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Situation Analysis of the Montenegrin Legal, Institutional and Financial Frameworks in the Field of E- Mobility

Study prepared by EnergyInstitute Hrvoje Požar | Zagreb | February 2019





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ACRONYMS

AC	Alternating current
APEE	Action Plan of Energy Efficiency
MNE	Montenegro
CO ₂	Carbon dioxide
DC	Direct current
EE	Energy efficiency
EC	European Commission
EU	European Union
MSDT	Ministry of Sustainable Development and Tourism
ME	Ministry of Economy
MTMA	Ministry of Transport and Maritime Affairs
NPF	National policy framework
DSO	Distribution System Operators ¹
RES	Renewable Energy Sources
UNECE	United Nations Economic Commission for Europe
UNDP	United Nations Development Programme
EL	Energy Law
LoPP	Law on Public Procurement
LoR	Law on Roads
LoSPaC	Law on Spatial Planning and Construction of Structures
LoNP	Law on Nature Protection
LoAP	Law on Air Protection
LoE	Law on Environment

¹ „Distribution System Operator“ (DSO) is a general role implemented by legal entities in some countries, in Montenegro that is CEDIS

<https://www.emissions-euets.com/internal-electricity-market-glossary/623-distribution-system-operators-dsos>

Wherever in this Study DSO is mentioned, it refers to a general role of a legal entity that operates energy distribution system.

Only in Montenegrin context, CEDIS (Crnogorski elektrodistributivni sistem – Montenegrin energy distribution system) is being used

SUMMARY

The main goal of this document is to give an overview of the situation in Montenegro relating to the legal, strategic, planning, institutional and financial frameworks relevant to the development of e-mobility in Montenegro. The situational analysis will, together with other documents that will be developed within the framework of the project (market situation analysis, cost-benefit analysis for selected entities), serve as a basis for the adoption of incentive measures for e-mobility; the first of these should include providing an appropriate regulatory framework for the development of business models for chargers for electric vehicles and providing financial and fiscal incentives to achieve the stronger penetration of electric vehicles into the Montenegrin market.

Specifically, the results of the analysis show that the establishment of business models for e-mobility in Montenegro is currently hampered by two basic obstacles:

- 1) insufficiently large user base of electric vehicles
- 2) non-adapted / non-incentivised regulatory framework.

In addition, the non-adapted regulatory framework is one of the key obstacles for setting up a fast-charging infrastructure for e-vehicles; this almost certainly increase the number of electric vehicle users.

In the existing regulatory framework:

- There are no special tariff models related to fees in the electric power network for charging stations for electric vehicles;
- A tariff model in which peak power is subsidized, at a relatively generous level, should be applied to certain chargers. Currently, the fees charged for using the network are much higher in Montenegro than in other countries in the region. This applies to high-speed/fast chargers with a connection power that exceeds 34.5 kW.

Within the new concept of a regulatory framework, relevant to the construction and management of e-chargers in Montenegro, consideration should be given to the introduction of new tariff models for the use of the electric power network for electric vehicle users. A key element of a new tariff model should be the commercialization of the infrastructure for charging electric vehicles in the early stages of e-mobility when just a small number of electric vehicle users are present on the market.

In order to develop business models, it is essential to establish clear market relations based on best practices. The owner of an e-charger should be considered as an end-user, i.e. a buyer who buys electricity for his own use. Providing a charging service for electric vehicles should not be considered as the sale of electricity, but only as providing a service. A distribution system operator performs his regulatory activities up to the point that the charging station is connected to the distribution network; everything up to that point represents market activities in the field of e-mobility. The e-charger owner, as the ultimate/final buyer, should have the opportunity to transfer certain activities to other entities (contract management and maintenance, user identification, subscription service, billing, etc.).

In parallel with the provision of incentive tariff models, financial incentives for the purchase of electric vehicles should also be developed. Financial incentives could be provided through various models and institutions, and especially through the Eco-Fund; the characteristics of any financial incentives provided by the Eco-Fund would be confirmed as per the analyzes carried out within this project.

Finally, it should be emphasized that Montenegro, as a candidate country for EU membership, faces certain obligations relating to the adjustment of its legal and strategic frameworks. In this regard, there is a need to draft and adopt a National Energy and Climate Action Plan, in accordance with the EU Directive on energy community management, to transpose Directive 2014/94/EU on the Establishment of Alternative Fuels Infrastructure and to develop a National Policy Framework for the Establishment of an Alternative Fuel Infrastructure in Transport.

INTRODUCTION

Purpose and objective of the document

The Parliament of Montenegro (MNE) has adopted the Resolution on Environment (Official Gazette of Montenegro, No. 01/15), which, inter alia, calls for the rational use of natural resources and protection of natural ecosystems with balanced economic and social development; it also indicates that the system of management and control, along with the integration of environmental protection measures have been successfully established through economic and legal instruments - a basis for preservation and for a healthy environment. This obliges the Government of Montenegro to increase its allocation of budget funds for the environment to a level higher than the average level of allocation in the European Union (EU) for the purposes of establishing an Eco-Fund.

In November 2018, the Government of Montenegro adopted the Decision on the Establishment of the Environmental Protection Fund - the Eco-Fund ("Official Gazette of Montenegro" No. 81/2018) with the aim of acting as a central national institution for financing and providing technical support to projects / programs in the field of environment, climate change and energy. The Law on the Environment stipulates that the funds for the preparation, implementation and development of programs, projects and other activities related to the conservation, sustainable use, protection and improvement of the environment, as well as for the exploitation of renewable energy sources, will be provided from the Eco Fund.

One of the program areas of the Eco Fund is cleaner transport. The MNE transport sector can be characterized by a progressive increase in the total number of registered vehicles synchronised with the aging of the vehicle fleet. Road traffic is the dominant mode of transport; the percentage which is public transport is very low and this is almost entirely dependent on fossil fuels. The present state of the fleet in Montenegro, which has over 210,000 registered vehicles, is extremely unsatisfactory. The average age of registered vehicles is about 12 years, according to statistical data published by MONSTAT. Urban communities face traffic congestion, which ultimately results in air pollution from exhaust gases and noise pollution from vehicles. **With an increase in the financial means of citizens, along with the development of new highways**, an even greater increase in the number of road vehicles is expected.

The wider use of electric vehicles (e-vehicles) is one solution to these problems. A precondition for the success of e-vehicles on the market is the establishment and acceptance of electro-mobility (e-mobility) as a comprehensive socio-technical system. In order for e-vehicles to be able to compete with conventional vehicles with internal combustion engines in a market environment, a whole set of e-mobility elements such as standards, regulatory frameworks, environmental and energy policies need to be developed; practices, products and services need to be established, user experiences need to be improved and a charging infrastructure needs to be developed.

Globally, there are presently two approaches towards fostering e-mobility:

- 'Bottom-up', where the initiative comes from users and the business segment that seeks to force the government to introduce various forms of incentives.
- 'Top-down', where the government seeks to impose e-mobility. Most countries in Europe follow this approach by setting goals and incentive schemes.

MNE is at the very beginning of developing e-mobility; therefore it is necessary to determine an optimal model, and it is for the purpose that UNDP has initiated the development of an E-mobility Feasibility Study for Montenegro. This document is the first in a series of documents that will form the aforementioned study; it presents an analysis of the current situation with the aim of determining the barriers for the wider implementation and the factors necessary for the encouragement of e-mobility in Montenegro.

Structure of document

In **Chapter 2**, an analysis of the current state of e-mobility in Montenegro, including the strategic, legislative, institutional and financial frameworks, is presented. Relevant strategic documents and plans, which define the policy of Montenegro in the field of environmental protection, energy efficiency and transport development, as well as laws and regulations in this area, were analyzed. The objectives of the analysis were: 1) to determine whether there is a clearly and unequivocally expressed strategic commitment to e-mobility in MNE; and 2) to determine whether there are legislative barriers that prevent the wider use of e-vehicles in Montenegro

Chapter 3 deals with the problem of an infrastructure for charging e-vehicles. An overview of the technical solutions for chargers is given, and the criteria for setting up chargers, along with recommendations for MNE, are elaborated. An important part of this chapter is an analysis of the administrative procedures required for the construction of charging stations in Montenegro; this aims to identify deficiencies and barriers, and on the basis of these, improvements are proposed. Each chapter ends with the main conclusions based on the results of the analyzes, with recommendations for activities to be carried out.

ANALYSES OF THE CURRENT SITUATION OF E-MOBILITY

LEGAL FRAMEWORK FOR E-MOBILITY

E-mobility is an area that is developing at a fast pace and is closely related to technology development. It requires an adequate legislative framework to ensure the use of modern technological solutions and the construction of publicly available places for charging e-vehicles. E-mobility is also affected by many areas of public policy; this area needs to be looked at from various aspects and properly integrated into national legislation.

The **environmental aspect** is particularly important as e-mobility makes an important contribution to meeting the ambitious climate and energy goals of the EU for the future. Directive 2009/28/EC on the promotion of the use of energy from renewable sources has set binding targets for all Member States in relation to percentages of energy from renewable sources including transport; in the long term the Directive (EU) 2018/2001/European Parliament and Council, as of 11 December 2018, on the promotion of the use of energy from renewable sources (RED II), expects e-mobility to constitute a significant part of renewable energy in the transport sector in the period leading up to 2030. This should, therefore, provide further incentives in view of the rapid development of e-mobility and its potential in the sector.

When charging e-vehicles at charging stations, **intelligent measuring systems** should be used if technically and financially feasible, during periods in which the total demand for electricity is high. Intelligent measurement systems, as defined in the Directive 2012/27/EU of the European Parliament and Council, as of 25 October 2012, on energy efficiency, should enable the production of real-time data which is necessary to ensure the stability of the electricity grid; it should also encourage the rational use of charging services. The same is covered by Directive 2014/94 / EU of the European Parliament and of the Council of 22 October 2014 on the establishment of an alternative fuel infrastructure, where Article 4 states that: "when charging electric vehicles in publicly available charging stations, intelligent measurement systems should be used if technically feasible and economically justified."

When developing an infrastructure for e-vehicles, it should be ensured that the installation and use of the electric vehicle charging station is developed in the arena of **a competitive market**; open access should be ensured for all interested parties regarding the introduction or management of a charging infrastructure, in accordance with the principles established under Directive 2009/72/EC on electricity and its revision.

Distribution system operators (DSOs) play an important role in relation to the development of charging stations. Some DSOs may be part of a vertically integrated company that owns charging stations or manage such sites. In any case, when developing plans and programs, DSOs should cooperate with other charging station owners without any form of discrimination; in particular they should provide them with the information they need to efficiently access and use the energy system.

Their role is further elaborated by the proposal of the revised Directive 2009/72 / EC, which is in the process of adoption in EU institutions. Chapter IV of the proposed revised Directive, clarifies some of the tasks of DSOs, especially with regard to: their activities related to the introduction of network services to ensure flexibility, the integration of electric vehicles and data management. Member States may allow DSOs to own or develop charging stations for e-vehicles or to operate them, only if the following conditions are met: 1) that no other party, after an open and transparent tender procedure, expressed an interest in owning or developing a charging station for electric vehicles or in operating one, and 2) that the regulatory authorities gave their approval for a DSO to own and operate an infrastructure for charging electric vehicles.

Directive 2014/94 / EU on the establishment of alternative fuels infrastructures (electricity,

hydrogen, bio-fuels, synthetic and paraffin fuels, natural gas, including biogas, in gaseous and liquefied form and liquefied petroleum gas) defines a common framework for measures to set up an infrastructure for alternative fuels to minimize dependence on oil and to mitigate the negative impact of transport on the environment; it sets minimum requirements for the construction of alternative fuels infrastructures, including charging stations for electric vehicles, implemented through the **National Policy Framework (NPF)** as well as **common technical specifications** for such charging and supply points and **user information requirements**.

