and objectives for the deployment of alternative fuel infrastructure related to points (a), (b), (c) and (d) for which no mandatory targets are set in this AFIR Regulation.

The national strategy shall take into account the needs of the different modes of transport existing in the territory of the state.

The national strategy may, where appropriate, take into account the needs and interests of regional and local authorities, in particular with regard to infrastructure for charging and refuelling public transport, as well as the interests of stakeholders.

Measures to support alternative fuel infrastructure must comply with relevant EU state aid rules.

Each Member State must publish its draft National Strategy and ensure that the public has early and effective opportunities to participate in the preparation of the draft national policy framework.

The Commission shall assess the draft national policy frameworks and may issue recommendations to Member States. These recommendations shall be issued no later than six months after the submission of the draft national policy framework referred to in paragraph 1 of this Article. They may, in particular, concern:

(a) the level of ambition of the objectives and targets for the fulfilment of the commitments set out in Articles 3, 4, 6, 8, 9, 10, 11, 12 and 13 of the AFIR Regulation;

(b) policies and measures relating to national targets and objectives.

Each Member State shall take due account of any recommendations made by the EC in its final national policy framework. If the Member State concerned does not take account

of a recommendation or a substantial part thereof, it shall provide the Commission with a written explanation.

By 31 December 2025, each Member State shall develop its final national policy framework in an easily readable and understandable form and communicate it to the EC. These final national policy frameworks shall be made public by the Commission.

1.2. Designate an authorised body (e.g. under the Ministry of Infrastructure or the Ministry of Energy) responsible for coordinating the NPF and reporting in accordance with Article 15 AFIR.

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2. Integration of the requirements of Regulation (EU) 2023/1804) AFIR regarding AFI infrastructure

Need for change

Regulations (EU) 2024/1679 and 2023/1804 (AFIR) stipulate that alternative fuel infrastructure (Electric Vehicle Recharging, Hydrogen Refuelling) is a mandatory component of the TEN-T road transport network. At the level of national technical standards (DBN B.2.2-12:2019), standards for the placement of EZS (≤ 60 km for category I roads) are provided for from 01.01.2026, but these standards are not integrated into the three-level hierarchy of TEN-T (Core / Extended Core / Comprehensive), which does not allow reporting based on distance-based targets. In addition, there are no regulations that would define mandatory placement intervals (≤ 200 km) or deadlines for the implementation of H_2 infrastructure. Furthermore, the aforementioned EU acquis acts require digital compatibility and functional integration of AFI, in particular the creation of a National Access Point (NAP) for the collection and dissemination of AFI data in a standardised DATEX II format, the mandatory implementation of smart charging technologies,and ensuring non-discriminatory access and payment (ad-hoc payment). Ukrainian legislation currently lacks a legally established mechanism for creating a NAP and does not set mandatory requirements for the implementation of smart charging/V2G (Vehicle-to-Grid) technologies, which hinders the digital integration and functional compatibility of the Ukrainian charging infrastructure with the European AFIR space.

Legislative proposals

Proposals for legislation on electric transport, in particular the updated Law of Ukraine "On Certain Issues of Using Vehicles Equipped with Electric Motors and Amendments to Certain Laws of Ukraine on Overcoming Fuel Dependence and Developing Electric Charging Infrastructure and Electric Vehicles" (Law No. 2956-IX and subordinate acts)

Description of changes:

2.1 Terminological harmonisation

Conduct a comprehensive review and transposition of Article 2 (Definitions) of Regulation (EU) 2023/1804 (AFIR) into the national legal system, unify technical requirements, definitions and digital standards, and create a basis for further integration into the TEN-T infrastructure ecosystem. This involves updating and harmonising terminology in

key regulatory acts, in particular Law of Ukraine No. 2956-IX and DBN B.2.2-12:2019 (in terms of the definition and classification of electric charging stations and technical parameters).

2.2. Distance-Based Targets

Amend Law No. 2956-IX or subordinate legislation by implementing requirements for the spacing of public EV charging stations and hydrogen refuelling stations:

- **LDV/HDV charging infrastructure:** Establish a maximum distance between charging points for light (LDV) and heavy (HDV) vehicles along the Core Network of ≤60 km.
- **Hydrogen infrastructure (H_2):** Establish an obligation to provide publicly accessible hydrogen refuelling stations (HRS) for HDVs along the Core Network and Extended Core Network at intervals of ≤200 km (Articles 6–7 of Regulation (EU) 2023/1804).

2.3. Operational and digital compatibility

Introduce mandatory requirements for all public EV charging points with a capacity of ≥50 kW and above (Regulation (EU) 2023/1804, Article 5):

- **Ad Hoc payment (without subscription or contract):** mandatory provision of payment via terminals or contactless payment devices (bank cards or contactless systems).
- **Smart Charging/V2G:** mandatory implementation of smart and digital charging technologies compatible with load balancing in power grids. Introduction of mandatory use of **Type 2 and CCS2** connectors to ensure compatibility. Establishment of a requirement to support the **EN ISO 15118-20:2022** standard for **Smart Charging and V2G** for new or refurbished public and private EV charging stations from 1 January 2027.
- **Digital Compatibility:** Amendments to technical regulations to establish the mandatory use of open control protocols (OCPP).
- **Non-discriminatory access and roaming:** if an AFI receives state or European support, it must ensure fair, transparent and non-discriminatory access for users and the obligation to provide roaming for users.
- **Digital integration:** establish that operators are required to provide up-to-date station data (capacity, availability, operability and price) in real time via digital platforms through National Access Points (NAPs).
- **Monitoring of service quality indicators (Uptime):** Amend Law of Ukraine No. 2956-IX or subordinate regulatory acts governing concession activities and the lease of public infrastructure to establish mandatory monitoring of the **"Uptime"** indicator (the percentage of time when the station is available and operational) as a key criterion for assessing the performance of a concession or lease agreement. Establish a legal requirement for charging point operators (CPOs) to continuously monitor and report on "Uptime"

2.4. National Access Point (NAP)

Initiate the development and adoption of a special regulatory act (or amend Law No. 2956-IX) governing the creation and operation of the National Access Point (NAP). To this end, it is necessary to:

- develop and approve Regulations on the Information and Telecommunications System (NAP)

- identify the body responsible for data administration and updating.

- Establish the obligation of EES operators to provide static and dynamic data (on availability, status, tariffs) in a standardised DATEX II format (CEN/TS 16157), with updates at least once per minute, enshrining this in Service-Level Agreements (SLAs) (Article 20 of Regulation (EU) 2023/1804);

2.5. Identifier Registry (IDRO)

Creation of **a Register of Identification Numbers** and introduction of a legislative requirement to maintain and enter information into the register of identification numbers at least for charging point operators (CPOs) and mobility service providers (MSPs), and designation of an authorised body to maintain it and implement e-roaming.

2.6. DBN (Directive 2024/1275)

Bringing state building standards (DBN B.2.2-12:2019) into line with Directive 2024/1275 on **mandatory minimum requirements for the installation of charging points** in new construction and renovation of residential/non-residential buildings.

2.7. Safety (STF WG6)

Integration of STF WG6 Guidelines on **fire safety** for electric vehicles and charging infrastructure in indoor spaces.

2.8. Simplification of permits

- Development of mechanisms to simplify permitting procedures and reduce the time required to connect AFI facilities to electricity networks, including along TEN-T (e.g. through the introduction *of a flexible connection* mechanism), as well as determining the procedure for obtaining land plots (or parts thereof) for the placement of IZE facilities.

- Implementation of the methodology of the Sustainable Transport Forum (STF) TF1 Working Group for **mapping problematic processes** of approval and connection to networks (DSO/TSO), as well as creation of **national guidelines on best practices** for permitting procedures.

2.9. Harmonisation of contractual terms and public procurement (TF2)

- Integrate TF2 standard templates into national public procurement procedures and grant mechanisms (in particular, within the Ukraine Facility).

- Introduce a unified contractual framework for charging infrastructure operators.

2.10 Accessibility and inclusiveness of infrastructure (TF5)

- Implement European accessibility standards (e.g. PAS 1899:2022) for all public charging points, ensuring barrier-free mobility for people with reduced mobility, disabled people and the elderly.

- Use the TF5 guidance as a basis for developing national construction and operational standards for AFI.

Implement requirements for the inclusiveness and accessibility of charging infrastructure for persons with reduced mobility (elderly persons, persons with disabilities) in accordance with European standards.

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3. Proposals for the integration of AFI in Urban Nodes

Need for change

Regulation (EU) 2023/1804 (AFIR) stipulates that AFI should be deployed not only along motorways, but also at key transport and logistics hubs, ensuring true multimodality, in particular within Urban Nodes in accordance with their status in the TEN-T network. Urban nodes are strategic territorial elements of the TEN-T, which serve as integration centres between different modes of transport, as this is where the largest transport flows and multimodal hubs are concentrated. Ukrainian legislation does not contain the concept of "Urban Nodes", "Sustainable Urban Mobility Plan" (SUMP), or target requirements for the installation of AFI in multimodal hubs, freight terminals and bus stations, which is mandatory for Urban Nodes (Regulation (EU) 2024/1679, Article 41(1)(c); Regulation (EU) 2023/1804). In addition, Regulation (EU) 2024/1679 makes Sustainable Urban Mobility Plans (SUMPs) legally binding for each urban node, with a clear deadline for adoption – 31 December 2027, and the deployment of AFI in nodes must comply with the digital compatibility and functional integration requirements set out in Regulation (EU) 2023/1804 (AFIR).