Additional encouragement for the development of an infrastructure for charging e-vehicles is provided in the Directive (EU) 2018/844 of the European Parliament and of the Council as of 30 May 2018 on amending Directive 2010/31 / EU on the energy performance of buildings and Directive 2012/27 / EU on energy efficiency. It sets minimum requirements for the provision of an e-mobility infrastructure and outlines a plan for the construction of new and the reconstruction of existing buildings.

Non-residential buildings and non-residential buildings subject to major reconstruction work, involving parking spaces and electrical installations in the building, and which have more than 10 parking spaces, it will be required to provide at least one charging station along with a cabling infrastructure for every five parking spaces. New residential buildings and buildings subject to major reconstruction work, involving parking spaces and electrical installations in a building with more than 10 parking spaces, it will be necessary to provide a cabling infrastructure for each parking place in preparation for the future installation of electric vehicle charging stations. In this regard, **construction regulations** could be efficiently used to introduce targeted requirements to support the establishment of charging infrastructures at parking lots in both residential and non-residential buildings.

Public procurement has a direct impact on the national economy; thus the state is in a position to influence the demand for environmentally-friendly goods and services and also to influence industry to respond to the growing use of environmental standards by integrating issues with an environmental impact in its public procurement process. Thus, the criterion of the most economically advantageous tenders, as stipulated in Article 95 of the Law on Public Procurement, would be based on the sub-criterion of this program and would include a level of environmental protection, i.e. energy efficiency (the so-called green procurement).

In order to determine the treatment of e-mobility regarding all of these aspects, a variety of legal documents have been analysed; the results of the analyzes are presented below.

ENVIRONMENTAL ASPECTS – ENVIRONMENT PROTECTION AND CLIMATE CHANGE

Constitution ("Official Gazette of Montenegro", no. 1/2007 and 38/2013 - Amendments I-XVI)

The constitution of MNE determines that MNE is a democratic, social and **ecological** state, that everyone has the right to a healthy environment; on the timely and complete information of its condition, the state has the obligation to preserve and improve the environment. This definition is the starting point for the legislative framework for environmental protection.

Constitutional definitions are further elaborated through environmental laws, such as the Law on Environment which is a fundamental law for this topic, and through other laws concerning certain segments of the environment; these primarily relate to the protection of air quality, such as the potential contribution of e-mobility to the reduction of air pollution.

Law on Environment (LoE) ("Official Gazette of Montenegro", no. 52/2016)

Environmental protection and sustainable development are regulated by the LoE and other related laws regulating certain segments of the environment, as well as the air. The LoE defines the principles and objectives of environmental protection in Montenegro, environmental entities, environmental segments, environmental impact protection, sustainable development and environmental protection documents, environmental protection instruments, specific environmental measures including the availability of information on carbon dioxide emissions from new passenger vehicles, environmental monitoring and reporting, the information system for environmental protection, public information, public participation and the interested public and the right to legal protection in matters of environmental protection and environmental financing, as well as the use of the funds of the Environmental Protection Fund (Eco-Fond).

Within the context of the problem of identifying and creating strategic planning and legal frameworks for e-mobility, air protection, according to the LoE, is achieved by conducting measures of systematic monitoring of air quality, through the reduction of air pollution by polluting substances and through conducting technical, technological and other necessary measures for reducing emissions of polluting substances into the air; the impact of polluted air on human health and the environment is also monitored. The systematic monitoring of the state of the environment encompasses both air quality control and the monitoring of emissions of polluting substances and greenhouse gas emissions in the air.

The LoE stipulates that the obligations of legal entities and entrepreneurs, who put new passenger vehicles on the market, include making information available on fuel consumption and carbon dioxide emissions for each model of passenger vehicle, at the place of sale. Information on fuel consumption and carbon dioxide emissions from new passenger cars can be made available to consumers via labels (stickers) on vehicles, posters or displays exhibited at sales outlets, in fuel consumption guidelines and in information regarding carbon dioxide emissions as well as in other promotional literature and material.

Pursuant to Article 50 of the LoE and as per the **Rulebook on the Contents of Marks, Guides, Posters, Displays and Promotional Literature and Materials on Fuel Consumption and Carbon Dioxide Emissions from New Passenger Vehicles ('Official Gazette of Montenegro' No. 40/17)**, the Ministry of Sustainable Development and Tourism has produced and published on its website a section entitled 'Annual Consumption of Fuel and Emissions of Carbon Dioxide'. This contains official data on fuel consumption and CO₂ emissions for each given model, a list of ten models of new passenger cars with the most economical fuel consumption and the lowest specific CO₂ emissions, graded according to rising CO₂ emissions and drivers' tips for improving fuel economy and CO₂ emissions; it also explains the impact of greenhouse gas emissions, the use of passenger vehicles and the different types of fuel on the environment.

 **LoE does not provide specific treatment for e-mobility; it does, however differentiate indirectly through the principles and goals of environmental protection and through financing possibilities connected to the Eco Fund.**

Law on Air Protection (LoAP) ("Official Gazette of Montenegro", no. 25/2010, 40/2011, 43/2015)

LoAP regulates the way that air quality is monitored as well as regulating protection measures, the assessment and improvement of air quality, and the planning of air quality management. Sources of air pollution include both stationary and mobile emission sources (motor vehicles), as well as certain products and activities that emit polluting substances into the air.

This law also established an institutional framework for air protection in order to establish that the efficiency of protection, and the improvement of air quality, are observed by state bodies, state administration bodies, local self-government units, domestic and foreign legal entities and entrepreneurs, non-governmental organizations, citizens and citizens' associations.

On the basis of the LoAP, the following bylaws were adopted: Rulebook on the content and method of making annual air quality information ("Official Gazette of Montenegro", No. 27/2012), Rulebook on the manner and conditions for monitoring the quality of air ("Official Gazette of Montenegro", No. 21/2011 and the Regulation on the Determination of Types of Pollutants, Limits and Other Quality Standards ("Official Gazette of Montenegro", No. 25/2012).

 **LoAP does not provide specific treatment for e-mobility treatment; it has, however, introduced e-mobility as a way of improving air quality and has determined that motor vehicles are a source of air pollution.**

Law on Environment Impact Assessment ("Official Gazette of Montenegro", no. 80/2005, "Official Gazette of Montenegro", br. 40/2010, 73/2010, 40/2011, 27/2013, 52/2016)

This law regulates the procedures used to assess: the significance of the impact that projects that have on the environment; the content of impact assessment studies; the participation of stakeholders, organizations and the public; the assessment and approval process; the notification of projects that can have a significant impact on the environment of other countries; and the supervision and evaluation of

other issues of importance in terms of environmental impact assessment. Environmental impact assessment determines, in each individual case, the possible direct and indirect impact of a planned project on human and animal life, flora and fauna, land, water, air, climate and landscape, material assets and cultural heritage, and on the mutual relations of the aforementioned elements. The subjects of environmental impact assessment are projects that are planned and performed, and which can significantly affect the environment or human health. Such projects are in the fields of industry, mining, **energy, transport**, tourism, agriculture, forestry, water management and utilities, as well as including all projects that are planned within a protected natural asset or are within the protected environment of an immovable cultural property.

The Decree on Projects for which an Environmental Impact Assessment is Carried out ("Official Gazette of the Republic of Montenegro", No. 20/07, "Official Gazette of Montenegro", No. 47/2013, 53/2014) defines projects for which an environment impact assessment is mandatory and projects for which an impact assessment could be required; this does not include any particular category of e-vehicle charger.

Law on Strategic Environmental Assessment ("Official Gazette of Montenegro", "Official Gazette of Montenegro", No. 40 2011, 59/11, 52/16) This law determines the conditions, method and procedure for assessing the impact on the environment of particular plans and programs – it is a strategic assessment carried out through the integration of the principles of environmental protection during the process of preparation, adoption and realization of plans and programs that have a significant impact on the environment.

The Laws on Environmental Impact Assessment do not offer any special treatment to projects in the field of e-mobility.

The Law on Nature Protection (LoNP) ('Official Gazette of Montenegro', No. 54/2016) This law regulates the conditions and manner of the protection and conservation of nature; e-mobility is not subject to this law.

International conventions within the field of climate change:

With the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, a global initiative on combating climate change began.

The implementation of the general objectives of the UNFCCC is more closely defined by the Kyoto Protocol; this recognizes improvements in energy efficiency levels and uses renewable energy sources as instruments to contribute to reducing the negative impact of climate change, i.e. to achieve limiting the level of greenhouse gas emissions. In 2007, MNE ratified the Kyoto Protocol (the Law on Ratification was published in the Official Gazette of Montenegro No. 17/07). By ratifying the UNFCCC and the Kyoto Protocol, Montenegro joined other countries in actively tackling climate change through joint international efforts.

Also, Montenegro signed, and in October 2017 ratified, the Paris Agreement, thus committing itself to contributing to the reduction of greenhouse gas emissions at a global level. Montenegro's contribution towards the efforts of the international community in the fight against climate change, expressed through its Intended National Contribution to Reducing GHG Emissions, represents a reduction of at least 30% in the period up to 2030 compared with the level of emissions recorded for the base year of 1990. This goal is defined in the National Strategy on Climate Change by 2030 and should be realized through the development of industrial technology, by increasing the percentage of RES, by increasing the overall level of energy efficiency and through the modernization of the energy sector. More detailed information on the sources and scope of energy use from renewable sources is detailed in the National Action Plan for the use of energy from the RES until 2020. According to the Energy Law, the implementation of the AP is monitored by the Ministry of Economy

International conventions in the field of climate change set the framework for decarbonization measures in all sectors, including transport.

INFRASTRUCTURE ASPECTS – TRANSPORT AND CONSTRUCTION

Law on Road Transport (" Official Gazette of Montenegro", no. 71/2017)

This law stipulates the conditions for, and manner of, carrying out public transport activities concerning passengers and cargo in road transport; this includes the provision of bus and freight services, transport for own needs and other issues of importance for public transport in road transport.

In March 2019, an official public debate on the Draft Law on Amendments to the Law on Road Transport was conducted by the Ministry of Transport and Maritime Affairs; further consultations and discussions on the Draft Law with the Ministry are still ongoing.

Law on Roads (LoR)("Official Gazette of Montenegro", no. 42/2004," Official Gazette of Montenegro", no. 21/2009 - dr. law, 54/2009, 40/2010 - dr. law, 36/2011 i 40/2011 - dr. law and 92/2017)

The LoR regulates the legal position, development, maintenance and protection of roads; this implies that it regulates every single area on which there is continuous traffic. The road network consists of public and unclassified roads. Public roads are traffic areas of general interest for public road transport that can be used in the manner, and under the conditions, specified by the regulations on public roads and traffic safety. On public roads, property rights, or other real rights on any ground cannot be acquired, except in cases of public interest; such cases might include the installation of electric cables or other similar objects and devices of general interest. Real rights can only be acquired under the condition that the use of such a right does not jeopardize the stability, safety or traffic regime of a public road. On any road surface, outside the traffic lanes of a public road intended for the provision of services to traffic participants, a right to use can, under special conditions, be exercised. The administrative authority is responsible for issuing approval for the installation of power lines and similar infrastructures on state roads. For the use of public roads, fees are paid including a charge for the installations of electrical cables.

The Law on Roads was adopted in 2004, and was amended in 2009, 2010, 2011, and 2017. Since this law was passed, there have been significant changes in legislation in Montenegro; these changes have resulted in a need to harmonize regulations in the field of roads. Thus it was necessary to draft a new law that would regulate the issues regarding the legal position of roads: their condition, their methods of management, their manner of protection and maintenance, their sources and methods of financing, and particularly the conditions for their construction, reconstruction and inspection.