Legislative proposals

3.1. HDV in Urban Nodes: amend the DBN regulations governing infrastructure design within urban agglomerations (Urban Nodes). Establish mandatory minimum aggregate charging capacities for HDVs (900 kW by 2025 and 1800 kW by 2030) within designated Urban Nodes, particularly at freight terminals.

3.2. Charging for buses: require all multimodal passenger hubs (including bus stations) in Urban Nodes to be equipped with at least one charging station for buses by 31 December 2030 (Regulation (EU) 2024/1679, Article 41(1)(c))**.** It is recommended that the possibility of installing hydrogen refuelling stations for buses be considered as a pilot project during the design phase.

3.3. SUMP integration: establish that Sustainable Urban Mobility Plans (SUMP) are legally binding for each urban node, with a clear deadline for adoption – 31 December 2027. When developing Sustainable Urban Mobility Plans (SUMP), it is advisable to use the updated TF4 recommendations on electrification and the deployment of charging infrastructure for HDVs.

3.4. Closed fleets: develop a national approach within the NPF to support infrastructure for specialised and closed fleets (taxis, logistics, car sharing), taking into account the TF3 recommendations.

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4. Medium-term priorities (Q3 2026–2030)

- Develop and adopt sectoral laws for road/air/rail/maritime/river transport (Articles 2–13).

- Introduction of two-year reporting and updating of standards, labelling rules, opening of user data (Articles 15–23).

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5. Long-term priorities (2031+): Sustainable development and review

- Scalability after 2030 (reviews under Article 24 every 5 years).
- Alignment with EU accession (Green Agenda of Cluster 4).

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6. Official translation of Regulation (EU) 2023/1804 (AFIR)

It is recommended that Regulation (EU) 2023/1804 (AFIR) be included in the list of EU acquis acts subject to official translation.

BASED ON THE CONCLUSIONS OF SECTION III

1. Inconsistency with the polluter pays principle

Need for change

The national road charging system does not include an external-cost charge component. This additional charge is intended to cover the negative impact of transport on the environment, in particular CO_2, NOx emissions and noise pollution. In the EU, this instrument, established by Directive 1999/62/EC (Eurovignette Directive), is an integral part of the implementation of the polluter pays principle. This ensures that users of vehicles with higher emission levels pay higher charges.

Ukrainian road pricing is not yet integrated into climate policy, which reduces its incentive effect in the field of transport decarbonisation and currently only provides for the basic implementation of the "user pays" principle. However, it does not implement the polluter pays principle. The absence of this component means that no charges are levied for the negative impact of transport on the environment (CO_2 and NOx emissions, noise pollution).

Legislative initiatives

Introduction of CO_2 differentiation and environmental incentives

In order to ensure the implementation of the polluter pays principle, amend the Law of Ukraine "On Motorways" and the relevant resolutions of the Cabinet of Ministers of Ukraine (instead of No. 1312) to provide for mandatory differentiation of rates according to CO_2 emission class for heavy goods vehicles (HGVs).

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2. Transition from time-based to distance-based models

The need for change

Directive 1999/62/EC establishes the transition from time-based payment models (user charges/vignettes) to distance-based charging models for heavy goods vehicles (HGVs). According to the updated EU requirements, from 25 March 2030, time-based charges (vignettes) must be abolished for heavy goods vehicles on the Core TEN-T network. This transition aims to ensure a more accurate reflection of actual infrastructure use and is one of the tools for achieving climate goals.

Ukrainian legislation defines the general principles of toll roads (mainly concessionary), but does not contain specific regulatory requirements or deadlines for the abolition of time-based charges on international transport corridors (TEN-T).

The legal consolidation of the transition to distance-based charging should be part of Ukraine's strategic move to establish a transparent mechanism for financing infrastructure development and unify rules in the domestic market in line with the updated legal framework of Directive 1999/62/EC.

Legislative initiatives

Legal consolidation of the transition of TEN-T to distance-based charging

The draft separate law on charging heavy goods vehicles should enshrine a gradual transition from time-based charges (vignettes) on the main TEN-T network by 2030. The launch of a large-scale road pricing system will also require the creation of effective enforcement mechanisms, in particular automated systems for recording traffic, checking weight parameters, recording distance travelled and collecting payments in real time. This transition must be coordinated with other areas of harmonisation, in particular the introduction of CO_2-differentiated tariffs.

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3. Lack of incentives for zero-emission vehicles (ZEV)

Need for change

Current Ukrainian regulations on toll roads (concessions) do not provide for special tariff discounts for electric vehicles (zero-emission vehicles) or other low-emission vehicles for commercial operations. Currently, exemptions from tolls are only granted to special-purpose and emergency services (CMU Resolution No. 11). Directive 1999/62/EC requires that zero-emission vehicles (ZEVs) for heavy-duty vehicles (HDVs) belong to the cleanest CO_2 class 5. They are subject to the highest reduction in fees: from 50% to 75% compared to the fee for Class 1. EU Member States are also allowed to temporarily (until 31 December 2025) grant full exemption from road charges for zero-emission HGVs. Significant discounts (up to 75%) are also provided for light vehicles.

Legislative proposal

Introduction of CO_2 differentiation and environmental incentives

It is necessary to consolidate the status of ZEVs as a priority category in road pricing and to establish mandatory rate variation depending on the emission class (Euro/CO_2 class)

with discounts or full exemptions for zero-emission vehicles. This requires amendments to the Law of Ukraine "On Motorways" and relevant resolutions of the Cabinet of Ministers of Ukraine (instead of No. 1312) to regulate the introduction of environmental differentiation of tariffs according to emission class and provide incentives for ZEVs.

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4. Creation of a direct financial mechanism for the development of IEE

Need for change

Ukraine lacks a separate regulatory mechanism that would allow the targeted use of part of the revenue from road tolls for the development of the EV charging network. Although concession or public-private projects may include elements of charging infrastructure, there is no specific mechanism for regulatory charges, as in Directive 1999/62/EC , for the targeted financing of charging/refuelling infrastructure.

Directive 1999/62/EC explicitly provides for the possibility of using road charges as a tool to finance the development of alternative fuel infrastructure

and allows EU Member States to levy regulatory charges specifically intended to finance the construction, operation, maintenance and development of facilities that provide energy to low- and zero-emission vehicles during their operation (Article 9(1a)(b)).

Legislative proposals

Description of changes:

Provide for the possibility of levying special regulatory charges to finance the construction, maintenance and development of facilities that provide energy to low- or zero-emission vehicles (ZEV charging). Such charges should be applied on a non-discriminatory basis.

In order to create a direct financial flow for the development of ZEVs, it is recommended to modernise financial and regulatory legislation by:

- **Introduction of regulatory fees:** Ukrainian legislation should be adapted to legalise the imposition of special regulatory fees (by analogy with Article 9(1a)(b) of the Directive). These fees may be used to finance the construction, operation and modernisation of energy or fuel facilities located on or along the road network;
- **Modernisation of the** State Road **Fund:** Although the State Road Fund (SRF) is earmarked and finances the construction and repair of roads, it currently lacks a mechanism that would allow part of the road charges to be earmarked for the development of charging infrastructure along the TEN-T. If regulatory charges or surcharges are introduced, the SRF or another administrator should have the right to administer these revenues and allocate them to the financing of charging infrastructure.
- **Use of mark-ups:** Allow mark-ups (up to 50% for cross-border projects) to be applied in public-private partnership (PPP) or concession projects on TEN-T. These revenues could be used to develop charging stations in the same transport corridor, which is part of the EU's corridor financing concept.

Creating such a financial flow will transform the infrastructure for electric vehicles from an ancillary service to a full-fledged element of the road use system, financed by flexible charging mechanisms, as envisaged by the European model, and will stimulate the decarbonisation of the transport sector.

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5. Official translation of Directive 1999/62/EC

It is recommended that Directive 1999/62/EC (as amended) be included in the list of EU acquis acts subject to official translation.

BASED ON THE CONCLUSIONS OF SECTION IV

1. Regulatory integration of the SSPA category and updating of building regulations

Need for change

Current Ukrainian standards, such as GBN V.2.3-37641918-549:2018 (Rest areas), consider rest areas only as road service facilities with a basic set of functions and do not contain provisions on multi-level safety classification, certification procedures or mandatory technical requirements for SSPA. The absence of an SSPA category creates a direct conflict with Regulation (EU) 2023/1804 (AFIR), which requires high-power charging infrastructure for heavy-duty vehicles (HDVs) to be located exclusively at certified SSPA.

Legislative proposals

Creation of the SSPA category and updating of GBN B.2.3-37641918-549:2018 (Rest areas) and DBN B.2.3-4:2015, for which it is proposed to:

- amend GBN V.2.3-37641918-549:2018, highlighting a new category of infrastructure – Safe and Secure Parking Areas (SSPA);
- establish that these areas are mandatory elements (Article 29(1)(h) of Regulation (EU) 2024/1679) on the TEN-T Core/Extended Core network;
- initiate the development of a National Technical Standard for SSPA, which transposes the provisions of Annex I to Regulation (EU) 2022/1012, defining four security levels (Bronze, Silver, Gold, Platinum).