The draft law, which was subject to public consultation in the summer of 2018, should resolve all of the identified shortcomings and irregularities regarding the enforcement of relevant legal regulations in the field of roads; as such it should regulate more precisely the conditions and manner of management and the manner of protection and maintenance of roads, provide a solution for the ways and sources of financing, enable the harmonization of requirements regarding the construction and reconstruction of roads through the Law on Spatial Planning and Construction of Structures, and should also ensure the necessary harmonization with the regulations of the European Union. The draft law initially recognizes **a place for charging an electric vehicle as an accompanying facility** of a road or of a surface and as a facility for providing a different service to road users.

Laws in the field of transport do not specifically regulate the issue of stations for charging / supplying e-vehicles, except in the section relating to the placement of power lines. Laws in this area also do not transpose Directive 2014/94 / EU on the establishment of alternative fuel infrastructure and do not foresee the adoption of the NPF. A draft of a new Law on Roads has been developed.

Most Member States have transposed the Directive and have developed their NPFs; these set out objectives relating to an infrastructure for charging e-vehicles. However, the ambitions and details of

such goals vary among Member States. One positive example is the Polish NPF; this analyzes the needs of agglomerations, densely populated areas, and the entire TEN-T network in terms of needs related to infrastructure in the area of alternative fuels, including market needs. In Germany, the largest service provider plans to install high-power charging stations at all its highway service stops. Highways England in the United Kingdom is working to ensure that high capacity charging points are available at least every 32 km along 95% of the strategic road network in England. A European priority is to provide places for high power charging in the basic TEN-T network at each charging point². In any case, through the legal framework in the area of transport in Montenegro, it is necessary to ensure that the Directive is transposed and that the NPF is developed as a basic document for the development of e-mobility

The table below shows the Legal arrangements related to the infrastructure for charging e-vehicles in selected countries in the region.

Table 2-1: Legal arrangements relating to infrastructures for alternative fuels in countries within the region

Country	Legal arrangement
Slovenia	Slovenia transposed the Directive 2014/94 / EU by adopting the Regulation on the Establishment of an Alternative Fuel Infrastructure ("Official Gazette of RS", No. 41/17). The present regulation establishes that it is the obligation of the ministry responsible for transport to provide a comprehensive database of locations of publicly available charging stations for alternative fuel supplies and that users should be allowed free and non-discriminatory access to such data. The regulation also defines the technical conditions that should be fulfilled by charging plants. Article 314 of the Law on Energy ("Official Gazette of RS", No. 17/14 and 81/15) states in the first paragraph that the promotion of measures of energy efficiency and the use of RES should be carried out by the state through education, information and public awareness programs, energy advice, promotion of energy audits, preparation of regulations, financial incentives and other support programs. On this basis, in 2017, Slovenia adopted a Market Development Strategy for the establishment of an appropriate infrastructure related to alternative fuels in the transport sector in the Republic of Slovenia; this implemented the obligation of the Member States, under Directive 2014/94 / EU, to adopt a national policy framework.
Croatia	In 2016, Croatia adopted a law transposing Directive 2014/94 / EU - The Act on the Establishment of an Infrastructure for Alternative Fuels ("Official Gazette" No. 120/16). This law also stipulates the technical conditions that the charging stations have to fulfil. The law establishes the obligation of the state to adopt the NPF; this was done in 2017. Additionally, the law defines that the ministry responsible for transport is also responsible for the development of an infrastructure for alternative fuels, and that the national energy efficiency co-ordination body (within the ministry responsible for energy) is in charge of monitoring the implementation of such a policy.
Czech Republic	The Czech Republic has developed a "National Action Plan for Clean Mobility" prepared in co-operation with the Ministry of Industry and Trade, the Ministry of Transport and the Ministry of the Environment; it was approved at a Government session on November 20, 2015. This document is based on the requirements of Directive 2014/94 / EU. It can be said that the Czech NPF puts a relatively low emphasis on the use of electric vehicles in comparison with other types of alternative fuels.

Law on Spatial Planning and Construction of Structures (LoPPaCoS) ("Official Gazette of Montenegro", no. 64/2017, 44/2018, 63/2018 and 11/2019 - corr.)

² Izvor: KOMUNIKACIJA KOMISIJE EVROPSKOM PARLAMENTU, VIJEĆU, EVROPSKOM GOSPODARSKOM I SOCIJALNOM ODBORU I ODBORU REGIJA: Prema najširoj uporabi alternativnih goriva - Akcioni plan za infrastrukturu za alternativna goriva u skladu s članom 10. stavom 6. Direktive 2014/94/EU, uključujući procjenu nacionalnih okvira politike u skladu s člankom 10. stavkom 2. Direktive 2014/94/EU <http://ec.europa.eu/transparency/regdoc/rep/1/2017/HR/COM-2017-652-F1-HR-MAIN-PART-1.PDF>

This law regulates the spatial planning system including: the manner of, and conditions for, the construction of buildings, the legalization of illegal buildings and other issues of importance for spatial planning and the construction of structures. Planning and construction goals include the rational and efficient use of spatial and other resources, along with their preservation, the protection of natural assets, the rational use of natural resources and energy, and the achievement of increases in energy efficiency levels. The law promotes the principles of spatial sustainability of development and of quality planning and construction. In accordance with this brief, the economic and social development of the society is encouraged, along with sustainable development, environmental protection, development of economy and infrastructure, and the prevention or mitigation of the effects of climate change. Furthermore, in accordance with these efforts, measures are planned to mitigate climate change and adapt to climate change. The term infrastructure refers to utility, traffic, energy, electronic communications and other communications that provide common supplies and services along with any other types of improvement capable of enhancing quality of life in a settlement or for users of a given space in a given area; in terms of engineering facilities, this refers to, among others, stations for the supply of motor vehicle oil derivatives and gas, but not for the supply of electricity and other forms of alternative fuels.



The LoSPaCoS does not provide special treatment for e-vehicle charging stations in terms of identifying charging/supplying stations for electric motor vehicles; it is, however, obliged to incorporate them into spatial planning acts, and may also have to facilitate conditions for their construction.

The table below show an example of the treatment of e-vehicle chargers in legislation; this relates to the construction of facilities in Croatia and Slovenia.

Table 2-2: Examples of legal arrangements regarding the treatment of e-vehicle chargers

Country	Legal arrangement
Croatia	The Rulebook on Simple Structures and Other Structures and Works (Official Gazette No. 112/17, 34/18), which was adopted on the basis of the Construction Act (Official Gazette No. 153/13, 20/17), stipulates that without a construction permit, and in accordance with the main design, works can be carried out on an existing building, or part of an existing building, when equipment intended for charging electric vehicles is to be installed; such installations can be completed with or without an associated canopy where photovoltaic modules for the production of electricity for charging vehicles are placed.
Slovenia	A charging station is a simple facility (no building permit is required), according to the Decree on classifying buildings according to the complexity of construction (Official Gazette of RS No. 18/13, 24/13, 26/13, 61/17, 37/18). The Rulebook on Technical Requirements for the Construction and Operation of Stations for the Supply of Fuels to Motor Vehicles (Official Gazette of RS No. 111/09, 61/17) stipulates that in the area of a gas station, it is possible to build and operate a device for supplying motor vehicles with electricity from the network. The requirement in the previous article should, however, be taken into account; that stations for supplying motor vehicles with fuel must be fully in line with legislation relating to spatial planning, building construction, environmental protection, fire protection, health and safety at work and explosion protection.

ENERGY ASPECTS - INFRASTRUCTURE, TARIFFS AND ENERGY EFFICIENCY

Energy Law (EL) ("Official Gazette of Montenegro " no. 5/2016)

The Energy Law stipulates what are energy activities; it regulates the conditions and manner of the performance of these activities in order to provide end-users with a safe high quality energy supply. It also stimulates the production of energy from renewable sources and high efficiency cogenerations and regulates the organization and management of the electricity and gas market along with other issues relevant to energy. Bearing in mind all of the aspects of e-mobility for which it is necessary to provide

legal and regulatory preconditions (contribution to achieving national goals for the RES, the role and tasks of the distribution system operator, connection issue, tariffs, etc.), consideration should be given to the provisions of EL relating to:

- Energy development planning
- RES and incentive measures
- Competencies of the Energy Regulatory Agency in terms of approving methodologies, rules, fees and pricing, and the formation of prices and fees in the electricity system,
- Licenses, certificates and energy permits
- Rights and obligations related to the activity of electricity distribution
- Rights, obligations and responsibilities of the distribution system operator
- Rules for the functioning of the distribution system
- Measurement
- Access to the distribution system

Rules for the Functioning of the Electricity Distribution System ("Official Gazette of Montenegro", no. 15/2017)

These rules determine the general conditions for using the distribution system: the obligations and rights of CEDIS, suppliers, end customers, electricity producers connected to the distribution system, and in particular standard and **non-standard services**, contractual relations regarding the delivery of electricity, plans for the development of the distribution system and customer categories.

Decision on the Determination of Fees for Connection to the Electricity Distribution System ("Official Gazette of Montenegro", no. 90/2017, 24/2018)

The fee for connecting to the distribution system consists of a fee for the connection to the distribution system plus a fee for creating the appropriate technical conditions in the distribution system. According to the type of connection, the fee for carrying out a connection to the distribution network is determined by: connection to 0.4 kV voltage level, connection to 10 kV voltage level and connection to 35 kV voltage levels. The process of installing an e-vehicle charger would include a connection contract with a distribution system operator and thus a one-off connection cost has been identified; this is described in the regulations in the table below. The unit price is determined depending on the type of connection, the length of the line, and the number of meters. Depending on the voltage level fee for creating the technical conditions in the distribution system, calculated according to 1kW, the amount for a 0.4 kV would be **21.05 EUR** (excluding VAT). In the table below, for the purpose of comparison, the value of this fee is given for other countries in the region.

Table 2-3: Legislative arrangements for the connection of a charging station to the power distribution network

Country	Legal arrangement
Slovenia	The connection fee is determined in accordance with the Law on Methodology for Determining the Regulatory Framework and the Methodology for Charging Network Fees for Electric Operators (Ur.I.RS 46/2018). SODO (System Distribution Network Operator) defined the cost of the network charge for coupling power for the consumer group "Charging EV". Price per kW (excl. VAT) was 71,82 EUR on 1.1.2019 . The VAT rate in Slovenia is 22%.
Croatia	The connection fee is determined according to the Methodology for Determining the Fee for Connection to the Electricity Network of New Users of the Network and for Increasing the Connection Power of the Existing Network Users (NN 51/17); for the simple connection of a new customer, the fee is determined by the unit price per kW of required power. The unit price per kW for the City of Zagreb is 1700 kn (about 226 EUR), while for other geographic areas it is 1350 kn (about 180 EUR), excluding VAT. The VAT rate in Croatia is 25 %.



A one-off unit fee for coupling power does not represent a significant obstacle to the construction of an infrastructure for charging e- vehicles in MNE.

General Conditions for the Supply of Electricity ("Official Gazette of Montenegro", no. 70/2016)

General conditions are determined for the supply of electricity; the rights and obligations of the buyer and supplier; the conditions and manner of meter reading, the calculation of and payment for consumed electricity; and other issues of importance for the supply of electricity

Measurement Rules in the Electricity Distribution System ("Official Gazette of Montenegro", no. 7/2017)

These rules contain provisions regulating the measurement of electrical energy at measuring points in the distribution system: the location, manner and types of measurement and the characteristics of the metering equipment; the method of installation, reception, testing and maintenance of measuring equipment; the method of collecting and metering other data at measuring points; the manner of processing such information; making available and transferring measurements and other data taken from measuring points to data users; and maintaining grouping methods for archiving data.