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2. Technical integration (security and infrastructure equipment)

Need for change

Ukrainian standards do not meet the minimum SSPA Bronze security level. There are critical discrepancies in the requirements for lighting, video surveillance, physical protection and special power supply for HDV. For example, the Ukrainian lighting standard (6 lx) is significantly lower than the minimum EU requirement (from 15 lx).

Legislative proposals

2.1 Harmonisation of requirements for lighting, video surveillance and physical protection

- **Lighting (Lux):** Amend the DBN/GBN by increasing the minimum lighting level for the SSPA perimeter (Bronze level) from 6 lux to at least 15 lux.

- **Video surveillance (CCTV):** Make it mandatory to have video surveillance (CCTV) systems with a minimum resolution of 720 pixels.

- **CCTV data storage:** Establish a mandatory minimum storage period for video surveillance data of 30 days.

- **Physical protection:** Require a solid physical barrier with a height of at least 1.8 metres for higher security levels (Gold/Platinum).

2.2 Integration of Minimum Level of Service

- **Sanitary conditions:** Establish an obligation to provide a minimum level of service, including separate toilets and shower facilities for men and women, equipped with hot water and free soap.

- **24/7 availability of services:** Require food and beverages to be available for purchase 24 hours a day, 7 days a week.

- **Power supply for refrigerators:** Require mandatory availability of electrical equipment for refrigerated vehicles by 31 December 2026.

2.3 Mandatory connection of HDV charging to SSPA (AFIR)

- **AFI deployment:** Require all SSPA on the TEN-T network to be equipped with at least two publicly accessible heavy-duty vehicle (HDV) charging stations (with a capacity of ≥100 kW) by 31 December 2027, in accordance with Regulation (EU) 2023/1804.

- **AFI strategic planning:** As part of the development of the National Policy Framework (NPF AFIR) provided for in Article 14 of Regulation (EU) 2023/1804, establish that the development of projects for the reconstruction and development of Ukrainian TEN-T corridors must be accompanied by SSPA planning that meet AFIR standards and ensure safe rest for drivers in accordance with Regulation (EU) 561/2006, and to specify that all new HDV charging points (≥100 kW) on the TEN-T network must be located *exclusively* at certified SSPA that meet EU requirements. This approach will ensure the fulfilment of the AFIR quantitative and spatial targets for 2027–2030 and create the conditions for Ukraine's participation in CEF Transport programmes.

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3. Digital and institutional integration

Need for change

Ukraine lacks an institutional mechanism for SSPA certification that provides for independent audits and accreditation of bodies under ISO 17021. Also, national standards

do not provide for the integration of parking management systems with European digital standards such as DATEX II.

Legislative proposals

3.1 Creation of a national SSPA certification system

- Accreditation and audit: Introduce an institutional mechanism for SSPA certification, which will include accreditation of certification bodies according to ISO 17021 and mandatory specialised training for auditors.

- Control procedures: Establish procedures for conducting initial, repeat and unannounced (sudden) audits, as well as clear grounds and mechanisms for revoking SSPA certificates (if non-conformities are not remedied within the specified time frame).

- Complaints mechanism: Create an online mechanism for SSPA users to submit complaints and feedback to improve transparency and quality control.

3.2. Implementation of DATEX II requirements

Ensure that Gold and Platinum level SSPA are equipped with intelligent parking management systems compatible with the DATEX II standard (Regulation (EU) 2022/1012, Table 5). This will enable the integration of Ukrainian SSPA into European digital transport platforms and provide users with access to up-to-date information on safe parking.

3.3. Creation of a national SSPA register and policy coordination

- Introduce a single national online register of certified SSPA, which should be integrated with the EU system (in accordance with Article 8a(1) of Regulation (EC) 561/2006) and contain up-to-date information on location, safety level and AFI infrastructure.

- Identify a central body responsible for coordinating the implementation of AFIR/SSPA requirements (preferably *the Ministry of Development*).

- Establish an interdepartmental working group with the participation of the Ministry of Economy, the Ministry of Energy, the NEURC, the Recovery Agency, the National Institute for Infrastructure Development, local authorities and representatives of the private sector to develop a national roadmap for harmonisation and prepare an action plan for the adaptation of EU technical standards in the field of AFI and secure parking within the framework of negotiations under Chapter 21 of the acquis (*Transport Policy*).

The implementation of the proposed legislative and policy measures will create a regulatory and institutional framework for the certification of secure parking areas in Ukraine, open up access to EU funding and ensure the integration of Ukraine's road infrastructure into the single TEN-T network.