Rules on Minimum Quality of Supply and Supply of Electricity ("Official Gazette of Montenegro", no. 50/2017)

These rules prescribe the minimum quality of delivery and supply of electricity based on quality service criteria, in particular in relation to the time required for a transmission / distribution system operator to connect and repair, the power continuity and voltage quality of electricity.

Rulebook on Electricity Tariffs

The Rulebook on Electricity Tariffs regulates the manner of determining fees for energy-electricity entities for the performance of energy/electricity activities; it also regulates the manner of determining tariffs for the purchase of electricity supplied and for the services provided in connection with this supply to consumers / customers by energy/electricity entities in accordance with the Energy Law. The following is of particular significance:

- the structure of fees by activities including the determination of unit prices for electricity and associated services;
- the methodology for determining a regulated permitted income,
- classification/categorization of consumption according to customers' voltage connection level to the network;
- determining tariff elements and tariff standing points according to place of delivery and place of measurement, consumer categories, days of the week and times of the day that electricity and other delivered services should be supplied to consumers;
- procedures for approving and changing fees, etc.

Prices for the Supply of Electricity to End-Users (to be enforced as of 1.5.2019.)

In accordance with the Article 205 of the Energy Law and Article 15 of the General Conditions for Electricity Supply, on February 13, 2019, Elektroprivreda Crne Gore EPCG AD Nikšić – Functional Unit Supply published prices for the supply of electricity to end-users according to the relevant acts.

The fee for using the distribution network, which is relevant in terms of fast charging stations with a connection power exceeding 34.5 kW, is defined by tariff models T3 or T4; these contain the following tariff elements:

- reactive energy (EUR / kVArh);
- engagement of network capacity (EUR / kW);
- network losses (EUR / kWh);
- fee to market operator (EUR / kWh);
- reimbursement fee for encouraging RES (EUR / kWh).

The difference in the tariff items between these two models only concerns the part about reactive energy. T4 is applied to 'small' customers, who, according to the Law on Energy **have the right to supply of the last choice???**, and are defined as customers with usage at the 0.4 kV voltage level, who do not belong to the category of households purchasing electricity for their own consumption, who have less than 50 employees, whose electricity consumption in the previous calendar year was up to a level of

30,000 kWh and whose annual income is less than EUR 8,000,000 or whose total assets (assets per balance sheet) is less than EUR 8,000,000. It should be noted that fee for **connecting to the network** ??? has not changed in relation to the current price list (enforced until 1.5.2019); it remains at 17.2733 € / kW.

Regarding the prices of active electricity, these are defined by tariff models for: 1) households and 'small' customers, and 2) other customers. In the first category, the basic model still comprises blue, red and green models for double-tariff measurements; this is relevant for e-mobility. In the second category the basic model only comprises a green model. The green model, in both of the basic model cases, includes an additional fee for 100% supply provided by RES.

Examples of tariff models, relevant to e-vehicle chargers in Croatia and Slovenia, are shown in the table below.

Table 2-4: Tariff models in the countries within the region

Country	Legal arrangement
<p>Slovenia</p>	<p>The Regulation on the Establishment of an Alternative Fuel Infrastructure defines electricity distribution system operators as performing an economic public service in accordance with Article 78 of the Energy Act, and thus defines them as entities responsible for the development of charging stations. The Slovenian Energy Act (Official Gazette of RS, Nos. 17/14 and 81/15) in Article 78 defines that a distribution system operator is responsible for the development of the basic public infrastructure of fast charging stations for electric motor vehicles on the highway network. By the end of 2015, on the Slovenian network of highways, there were 26 operational fast charging stations which enabled the simultaneous charging of two vehicles (50 kW DC and 43 kW AC).</p> <p>In 2015, Slovenia recognized a special group of customers who wished to use electricity to charge their e-vehicles on a publicly accessible infrastructure of high-speed/fast chargers (on highway and beyond) in Article 119 (referring to tariffs for charging network charges) of the Law on Methodology for Determining the Regulatory Framework and the Methodology for Calculating Network Fees (Official Gazette RS, No. 66/15, 105/15, 61/16 and 46/18). A fast charger in this context implies a charger that enables the transmission of electricity (at least one charging point) with a power of more than 43 kW. This group of customers was given privileges in relation to others, with the aim of encouraging the initial development of e-mobility. The tariff system comprised the following tariffs:</p> <ul style="list-style-type: none"> • Working energy at a higher daily rate (EUR / kWh); • Working energy at a lower daily rate (EUR / kWh) i • Calculated peak working power (EUR / kW). <p>In the last amendments to the Act, on June 21, 2018, tariffs for fast chargers were abolished. In Article 131, a special group of customers who wished to use electricity to charge their electric vehicles on a publicly available infrastructure was identified (not exclusively for fast charging).</p>
<p>Croatia</p>	<p>The Law on the Establishment of an Infrastructure for Alternative Fuels (Official Gazette No. 120/16) defines that an operator of publicly available charging points, who is the ultimate buyer of that electricity, is free to choose which electricity supplier to use. This means that the provision of a charging service for an e-vehicle is not considered to be purely the sale of electricity, but rather the provision of a service.</p> <p>The role of DOS in the process of constructing a particular charging unit is no different from any other structure that requires a simple connection, according to the Rules on Connection to the Distribution Network; this refers to:</p> <ul style="list-style-type: none"> • issuance of electric energy consent (EES), based on the request from a user for the issuance of electric energy consent; • entering into a contract for the purposes of connection with a network user;

	<ul style="list-style-type: none"> • connection to the distribution network. <p>According to the Law on the Establishment of Alternative Fuel Infrastructure, all chargers with a power of over 22 kW should be treated as high power charging stations. Such chargers, according to the current tariff system, are subject to the following tariff items:</p> <ul style="list-style-type: none"> • active energy at a higher daily rate (HRK / kWh); • active energy at a lower daily rate (HRK / kWh); • excessive reactive energy (HRK / kVAh); • fee for the calculated metering point (HRK / point) and • calculated peak workforce (HRK / kW). <p>This tariff model should apply to all consumers of power higher than 20 kW, i.e. there should be no special tariff model for e-chargers.</p>
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In MNE, the tariff system is not used to promote e-mobility, i.e. there is no tariff model that relates exclusively to an infrastructure for charging e-vehicles. The fee for engaging network capacity (power) is high and is certainly a barrier to the development of e-mobility in terms of high-power charging stations. Defining a special tariff model is considered a key precondition for enabling the realization of e-mobility business models in underdeveloped market conditions, as can currently be seen in MNE.

The comparison of network fee costs, according to existing tariff models and the number of tariff items in Montenegro, Croatia and Slovenia, are shown in Table 3-2.

The Law on Efficient Use of Energy

The Law on Efficient Use of Energy regulates the efficient use of energy; thus it regulates measures for improving energy efficiency along with other important issues concerning energy efficiency in final consumption. As final consumption includes transport, this implies implicitly that e-mobility falls within the scope of this law. The law envisages the adoption of an Energy Efficiency Action Plan (EEAP) as a core document to define measures to improve energy efficiency in line with the 2012/27 / EU Energy Efficiency Directive; it also defines measures to improve energy efficiency in the transport sector .

HOMOLOGATION OF VEHICLES

In 1958, the **UN passed the Agreement on the Adoption of Uniform Conditions for the Approval and Reciprocal Recognition of the Approval of Equipment and Parts of Vehicles** for the adoption of international regulations (UNECE Regulations) for the Construction of Vehicle Equipment and Parts as well as Uniform Rules for the Examination of Vehicle Parts and mutual recognition of homologation approvals. UNECE has a World Forum for Harmonization of Vehicle Regulations - WP.29 and Montenegro is represented in this working body.

The Agreement on the Adoption of Uniform Technical Regulations for Vehicles with Wheels, Equipment and Parts Which Can be Installed and / or Used on Wheeled Vehicles, along with the Conditions for Mutual Recognition of Granted Approvals Pursuant to these Regulations, which entered into force on October 16, 1995, is in force in MNE ("Official Gazette of Montenegro - International Treaties", No. 5/2014)

By notification, through succession, MNE is obliged to comply with the above agreements; that is, to carry out an approval of vehicles, their equipment and parts, in accordance with the regulations issued by UNECE. In this way, it will recognize the approvals issued by the authorized laboratories of other countries under the ECE Regulations. Thus, in MNE all UNECE Regulations are in force. Also, based on the aforementioned agreements, and after gaining independence in 2006, MNE received an international mark for E56 homologation.

It is important to note that in the **European Union**, in addition to directives and regulations, the vehicle type-approval area is alternatively regulated by the regulations of the United Nations Economic

Commission for Europe, pursuant to **Directive 2007/46**; the UNECE Regulations are considered to be equivalent as directives to EU regulations in this field.

The Faculty of Mechanical Engineering of the University of Montenegro in Podgorica is an institution authorized to perform administrative tasks in the field of type-approval of motor vehicles in accordance with the Regulation on Technical Requirements for Vehicles Imported or First Time Placed on the Market in MNE (Official Gazette of Montenegro, No. 5 / 15) and the Amendments to the Rules ("Official Gazette of Montenegro" No. 63/18).

In addition to the vehicle type-approval (homologation) system applicable to UN member states, there is a **system based on directives and regulations at an EU level; that is, on a basic directive on vehicle type-approval (homologation) as a whole and on individual directives for equipment and vehicle parts.**

In the EU, a vehicle is issued with a vehicle type approval (WVTA - Whole Vehicle Type Approval), based on type-approval for equipment and vehicle parts according to individual directives; this replaces national vehicle type approval.

Law on Road Traffic Safety ("Official Gazette of Montenegro", no. 33/2012, 58/2014 and 14/2017 – Decision of the Constitutional Court)

This law regulates traffic rules on roads, **the obligations of drivers and other parties involved in transport services**, traffic restrictions, traffic signs, posts, cryptograms and commands that must be observed by **road users**, the conditions that must be met by drivers for driving vehicles, the requirements for vehicles, the special measures taken in traffic, and any other rules and measures that ensure the safety of road traffic.

In its introductory section, the law defines types of vehicles, referring specifically to mopeds, tricycles and four-wheel drive electric vehicles, while for other power-driven vehicles it does not specify specific types of drives.

The law regulates the type-approval process and stipulates that vehicles that are imported, or are put on the market in Montenegro for the first time, as well as their parts, devices and equipment, according to their design and safety characteristics, must be harmonized with approved technical requirements and conditions.

Rulebook on Technical Requirements for Vehicles Imported or First Placed on the Market in Montenegro ("Official Gazette of Montenegro", No. 5/2015, 63/2018)

This regulation specifies the technical requirements and conditions regarding safety features for vehicles whose parts, devices and equipment are imported; meaning that they are put onto the market for the first time in Montenegro, and including detailed requirements and technical documentation, method of carrying out vehicle type approval (homologation), content and appearance of the certificate regarding the type of vehicle type approval, the type of issuance, the content and manner of records being kept of the implementation of vehicle type-approval, and the conditions regarding personnel, equipment and space for any legal entity that performed the type-approval task. This rule applies only to vehicle categories M, N and O. This means that other categories of vehicles can be imported in Montenegro without any restriction.



It can be concluded that legislation related to vehicle approval and placing vehicles on the market of MNE does not contain any import/entry barriers for e-vehicles of any category.

FINANCIAL ASPECTS

The Law on Tax on The Use of Passenger Motor Vehicles, Vessels, Aircrafts and Aeroplanes ("Official Gazette of Montenegro", No. 28/2004 1 37/2004 and "Official Gazette of Montenegro", No. 86/2009)

This law introduces the obligation to pay taxes on the use of passenger motor vehicles, motorcycles, vessels, aircrafts and aeroplanes. The tax on the use of motor vehicles is paid by legal persons and citizens who own registered passenger cars and motorcycles. The tax on the use of passenger motor

vehicles is paid annually according to the engine's working volume. The motor vehicle tax is calculated by the owner of the motor vehicle. The tax is paid when registering a motor vehicle. Tax control is carried out by the ministry in charge of internal affairs. Registration of motor vehicles cannot be carried out without proof of paid tax.

The Regulation on the Amount of Costs for Technical Inspection of Vehicles ("Official Gazette of Montenegro", No. 16/2013) determines the costs of technical inspection by type and by vehicle volume; it does not recognize e-vehicles. Technical inspection is not carried out for newly produced vehicles; this is only carried out three years after the first registration.

The Decision on Determining the Amount of Annual Fee for the Use of Roads Within the Registration of Road Motor Vehicles, Tractors and Trailers ("Official Gazette of Montenegro" No. 60/2005) determines the amount of annual road usage fee within the registration fee for road motor vehicles, tractors and trailers, based on the type and working volume of the engine, and depending on the type of vehicle (e-vehicles are not specifically identified).

The Regulations on Vehicle Registration ("Official Gazette of Montenegro", No. 10/2015, 21/016, 43/2016, 42/2017) defines the price of a license plate depending on the type of vehicle (e-vehicles are not specifically identified).

 **The Law on Tax on the Use of Passenger Motor Vehicles and Others stipulates that engine vehicle tax is not paid for electric engine vehicles. No other taxes or fees related to e-vehicles have been identified.**

GREEN AND SOCIALLY RESPONSIBLE PUBLIC PROCUREMENT

The Public Procurement Law ("Official Gazette of Montenegro", No. 42/2011, 57/2014, 28/2015, 42/2017) is a general normative framework that regulates the public procurement system in Montenegro; specifically it regulates: public procurement procedures prior to the conclusion of a public procurement contract; framework agreements for the procurement of goods, services or works; the procedure for the protection of rights and the competence to decide; the organization and status of the Commission for the Protection of Rights in Public Procurement Procedures; the Competencies of the Public Procurement Administration, Inspection Supervision and other issues of relevance to public procurement. In the LoPP, the area of 'green' public procurement is defined through the following public procurement institutes:

- the criterion of the most economically feasible offer, whereby the mentioned criterion can be based, inter alia, on the following sub-criteria: program and degree of environmental protection, i.e. energy efficiency, regular maintenance costs and cost-effectiveness.
- technical specifications that can include environmental management, energy efficiency requirements and social requirements.
- a description of the subject of the public procurement where the contracting authorities may provide information on the quantity, place and deadlines of execution, or specific requirements regarding the manner of execution of the subject of public procurement, which are relevant for the preparation of the contract and the execution of the contract, including data relevant to environmental protection, energy efficiency or social requirements.

A proposal for a new Public Procurement Law (from 2018) has been prepared. It is harmonized with EU public procurement legislation and introduces new documents which relate to enabling the use of sustainable procurement criteria; it takes into account social aspects of public procurement, fostering innovation in public procurement and enables easier access of SMEs. Thus, it enables the use of cost-benefit criteria throughout the procurement cycle. For example, the **PPL proposal defines the principle of environmental protection and the provision of energy efficiency**, according to which a procuring entity is obliged to acquire goods, services and works that minimize the level of environmental impact and which ensure an adequate reduction in energy consumption, i.e. energy efficiency.

The Regulation on the Unification of Public Procurement of Goods and Services ("Official Gazette of Montenegro", No. 74/2017) defines that the unification of the public procurement of goods and services should be carried out an administration body - for the administration of property, for the supplying state administration bodies and administrative units within state administration bodies and independent administrative bodies, as contracting authorities. There is, however, no specific criteria for green and sustainable procurement.

In conclusion, in addition to supplementing the legal framework in such a way that would create prerequisites for the implementation of the Green Public Procurement, it would be necessary to educate the personnel in charge of public procurement to enable listed criteria of sustainability to be applied effectively, and to ensure the implementation of environmental protection and energy efficiency measures in all tenders.

The table below shows an example of an additional legal arrangement relating to the promotion of more environmentally friendly vehicles in Croatia.

Table 2-5: An example of a legal arrangement used for the procurement of ecologically friendly vehicles in Croatia

Country	Legal arrangement
Croatia	The Law on the Promotion of Clean and Energy Efficient Vehicles in Road Transport (Official Gazette No. 127/13) transposed Directive 2009/33 / EC on the Promotion of Clean and Energy Efficient Vehicles in Road Transport. This law stipulates that, when purchasing transport vehicles, public authorities are obliged to consider energy and environmental impacts over the lifetime of a vehicle as a public procurement criteria, including energy consumption and emissions of CO ₂ .



Public procurement has strong potential for promoting e-mobility. The use of criteria for environmental protection and energy efficiency must be followed up by instructions/manuals and recommendations to relevant institutions, as well as by education on how to apply such criteria in the public procurement process.

STRATEGIC-PLANNING FRAMEWORK FOR E-MOBILITY

Strategic and planning documents from the fields of environmental protection, energy and transport, regarding their main determinants, relating to e-vehicles and e-mobility in Montenegro are presented in Table 2 1.

Table 2-6: Overview of strategic and planning documents relevant for e-mobility

Title of document	Treatment of e-mobility in document
National Strategy for Transposition, Implementation and Implementation of the EU Legal Framework in the Field of Environment and Climate Change with the Action Plan for the period 2016-2020 (NEAS)	<ul style="list-style-type: none"> • It has been established that the Ministry of Transport and Maritime Affairs plays a key role in promoting efficient fuel consumption for vehicles, as well as in the adoption of appropriate standards • The need for the transposition of Directive 2014/94 / EU on the Establishment of an Alternative Fuel Infrastructure was not identified, most likely for the above reasons, or due to the level of competence of the Ministry of Transport and Maritime Affairs
National Sustainable Development Strategy till 2030.	<ul style="list-style-type: none"> • Recognizes traffic as an important sector in energy consumption • Among the proposed measures is the introduction of hybrid and electric vehicles
National Climate Change Strategy	<ul style="list-style-type: none"> • Foresees a new measure - Introduction of Alternative Measures as a Replacement for Existing Fossil Fuels; this measure should include the use of hybrid and electric vehicles
Transport Development Strategy	<ul style="list-style-type: none"> • The actual strategy does not address the issue of energy efficiency in the field of transport, nor does it

Title of document	Treatment of e-mobility in document
	mention e-mobility or the use of alternative fuels in road transport - a new strategy is being drafted; this draft states that MNE should promote initiatives and studies to include the private sector in the introduction of electro-mobility into the country. As one of its goals it should cite the replacement and innovation of the country's fleet
Energy Development Strategy till 2030	<ul style="list-style-type: none"> • Considers traffic as a significant sector from the point of view of energy consumption • Among the proposed measures for promoting energy efficiency in transport is a public campaign for raising public awareness about the purchase / use of energy efficient vehicles, or alternative fuel vehicles
National Action Plan for the Use of energy from RES	<ul style="list-style-type: none"> • The plan covers the timeframe until 2020 and does not foresee use of electricity in road transport
National Action Plan for Energy Efficiency	<ul style="list-style-type: none"> • Foresees the development of an action plan for energy efficiency in transport

The Energy Efficiency Action Plan (EEAP) does not stipulate specific measures for transport, but clearly refers to the IPA project "Development of Sustainable Energy Use"; this envisages the development of an Energy Efficiency Action Plan for transport. The draft EEAP for transport has already been developed and foresees the following measures concerning e-mobility:

- Establishing a system for using alternative fuels and implementing energy efficiency measures
- Implementing support/incentive schemes for green public transport vehicles
 - Taxation of vehicles based on CO₂ emissions at the annual registration
 - Introduction of subsidies for the purchase of green vehicles
 - Measures to raise awareness on alternative fuels in transport and on alternative modes of transport.

The adoption of this document is not envisaged because it has not been recognized as a strategic document by any law; it is, however, expected that all institutions involved in the preparation of the Action Plan, would identify the measures that they would be responsible for implementing, as per the planning documents.

Nevertheless, the measures envisaged in this document represent a strong impetus for the further development of e-mobility in MNE.

As part of the process of joining the EU, MNE will take on the obligation to transpose Directive 2014/94 / EU on the establishment of an alternative fuel infrastructure and to develop a NPF.

It needs to be emphasized that this obligation has not been identified in any of the strategic or planning documents that have been analyzed.

In addition, it is certain that, as a member of the Energy Community, Montenegro will have to prepare a National Energy and Climate Plan for the period up to 2030.

This plan would be expected to combine the following goals: reducing greenhouse gas emissions, improving the percentages of RES and energy efficiency, discussing issues concerning the safeguarding of energy supplies, achieving a free energy market, assessing competitiveness, and supporting innovation and research. This plan would also, for the period 2021-2030, be expected to combine the current energy efficiency action plan with the plan for the use of renewable energy sources. The transport sector is important both regarding decarbonisation and energy efficiency; as such, it would be expected to clearly define implementation measures up to 2030 and ultimately to achieve the set goals. In line with the Law on Environment, Montenegro will also have to develop its own low-carbon development strategy; in this document it will be crucial to define the strategic direction of the development of low-carbon transport.

INSTITUTIONAL FRAMEWORK FOR E-MOBILITY

As illustrated in the analysis of the strategic and legislative frameworks, e-mobility is and should be an integrated part of public policies in a variety of areas including: environmental protection including air protection, climate change, energy efficiency, transport and energy. As such, the number of institutions that need to be involved in the development of e-mobility is significant. Their overview and responsibilities are given in the table below

Table 2-7: Overview of institutions in MNE with responsibilities in regard to e-mobility

Institution	Organisational unit	Description of their responsibilities
Enactment of strategic-legislative documents and determining incentive measures		
Ministry of Sustainable Development and Tourism	Directorate for Construction	Issuing licenses for construction of chargers for e-vehicles
	Directorate for Environment	Strategic-legislative documents in the field of air protection, supervision of the Eco-Fund
	Directorate for Climate Change and Mediterranean Affairs	Strategic-legislative documents in the field of climate change
Ministry of Economy	Directorate for Energy	Strategic-legislative documents in the field of energy market
	Directorate for Energy Efficiency	Strategic-legislative documents in the field of energy efficiency, including measures for the transport sector
Ministry of Transport and Maritime Affairs	Directorate for Road Transport	Strategic-legislative documents in the field of the development of road transport, including regulations for motor vehicles and the homologation of vehicles
Ministry of Interior	Directorate for Citizens' Affairs and Personal Documents – Directorate for Drivers, Vehicles and Weapons	Proposing laws and regulations in the field of drivers and the registration of vehicles and their enforcement
Institutions for implementation of specific aspects of e-mobility		
Eco-Fund	/	Financial incentives for cleaner transport and use of alternative fuels in transport
Faculty of Mechanical Engineering, University of Montenegro in Podgorica	Centre for Engines and Vehicles	Administrative proceedings in the field of homologation of motor vehicles in line with the Rulebook on Technical Requirements for Imported Vehicles or Vehicles Imported for the First Time onto the MNE Market ("Official Gazette of Montenegro", no. 5/15) and Changes and Amendments to the Rulebook ("Official Gazette of Montenegro", no. 63/18)
Montenegrin Energy Distribution System (CEDIS)	/	Approval of connections to the distribution grid
Regulatory Agency for Energy	/	Analyzes and considerations, in terms of introducing tariff models for energy, that will enable the faster development of e-mobility in Montenegro

This institutional framework is common in countries within the region and reflects all of the aforementioned aspects of e-mobility.

No changes or amendments to the institutional framework are required; it is, however, necessary to ensure that each institution, within its competencies, deals with the issues that are relevant to e-mobility, ensures that there is effective cooperation and that coordination takes place among relevant institutions.