BASED ON THE CONCLUSIONS OF SECTION V

1. Institutional and regulatory integration of CEF

Need for change

Ukraine's effective participation in the CEF requires consistent adaptation of the infrastructure planning and financing management system to EU standards. Currently, there is no centralised coordination point for project support and harmonisation of domestic legislation to identify Projects of Common Interest (PCI).

Legislative proposals

Establishment of a National CEF/TEN-T Coordination Centre

Description of changes: Establish a central body or coordination centre (National CEF Coordination Centre) responsible for the centralised support of CEF projects. This body should liaise with the European Commission, CINEA and the EIB, and ensure that projects are managed directly in accordance with the EU Financial Regulation.

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2. Strategic integration and planning

The need for change

Synchronisation of strategic documents is necessary to prioritise investments and ensure the continuity of the TEN-T network on Ukrainian territory, which is critical for obtaining CEF-Transport and AFIF funding.

Legislative proposals

Synchronisation of the National Transport Strategy and the Border Infrastructure Development Strategy

Ensure the synchronisation of the National Transport Strategy until 2030 and the Border Infrastructure Development Strategy with the main EU Regulations: TEN-T (2024/1679), AFIR (2023/1804) and CEF (2021/1153). This alignment creates a regulatory framework for the practical integration of Ukraine into the TEN-T Core Network and ensures that projects comply with CEF requirements for climate proofing and decarbonisation targets.

Thus, Regulation (EU) 2021/1153 creates a framework for the financial and regulatory integration of Ukraine into the TEN-T network, while setting the direction for reforming the national infrastructure planning system in line with EU standards and sustainable development principles.

BASED ON THE CONCLUSIONS OF SECTION VI

1. Setting a maximum timeframe and priority status for TEN-T projects

Need for change

National legislation does not set a fixed maximum period of four years for the completion of all permit-granting procedures, as specified in Article 5 of Directive (EU) 2021/1187. There is also no legally enshrined priority status for TEN-T projects in all national permit-granting and approval procedures (Article 3 of Directive (EU) 2021/1187). The absence of a four-year limit poses a threat to the timely implementation of TEN-T projects and limits predictability for investors.

Legislative proposals

Amend the Law of Ukraine "On the Regulation of Urban Development" (No. 3038-VI) to provide for a maximum four-year period for all procedures related to the implementation of TEN-T projects, excluding court appeals (in accordance with Article 5 of Directive (EU) 2021/1187). Grant priority status to TEN-T projects ( ) in all national permitting, approval and judicial procedures (in accordance with Article 3 of the Directive).

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2. Establish a single point of contact (Designated Authority) and ensure institutional coordination

Need for change

Ukraine lacks a single national designated authority or single contact point to coordinate all stages of the permitting procedures for TEN-T projects. Existing institutions (e.g. the Agency for Reconstruction, the Agency for Public-Private Partnerships) have a limited mandate and do not provide for the inter-agency coordination required by Article 4 of Directive (EU) 2021/1187. For example, Ireland has established a special office for zero-emission vehicles, *Zero Emission Vehicles Ireland (ZEVI)*. Operating within the Department of Transport, this office has become the central body responsible for shaping public policy in the field of electromobility and the development of AFI. The ZEVI model ensures coordinated investment planning, regulatory development, zoning coordination and energy network integration by combining the capabilities of Transport Infrastructure Ireland (TII), the National Transport Authority (NTA) and ESB Networks (ESBN). Ukraine lacks a similar centralised competent authority, which complicates the integrated strategic planning of AFI, which is a key requirement of Regulation (EU) 2023/1804. Also, there is a need to formalise Ukraine's participation in TEN-T coordination platforms and to involve European coordinators to harmonise schedules and procedures in cross-border areas, in particular with regard to Projects of Common Interest (PCI), alternative fuel infrastructure (AFI) and digital components (ITS, 5G corridors).

Legislative proposals

Description of changes

2.1. Amend the Law of Ukraine "On Public-Private Partnership" (No. 4510-20) or develop a special regulatory act focused on the procedural features of TEN-T.

2.2. Create or authorise an existing body *(e.g. the Ministry of Development or the Recovery Agency)* to perform the functions of a single coordination centre (*Designated Authority*) for AFI and TEN-T projects. Amend the provisions of the Cabinet of Ministers of Ukraine regarding the distribution of powers and functions of central executive bodies.

The main functions of this centre (Single Access Point) should include: developing Detailed Application Outlines for AFI projects (Article 6(4) of Directive (EU) 2021/1187), monitoring deadlines, and coordinating between all competent authorities (Ministry of Energy, NEURC, DIAM, NEC Ukrenergo, local authorities, and network operators (DSO/TSO).

In addition, it is recommended that a working group *(similar to the EV Planning Working Group in Ireland)* be set up at the centre, which is a priority identified by the EC and will include representatives of the energy (Ministry of Energy, NEURC, NPC Ukrenergo), transport (Ministry of Development, Agency for Reconstruction), construction and justice departments, as well as network operators (DSO/TSO).