FINANCIAL FRAMEWORK FOR E-MOBILITY

A financial framework for fostering e-mobility would usually encompass investment incentives for the procurement of e-vehicles and/or the building of an infrastructure for charging e-vehicles; tax measures giving preference to e-vehicles would also usually be available.

However, there are no such financial incentives for e-mobility in Montenegro. An important step in setting-up such incentives would be the establishment of an Environmental Protection Fund (hereinafter referred to as Eco-Fund). The Decision on Establishing the Fund, Article 6, clearly states that funds from the Eco-Fund are to be used, among other things, for promoting cleaner transport and for the use of alternative fuels in transport. It is expected that financial incentives provided by the Eco-Fund could first of all be offered in the area of e-mobility. Examples from the countries of the region, shown below, could be used as good examples of incentive schemes.

Table 2-8: Examples of incentives for the procurement of e-vehicles in the region

Country	Incentive description
Slovenia	<p>The Slovenian Public Fund for Environmental Protection (Eko sklad) offers subsidies for the procurement of electric and plug-in hybrid vehicles, both for citizens and legal entities from business and public sector. These subsidies amount to:</p> <ul style="list-style-type: none"> • 7,500 EUR for M1 category electric vehicles; • 4,500 EUR for N1 and L7e category electric vehicles; • 4,500 EUR for M1 and N1 category plug-in hybrid vehicles with CO₂ emissions below 50 g CO₂/km; • 3,000 EUR for L6e category electric vehicles; • 1,000 EUR for L3e, L4e and L5e category electric vehicles; • 500 EUR for L1e-B and L2e category electric vehicles; • 200 EUR for L1e-A category electric vehicles;
Croatia	<p>The Croatian Fund for Environmental Protection and Energy Efficiency also provides subsidies for the procurement of electric and plug-in hybrid vehicles, both for citizens and legal entities. These subsidies amount to:</p> <ul style="list-style-type: none"> • 20,000 HRK (approximately 2,700 EUR) for L1 to L7 category electric vehicles; • 40,000 HRK (approximately 5,400 EUR) for M1 category plug-in hybrid vehicles with CO₂ emissions below 50 g CO₂/km; • 80,000 HRK (approximately 10,800 EUR) for M1 category vehicles belonging exclusively to small and mid-size segment companies (A, B and C segment of vehicles according to the European classification). <p>In addition to vehicles, in 2018, the Croatian Fund provided subsidies for electric bikes, amounting to 5,000 HRK (approximately 675 EUR), while in 2014 and 2015 it provided subsidies of up to 40% to enable legal entities to build electric vehicle charging stations. Many cities and municipalities used this opportunity to set up electric vehicle charging stations in public locations.</p>

The tax policy, regarding vehicles, is defined in the Law on Tax on Use of Passenger Motor Vehicles, Vessels, Airplanes and Aircrafts ("Official Gazette of Montenegro", No. 28/04, 37/04, 86/09). Tax on the use of passenger motor vehicles is paid annually and is based on: engine displacement for passenger motor vehicles, length and engine power for vessels and number of seats for airplanes and aircraft. This tax is paid by natural persons and legal entities that own registered passenger motor vehicles, vessels, airplanes and aircrafts, in accordance with the prescribed tariffs. Revenues generated on this basis belong entirely to the budget of the state. Article 6 of the law states that no taxes should be levied for electric motor vehicles; this tax exemption is the only financial incentive for e-vehicles and e-mobility that currently exists in Montenegro.

In the area of tax policy, attention should be paid to the Law on Sales Tax on Used Passenger Motor Vehicles, Vessels, Airplanes and Aircrafts ("Official Gazette of Montenegro", No. 55/03); this states that the buyer, i.e. any purchaser of used passenger and other motor vehicles, vessels, airplanes and aircrafts is obliged to pay a tax amounting to 5% of the vehicle's estimated value. The only exception from this liability is defined as a case where a motor vehicle, vessel, airplane or aircraft is inherited or given as a

gift to a person in the first order of succession; therefore there are no exemptions for e-vehicles. An overview of tax exemptions for electric vehicles in the EU is provided in the table below.

Table 2-9: An overview of tax exemptions for electric vehicles in the EU-28

Country	Description of tax exemption
Austria	Electric vehicles are exempt from fuel tax and monthly vehicle tax, and a lower VAT rate is applied to them.
Belgium	In all three regions of this state, the lowest tier of annual tax on vehicle use is applied to electric vehicles.
Bulgaria	Electric vehicles are exempt from vehicle ownership tax.
Cyprus	Vehicles with emissions lower than 120g of CO ₂ /km are exempt from paying registration tax and pay the lowest tax rate for annual road tax.
Czech Republic	Electric, hybrid and other vehicles using alternative fuels are exempt from road tax.
Denmark	Electric vehicles pay registration tax at a reduced rate, 40% in 2017. This rate increased to 65% in 2018, 90% in 2019 and will rise to 100% in 2020.
Estonia	/
Finland	Electric vehicles pay a minimal vehicle registration tax, based on their CO ₂ emissions
France	Opportunities exist for regional tax registration exemptions to be made available (total or a 50% exemption) for vehicles that use alternative fuels. Electric vehicles are exempt from company car taxes.
Greece	Electric and hybrid vehicles are exempt from registration tax and luxury tax. Electric and hybrid vehicles (with an engine displacement of up to 1.549 cc) are also exempt from vehicle use tax.
Croatia	Registration tax and vehicle use tax are tied to CO ₂ emissions.
Ireland	Up to December 2021, electric vehicles will be taxed at a lower registration tax rate, up to a maximum amount of 5,000 EUR. For plug-in hybrid vehicles, the maximum tax deduction was 1,500 EUR (up to December 2018). In addition, when purchasing a new electric or plug-in hybrid vehicle, buyers are given a grant worth 5,000 EUR (valid until December 2021 for electric vehicles and until 2018 for plug-in hybrid vehicles). Electric vehicles pay road tax at a minimal rate (120 EUR).
Italy	Electric vehicles are exempt from annual vehicle use tax (ownership tax) for a period of 5 years after initial registration. After this five year period, a vehicle owner has the right to a 75% tax deduction; this is in comparison with the rate that would be applied to an equivalent conventional vehicle.
Latvia	Electric vehicles are charged with company car tax at a minimal rate (10 EUR).
Lithuania	/
Luxembourg	Electric vehicles are subject to a tax deduction during initial registration; this is worth 5,000 EUR. Also, only a minimal amount of annual vehicle use tax is levied for electric vehicles.
Hungary	Electric vehicles are exempt from registration tax, annual vehicle use tax and company car tax.
Malta	Registration tax is not charged for electric vehicles.
The Netherlands	Registration tax is not charged for electric vehicles. Up to 2020, passenger vehicles with a zero emission level of CO ₂ are exempt from motor vehicle tax and are charged the lowest income tax rate (4%) for the private use of company cars.
Germany	Electric vehicles are exempt from annual vehicle use tax for a period of 10 years after initial registration.
Poland	Electric and plug-in hybrid vehicles are exempt from registration tax.
Portugal	Electric vehicles are exempt from paying registration tax, and plug-in hybrid vehicles with an electric range of up to 25 km are given a 75% reduction.
Romania	Electric vehicles are exempt from annual vehicle use tax (ownership tax).
Slovakia	Electric vehicles are charged with registration tax at the lowest rate (33 EUR) and are exempt from annual vehicle use tax.
Slovenia	Electric vehicles are charged with motor vehicle tax at the lowest rate (0.5%).
Spain	In large cities (Madrid, Barcelona, Saragossa, Valentia, etc.) electric vehicles are charged annual vehicle use tax (ownership tax) at a reduced tax rate of 75%. A deduction of 30% is applied to the taxation of electric and plug-in hybrid company vehicles.
Sweden	Electric vehicles and plug-in hybrids are exempt from annual vehicle use tax for a period of 5 years. A 40% vehicle tax deduction is applied to electric and plug-in hybrid company vehicles.

United Kingdom	Electric vehicles (with CO2 emissions up to 100 g/km) are exempt from annual vehicle use tax, while vehicles using alternative fuels get a £10 discount. Pure electric vehicles are exempt from taxes on company vehicles, while all vehicles with CO2 emissions lower than 50 g/km paid 5% in 2015/2016.
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Source: ACEA - European Automobile Manufacturers' Association
https://www.acea.be/uploads/publications/EV_incentives_overview_2018_v2.pdf (25.02.2019.)

There are no financial incentives for buying e-vehicles nor for the development of an infrastructure in Montenegro. It is expected that this situation will change when the Eco-Fund becomes fully operational. One significant fiscal incentive would be the exemption from paying passenger motor vehicle tax. Additionally, it would be justifiable to further amend the Law on Sales Tax on Used Passenger Motor Vehicles, Vessels, Airplanes and Aircrafts. Namely, calculating tax exclusively based on engine displacement/power with an additional tax deduction given for older vehicles is not at all environmental in character; such a ruling does not take into account the ecological characteristics of a vehicle, such as data on CO2 emissions. This should definitely be amended in the foreseeable future, whilst also retaining existing tax incentives for e-vehicles.

CONCLUSIONS AND PROPOSED ACTIVITIES

The main conclusions are shown in the table below:

Table 2-9: An overview of tax exemptions for electric vehicles in the EU-28

E-mobility aspect	Conclusions and proposals
Environmental protection	In the strategic and legislative documents in this area, transport is recognized as one of the most important sources of pollution, which implicitly adds to the relevance of e-mobility. Cleaner transport is also one of the areas covered by the Eco-Fund; this area is expected to significantly contribute to the achievement of environmental protection goals, which include decreasing transport-related pollution. In this regard, it is of key importance to develop and launch financial incentive programs for e-vehicles and related infrastructures in the foreseeable future through the Eco-Fund.
Energy and climate policy	Montenegro, being a member of the Energy Community and an EU candidate country, will have to adopt a National Energy and Climate Plan, in accordance with the Governance of the Energy Union Regulation. This plan will replace the current APEE and AP to promote the use of renewable sources of energy; it will define measures for the promotion of e-mobility, with the goal of advancing decarbonization, and of achieving an adequate percentage use in terms of renewable energy sources in transport; and it will enhance energy efficiency.
Transport policy	The transport policy in Montenegro has not dealt with the issues of e-mobility up until now. Montenegro, being an EU candidate country, will be required to transpose the Directive 2014/94/EU on the deployment of alternative fuels infrastructure and to develop a NPF.
Construction of facilities	The exemption from the requirement to obtain a building licence for the construction of a simple facility, such as an e-vehicle charging station, should be added to the legislation relevant to this category.
Connection and use of electric power distribution grid	There are no significant barriers regarding fees for connecting to the electric power distribution grid. The requirement of developing business models for the construction of charging stations would include a favourable tariff model. The current tariff system in MNE does not recognize charging stations as a separate category; thus, the introduction of such a category should be considered as a measure for the initial development of the e-mobility market.
Homologation of vehicles	No barriers were noted regarding the entry of e-vehicles; this refers to all categories on the Montenegrin market.
Financial and fiscal	Financial incentives need to be ensured through the Eco-Fund and

incentives	<p>a favourable tariff model for charging stations should be designed.</p> <p>In the tax policy domain the focus remains on tax on the use of motor vehicles. The revenue from such tax should be directed to the Eco-Fund, and the law should be applied in such a way as to ensure an ecological character (introduce the CO2 emissions criterion), while retaining a tax exemption for electric vehicles.</p>
Public procurement	<p>Prescribing state bodies with the obligation to consider energy effects and lifetime environmental impact, including energy consumption and CO2 emissions, when purchasing a vehicle, could be included in the selection criteria for public procurement procedures; this could act as an additional incentive for e-mobility. Such a request is in accordance with Directive 2009/33/EC on the Promotion of Clean and Energy-Efficient Road Transport Vehicles; it should be ensured that this measure is enforced in practice, through the instruction and education of participants in public procurement procedures.</p>

ANALYSIS OF THE EXISTING SITUATION REGARDING AN E-MOBILITY INFRASTRUCTURE

EXISTING SITUATION AND FUTURE NEEDS REGARDING AN E-MOBILITY INFRASTRUCTURE

Electric vehicles represent a negligible percentage of the overall structure of registered vehicles in Montenegro. According to data from 2017³, diesel-powered vehicles represent the dominant share, amounting to 70%. The rest is made up of petrol-powered (26%) and liquid petroleum gas (LPG) powered vehicles (4%). In 2017, 49 registered electric vehicles were registered in total. According to data from the Ministry of Interior, at the time of writing this study, there were 81 registered electric vehicles in Montenegro.

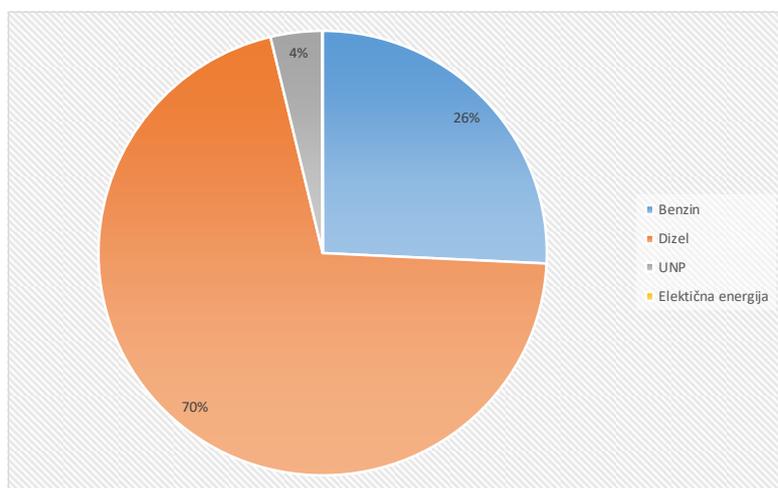


Image 1. Structure of registered motor vehicles in 2017

According to the PlugShare⁴ interactive database, there are a total of 7 charging stations offering charging services in Montenegro. These are mostly wall-mounted connectors (Level 1 charging), where users can connect free of charge by using their own connection cables. The only exception to this is the charging station located at Obala Bijela bb, Bijela 85343 (within the premises of the hotel Bela Roza); here, users can benefit from Type 2 connection (25 A / 230 V) if they are hotel or restaurant guests. The charging fee for users who are not hotel guests is 5€/hour. A destination charger for Tesla vehicle users has been installed at Radovici bb (within the premises of the hotel Chedi Luštica Bay). According to the Puni.hr⁵ interactive database, there is just one publicly available charging station, located at Aman Sveti Stefan (with Montenegrin Telekom as the service provider) in Montenegro. There are two Type 2 (32 A/230 V) parallel connections at that location.

In order to determine the future needs for an electric vehicle charging infrastructure, it is necessary, first of all, to define the

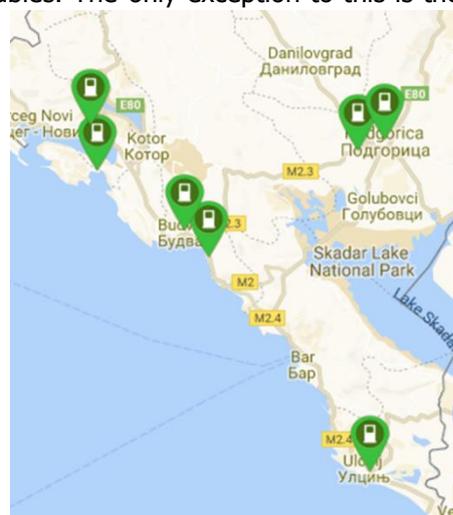


Image 2. Locations of publicly available charging stations according to the PlugSurfing interactive database

³ Source: MONSTAT Annual statistic of transport, storage and communications 2017,

⁴ Source: <https://www.plugshare.com/> (pristup 26.02.2019.)

⁵ Source: <http://puni.hr/> (accessed on 26 February, 2019.)

potential scope of the market. A simplified MAED model was used to model and assess, for the long term, the potential number of electric vehicles on the road and, hence, the number of chargers required; this model was developed under the umbrella of the International Atomic Energy Agency⁶. The analysis took into account the key economic, technical and social factors which would influence the adoption level of electric vehicles during the period up to 2035. Passenger transport, namely the use of passenger cars, was recognised as the key, dominant segment on which the aforementioned analysis should be based. The percentage of passenger cars represented within the total amount of registered vehicles amounted to over 90%.

As the average distance travelled by an individual citizen is considered the basic parameter for determining the activity of passengers, it is necessary to define the ownership of personal cars; these are the dominant means of mobility in urban and intercity transport. In other words, to model the number of vehicles on the road in the future, it is necessary to consistently determine the ratio between the number of inhabitants and the number of registered cars in MNE; this is expected to grow in parallel with the growth of GDP per capita. A graphic representation of historical dependence on the ownership of personal cars (number of inhabitants per registered vehicle) relating to GDP per capita in certain European countries, including Montenegro, can be found below. Several conclusions can be made from analyzing this graphic representation: European countries that are considered to be more developed, such as Germany, the Netherlands and Italy, in principle, have a higher percentage of registered vehicles per capita compared with countries with a lower GDP per capita such as Bulgaria, Romania and Croatia. Furthermore, during the previous decade, developed countries have witnessed only a slight increase in the ownership of specific types of registered vehicles, despite intensive growth levels in GDP. During the same period, developing countries, that are European Union Member States, such as Poland, Bulgaria and Croatia, have seen an intensive growth in car ownership and, despite the fact that they have not followed the same developmental path, they have all started to achieve statistics comparable to those of developed countries. In 2016, in Montenegro there were 296 registered personal vehicles per 1000 inhabitants. In the period up to 2035 it is expected that this ratio will converge with the European Union average; in 2016 there were approximately 511 registered personal vehicles per 1000 inhabitants⁷. In accordance with the afore-stated presumptions, in making analogous comparisons with similar countries, and taking into account the expected economic and demographic indicators, this model envisaged that the ratio between the number of registered vehicles and number of inhabitants in Montenegro in 2035 would be around 0.45; this would result in an increase in the total number of personal vehicles to a total of 284,000 (in a realistic scenario), or 0.53 (approximately 329,000 personal vehicles) in an optimistic scenario.

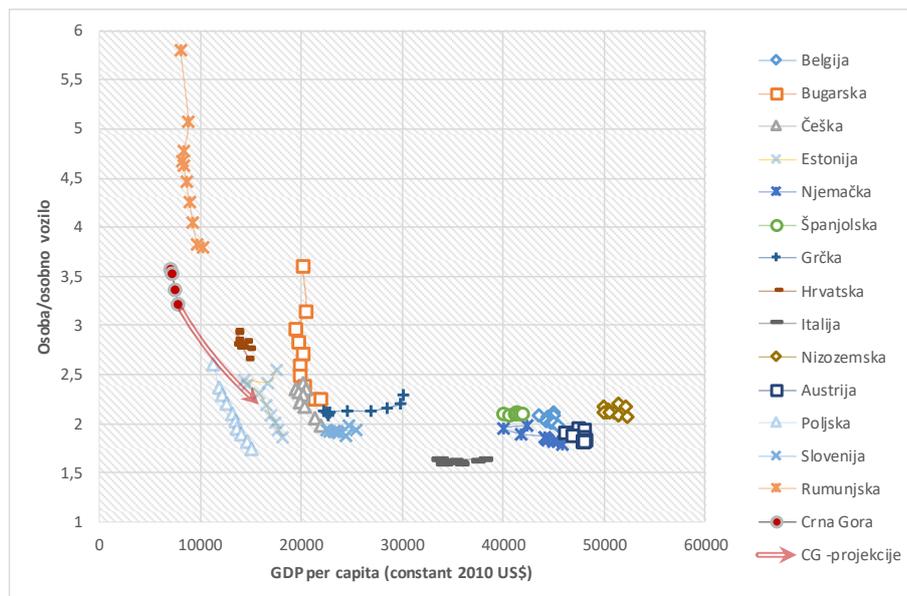


Image 3. Expected shifts in ownership statistics for personal vehicles in relation to GDP per capita in Montenegro (EIHP)

⁶ Source: <https://www.iaea.org/topics/energy-planning/energy-modelling-tools> (accessed on 26 February, 2019.)

⁷ ACEA Report, Vehicles in use Europe 2018

In the context of the electrification of road transport, factors such as the development of technology and a related infrastructure, the readiness of business models for private investors, and the acceptability of electric energy as an alternative option for end users, were taken into account during modelling; the results showed realistic limitations in the development of the market in the period up to 2035. The number of registered electric vehicles in 2035 in Montenegro is expected to be approximately 60,000 in a realistic scenario and 96,000 in an optimistic scenario.

Taking into account the provisions of the Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the Deployment of an Alternative Fuels Infrastructure, it is possible to define an adequate number of publicly available charging locations that would satisfy the needs of the relevant market. As defined by the Directive, a recharging point is an interface through which it is possible to charge one electric vehicle; however, a recharging point accessible to the public is a recharging point that provides charging services to vehicles and enables users to have access on a non-discriminatory basis. Access on a non-discriminatory basis may include different possibilities of authentication, use and payment. Taking into account the assessment of the number of registered vehicles on the road by the end of 2020 at an EU level, the approximate adequate average number of recharging points should correspond to at least one recharging point per 10 vehicles. Taking into account the specifics of the Montenegrin market, it can be assumed that this ratio would be achieved between 2025 and 2030. The analysis determined that the number of recharging points accessible to the public in 2035 in Montenegro would be approximately 3,050 (including both slow and quick charging stations) according to the realistic scenario, or approximately 4,700 according to the optimistic scenario.

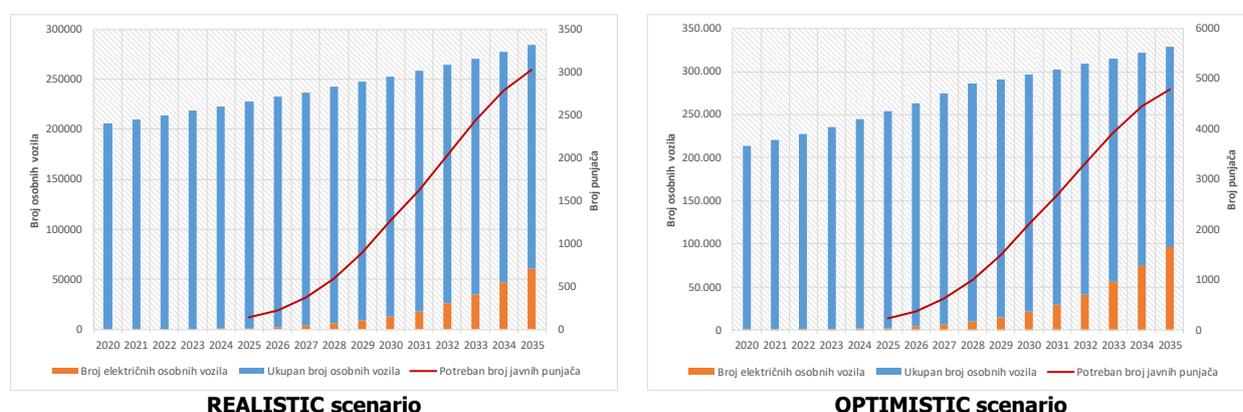


Image 4. Forecasts on the number of electric personal vehicles and the number of publicly available charging stations in Montenegro (EIHP).