The task of this group should be to develop measures aimed at removing legal and procedural barriers that arise during the construction of charging stations, their connection to the grid, and ensuring coordination of the development of the National Policy Framework (NPF-AFIR) and Sustainable Urban Mobility Plans (SUMP) at the local level, adapting national objectives to local needs.

It is also recommended to authorise the Ministry of Development or the Agency for Reconstruction (as the Designated Authority) to be responsible for coordinating and ensuring a mechanism for interaction with European coordinators.

2.3. Establish a national mechanism for collecting statistical data on the average duration of permit procedures for TEN-T and AFI projects. This should include:

- **Implementation of the requirement of Article 10 of Directive (EU) 2021/1187:** Require the collection of data on the average duration of permit procedures necessary for the implementation of TEN-T projects.

- **Periodic reporting:** Ensure regular reporting to the European Commission (similar to the requirements of Article 10 of Directive (EU) 2021/1187) on progress in implementing the Directive and the timelines for implementing AFI and TEN-T projects. Reports should be submitted periodically, every two years, starting in 2026.

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3. Regulation of the legal mechanism for the use of motorway right-of-way for service facilities

Need for change

Lack of a regulatory framework and a procedure approved by the Cabinet of Ministers of Ukraine for issuing permits for the use of public road right-of-ways for the construction of entrances, exits, transition lanes to road service facilities, and approval of intersections of

engineering networks and communications. This has led to the Agency for Restoration being forced to refuse to issue permits to business entities, which effectively halts the permitting procedures and hinders the deployment of alternative fuel infrastructure (AFI) along the corridors of the TEN-T core network.

Legislative proposals

Develop and approve the Procedure for issuing permits for the placement of road service facilities within the right-of-way of motorways. Designate the Agency for Reconstruction as the single designated authority responsible for coordinating these procedures and ensuring compliance with deadlines on the TEN-T road network. Regulate the issue of approval for the intersection of the right-of-way with engineering networks. The permit issuance process should be digitised and carried out within clearly defined timeframes (up to 90 days), with the introduction of a "single window" principle and integration with state registers. It is also advisable to provide for a preferential or free regime for projects that promote the deployment of alternative fuel infrastructure (AFI).

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4. Harmonisation of cross-border procurement and creation of joint entities

Need for change

Ukrainian legislation lacks provisions similar to Article 8 of Directive (EU) 2021/1187, which allow the application of the law of one EU Member State to joint entities in cross-border TEN-T projects (as a derogation from the Law of Ukraine "On Public Procurement"). This creates legal inconsistencies in the implementation of EU-funded projects.

Legislative proposals

Implement Article 8 of Directive (EU) 2021/1187 and introduce relevant definitions into national acts (e.g. the Laws "On Public-Private Partnership" and "On International Territorial Cooperation of Ukraine"). It is also necessary to create a legal basis for the application of EU procurement legislation (Directives 2014/24/EU, 2014/25/EU) in joint cross-border TEN-T projects. Define a "Joint Body" as a special legal form (e.g. based on the European Grouping of Territorial Cooperation, but with the necessary procedural features) that will allow the application of Article 8 of the Directive.

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5. Simplification of land allocation for alternative fuel infrastructure (AFI)

Need for change

The procedures for determining the intended use of land plots for AFI facilities (energy hubs, energy hubs) are burdensome and lengthy. Such procedures require the development

and approval of land management documentation and decisions of local self- authorities adopted at sessions. In addition, there is uncertainty regarding the legal status of AFI facilities in the context of land relations. Procedures need to be simplified to accelerate the deployment of this infrastructure along TEN-T corridors.

Legislative proposals

Amendments to the Land Code and the Laws of Ukraine "On Regulation of Urban Development" (No. 3038-VI), "On Certain Issues of Using Vehicles Equipped with Electric Motors and Amendments to Certain Laws of Ukraine on Overcoming Fuel Dependence and Developing Electric Charging Infrastructure and Electric Vehicles" (No. 2956-IX), as well as the Law "On Motorways", which simplify the determination of the intended use of land plots for electric charging stations (ECS), energy hubs and energy storage facilities, in particular on road management lands. It is advisable to use the simplified mechanisms provided for infrastructure projects during martial law (clause 9-3 of Section V of Law No. 3038-VI). It is also necessary to determine the procedure for obtaining state-owned and municipally-owned land plots (or parts thereof) for the placement of EES facilities, including the possibility of obtaining rights of use on a competitive basis (electronic auctions) for single lots.

BASED ON THE CONCLUSIONS OF SECTION VII

1. Simplification of licensing procedures and ensuring investment attractiveness (the example of Croatia).

Need for change

The duration of permitting procedures (24–48 months) is a critical administrative barrier to investment in AFI. Long-term guarantees of use of public land are needed to ensure a return on the significant capital expenditure required for HPC (High Power Charging) on Core TEN-T.

Legislative proposals

Amend the Law of Ukraine "On the Regulation of Urban Development", legislation on concessions and leases of state/municipal property to allow for long-term lease/concession rights (e.g. 10-20 years, as in Croatia) for AFI facilities located on the TEN-T network to reduce investment risks. Simplify procedures for connecting AFI facilities to electricity networks (by introducing the "One-step principle" and Pre-permitting). It is also necessary to extend the possibility of calculating fees for non-standard connections, which includes only the component of the fee for the creation of electricity networks for the linear part of the connection, for the period of martial law and one year after its end.

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2. Implementation of Smart Recharging and Vehicle-to-Grid (V2G) technology (example of Utrecht, Netherlands and Gudiksvall, Sweden)

Need for change

Ukrainian standards and technical regulations do not cover the specifics of smart systems and bidirectional charging (V2G) technologies. There is no legislative framework for legalising bidirectional energy exchange, which is critical for increasing the flexibility of the energy system and improving energy security, especially in the context of military challenges.

Legislative proposals

Amend the Law of Ukraine "On the Electricity Market", the Electricity Transmission System Code and the Electricity Distribution System Code, as well as technical regulations and DSTU, enshrining the possibility of supporting Smart Recharging functions and the **EN ISO 15118-20:2022** standard for bidirectional charging (V2G) for new and upgraded public and private charging points (Mode 3/4) by 1 January 2027. Legalise bidirectional energy exchange between EVs and the grid (V2G). Introduce *a flexible connection* mechanism. Create regulatory conditions for *regulatory sandboxes* to test the use of charging points to provide flexibility to Ukraine's Integrated Energy System.

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3. Integration of charging infrastructure with state assets (railway network) (example of Bulgaria)

Need for change

It is recommended to use the potential of state assets for accelerated and cost-effective deployment of AFI, especially along TEN-T corridors. International motorways often run close to railway tracks and traction substations, which is an untapped advantage for the placement of IZE, as railway junctions have access to high-voltage lines.

Legislative proposals

Develop and approve a mechanism for interagency cooperation (e.g., in the form of a memorandum between the Ministry of Development, Ministry of Energy and JSC Ukrzaliznytsia) and amend land use legislation to accelerate the deployment of AFI facilities on railway transport land and ensure the possibility of integrating charging infrastructure with existing railway facilities (depots, stations, traction substations). This will significantly reduce the cost of connecting to the grid and shorten project implementation times. The network should be designed to meet the needs of not only passenger cars, but also heavy goods vehicles and buses (HDVs), in line with AFIR requirements.

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4. Introduction of mechanisms for preliminary screening of network connection opportunities (example of Ireland)

The need for change

One of the biggest challenges for the deployment of high-power charging stations is ensuring sufficient power grid capacity. Ireland has addressed this issue by introducing a

mechanism for pre-screening grid connection opportunities (through ESB Networks in 2023). In Ukraine, however, shortcomings in the procedure for connecting to electricity networks create obstacles to the installation of RES facilities. The lack of up-to-date information on available capacity complicates investment planning and causes delays.

Legislative proposals

Description of changes

Amend the Code of the Electricity Transmission System and the Code of the Electricity Distribution System, approved by the NEURC, and the Law of Ukraine "On the Electricity Market", which, in particular, provide for:

1. Pre-permitting mechanism: Introduce a mechanism for pre-screening (pre-permitting) of grid connection possibilities, which will allow charging point operators (CPOs) to obtain real-time information from grid operators (DSOs/TSOs) about available capacity in a given area, the approximate cost of connection and the time frame.

2. Network information: Legally oblige electricity network operators (DSOs/TSOs) to provide information on the possibility of connecting and accessing electricity networks for charging points (in the event of a refusal of a request for connection or access).

3. Simplification of connection fee calculation: Extend for the period of martial law and one year after its end the possibility of calculating the fee for non-standard connection to electricity networks for charging stations, which includes only the component of the fee for the creation of electricity networks for the linear part of the connection.

Therefore, the successful integration of Ukraine into the European electric mobility space requires not only compliance with the quantitative requirements of the TEN-N and AFIR Regulations, but also the implementation of systemic solutions that combine:

- strategic planning
- digital harmonisation
- effective regulation
- rational use of state assets
- technological innovation

The implementation of these areas will contribute to the creation of a sustainable, competitive and integrated energy sector capable not only of fulfilling AFIR commitments, but also of enhancing Ukraine's energy security during times of military challenges and post-war recovery.

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