Table 3-1: Forecast on the percentage of electric personal vehicles within the total number of registered personal vehicles

REALISTIC scenario	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Number of electric personal vehicles	1,419	2,255	3,765	5,944	8,881	12,674	18,103	25,375	34,712	46,351	60,549
Percentage within the total number of personal vehicles	0.6%	1.0%	1.6%	2.5%	3.6%	5.0%	7.0%	9.6%	12.8%	16.7%	21.3%
OPTIMISTIC scenario	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Number of electric personal vehicles	2,189	3,613	6,185	9,899	14,815	21,054	29,838	41,424	56,084	74,110	95,811
Percentage within the total number of personal vehicles	0.9%	1.4%	2.3%	3.5%	5.1%	7.1%	9.9%	13.4%	17.8%	23.0%	29.1%

MNE should ensure that, through the construction of publicly available recharging points, adequate coverage is achieved, so that electric vehicles can circulate in urban/suburban agglomerations in and other densely populated areas, as well as on principal intercity road networks. In this context, special consideration needs to be given to intermodal locations along with the importance of adequate numbers

of recharging points available to the public in locations such as passenger terminals in ports, airports and train stations. In addition to such outlets, electric vehicle owners would depend greatly on access to recharging points at public parking lots, such as parking lots adjacent to apartment blocks, offices and commercial properties. Public authorities should implement measures to assist such vehicle users by ensuring that investors provide an adequate infrastructure with parking spaces exclusively for charging electric vehicles.

OVERVIEW OF TECHNICAL SOLUTIONS FOR E-VEHICLE CHARGING STATIONS

Below is a review of the equipment required for charging electric vehicles. Three specific characteristics relevant to all charging stations are listed below:

- Level: varies from 1 to 3, which refers to the charger’s output power range
- Type: defines the socket-outlet, i.e. the connector that needs to be used for the charging process
- Mode: varies from 1 to 4, and refers to the communication protocol between the charging station and the electric vehicle (as prescribed by the international standard EC 61851-1).

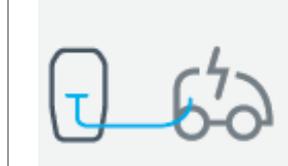
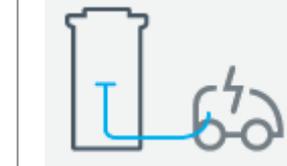
In accordance with the aforementioned standard, **Mode 1** denotes the connection between a vehicle and an electrical system via a conventional household socket (Schuko). There is no communication between the network and the vehicle. Furthermore, there are no specific protection elements, but nevertheless electric installations need to fulfil certain requirements, i.e. there needs to be a grounding system and a fuse for overload protection. In addition to that, sockets should have protection against contact surge voltage. This mode is common for recharging smaller vehicles, like electric bikes and motor bikes.

Mode 2 implies that there is the possibility of determining different charging parameters, and the connection between the charger and the vehicle is achieved via a cable with a built in protective relay. Protective relay is also a control function, since it can control and manage the charging current. Communication is achieved via control pins that need to be present on the vehicle’s socket. Protective relay contains a circuit breaker which provides protection from electric shocks, and it also contains built-in fuses to protect from voltage and temperature overloads. It ensures that the system can achieve a maximum power of 7.4 kW in a single-phase connection and 22 kW in a three-phase connection, with a current limit of 32 A per phase.

Mode 3 implies a charging station with a dedicated socket which enables a set of relevant characteristics such as: checking the status of a connection, continually checking grounding status, activating and deactivating charging, and providing the opportunity to select charging output depending on a vehicle’s needs. A charging station has in-built protective and management relays, like fuses, to protect it from overvoltage and overload, a circuit breaker which provides protection from electric shocks and a charging power regulator. Communication is enabled through additional control pins located both on the charger and on the vehicle. Because of its specifications, this mode is suitable for connection to advanced grids (smart grid).

Unlike the previous three modes, in **Mode 4** charging is performed by direct current (DC), enabling the system to generate significant output power of 50 kW and upwards. Protective and management functions are built in into the charger itself, just like for Mode 3, and communication between the charger and the vehicle is also enabled. Charging stations which use this mode are, as a rule, accessible to the public, and are also fast charge enabled. They represent a significant burden to the power grid, due to relatively high values regarding voltage and power output levels.

Table 3-2: Modes of electric vehicle charging

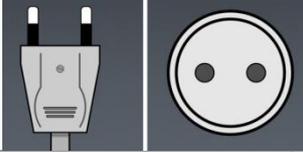
MODE 1	MODE 2	MODE 3	MODE 4
			
Direct connection between vehicle and grid	Direct connection between vehicle and grid	Direct connection between vehicle and grid	Indirect connection between vehicle and grid via external charger

<ul style="list-style-type: none"> - Non-dedicated socket - Cable without communication link - Risk of overheating 	<ul style="list-style-type: none"> - Non-dedicated socket - Cable with a communication device - Charge monitoring option 	<ul style="list-style-type: none"> - Dedicated socket with charge monitoring - Dedicated cable 	<ul style="list-style-type: none"> - External socket with direct current and charge monitoring - Dedicated cable
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Below is a general overview of the different types of charging stations and the most important features that characterize them. Charging stations are connected to either alternating (AC) or direct (DC) current. In the case of an **AC charging station**, the converter for charging the battery of an electric vehicle is built into the vehicle, as well as the charging protocol itself. The installed charging station is just a source of AC which provides support and ensures that the required safety protocols are met and that operation is safe. DC charging stations supply direct current, and the charging protocol is defined by the IEC 62196-3 standard. In this case, the battery charging converter is located in the charging station; thus, in addition to a power connection, charging the battery of a vehicle also requires a signal connector to determine the charging mode.

Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the Deployment of Alternative Fuels Infrastructure, in Annex II, defines the technical specifications for recharging points, and EN62196-2 and EN62196-3 are listed as the mandatory norms for charging vehicles with alternating current (AC) and direct current (DC) respectively.

Table 3-3: Characteristics of e-vehicle charging stations

Type of charging station	Current	Level	Power	Mode	Connector	Approximate price	Charging time*
House chargers 	AC	Level 1	≤ 3,7 kW	Mode 1-2	Type C (Euro connector) 	400-800 EUR	11 – 14 h
Slow chargers 	AC	Level 2	≥ 3,7 kW ≤ 22 kW	Mode 2-3	IEC 62196-2 Type 2 (7-22 kW);  Commando (7-22 kW) Tesla connector	1500-4000 EUR	2 – 6 h
Fast chargers 	AC, three-phase	Level 2	> 22 kW ≤ 43.5 kW	Mode 3	IEC 62196-2 Type 2	~4000 EUR for 2x22 kW setup ~15,000 EUR for 50 kW DC + 43 kW AC setup	1 – 2 h
Fast chargers 	DC	Level 3	Currently < 200 kW	Mode 4	CCS Combo 2 connector (IEC 62196-3 Type 2, 50 kW)  CHAdeMO (IEC 62196-3 Type 4, 50 kW)  Tesla (120 kW) 	15.000 – 25.000 EUR	50 min – 1 h
Ultra fast chargers 	DC	Level 3	≤ 350 kW	Mode 4	CCS Combo 2 connector (IEC 62196-3 Type 2, 350 kW) CHAdeMO (350 kW)	>30.000 EUR	7 – 10 min

*Assuming that the EV has a 40 kWh battery capacity and that there are no technical

Type of charging station	Current	Level	Power	Mode	Connector	Approximate price	Charging time*
limitations for charging in the relevant charging stations							

Connection of a facility (in this case a charging station) to the electric energy distribution grid is performed on the basis of a decision, giving approval for connection, issued by the Montenegrin Electricity Distribution System (Crnogorski elektrodistributivni sistem - CEDIS); once approved, the facility will be connected to the CEDIS grid. The proposed minimum technical specifications for the installation of fast chargers are provided in **Annex 1**.

In addition to the previously described types of charging methods, there are also several other options which include wireless charging (Magnetic Coupling Resonance and Electromagnetic Induction) and battery switching. Neither option is realistic within the context of the current Montenegrin market; therefore, they will not be given further consideration.

Within the context of integrating charging stations with renewable energy sources, it should also be noted that there are technological solutions for the modular application of photovoltaic cells coupled with electric vehicle charging stations. Such a system could be deployed with or without a battery-based energy storage solution.

CRITERIA FOR THE DEPLOYMENT OF E-VEHICLE CHARGING STATIONS

Numerous studies conducted so far show that the largest percentage of electric car charging is done at home; professional literature forecasts that this figure will be around 80% in the future. Despite this, the availability of an e-vehicle charging infrastructure is a key element regarding e-mobility, and its development in the initial stages of the e-vehicle market development is of particular importance. The good planning of a publicly available fleet network should meet the prerequisites for the penetration of e-vehicles into the market and should overcome any underlying barriers encountered by owners, such as the possibility of travelling longer distances and overcoming the fear of being stranded with an empty battery during a trip. Given that the processes of planning, constructing and maintaining charging stations are complex from various aspects (financial, legal, logistical, etc.), special attention should be paid to selecting locations and to the types of charging stations that would be given priority in terms of construction; this is necessary in order to create a basic network of charging stations that is both accessible to the public and that can meet customer needs. Therefore, it is necessary to determine key criteria to be used to select locations and to identify the types of charging stations that will be built on them.

The criteria for selecting a location is generally different for urban charging stations and for those on intercity roads and expressways; the location of a charging station inherently determines the optimum type of charging station to be deployed. Since a charging station located on an intercity road or expressway is not usually the final destination location of a user, in such a location it is generally desirable to deploy a fast DC charging station (output power >50kW). The selection of a location should be guided by the following criteria: maximum distance between charging stations, intensity of traffic, accessibility of the location and the possibility of connecting to the power grid. On the other hand, lower power charging stations can meet the needs of users in urban environments, and are usually deployed at locations where cars are parked for longer periods of time (public garages, public parking spaces, shopping malls, fair venues, cultural and sports facilities and the like). Therefore, the basic criteria for selecting a location includes: the average time a car is parked at such a location, the availability of parking spaces and the accessibility of the location, as well as the possibility of connecting to the power grid.

The locations of intermodal nodes, where users change modes of transport, such as bus and train stations and airports, should also be highlighted. Deploying an infrastructure for the fast charging of vehicles at intermodal locations is not just an additional feature relevant to existing e-vehicle users; it also provides opportunities for the development of new services such as e-taxis or e-car sharing.

Finally, it should be mentioned that the number of tourists driving electric vehicles will keep increasing in the future. While it is to be expected that the charging of a vehicle will be carried out at its final destination, using the facilities of private accommodation (hotels, apartments, camps), the planning of

locations for the deployment of charging stations accessible to the public should take into account the routes used by the largest number of tourists.

Table 3-4: Locations and adequate types of charging stations

Type of charging station \ Location	House chargers	Slow chargers	Fast AC chargers	Fast DC chargers	Ultra fast DC chargers
House, apartment building	✓				
Urban area		✓	✓	✓	
Intercity road routes			✓	✓	✓
Intermodal locations		✓	✓	✓	✓
Tourist locations and facilities	✓	✓	✓		

Determining potential locations for the deployment of charging stations in Montenegro

According to the types of location already described, the first step in identifying potential locations for deployment of charging stations would be to analyze the traffic situation in MNE.

The total length of the road structure in MNE is approximately 5,300 km; of this, 1,700 km are built on a solid surface. At the moment there are no motorways open to traffic (works are currently ongoing on the construction of the Mateševo – Smokovac section of the future Bar - Boljare motorway); intercity/regional road transport travels on main roads and regional roads.

Main roads are roads that are built on a solid surface, and have a roadway with one traffic lane in each direction (the width of the lane is at least 3 meters, with narrow hard shoulders in most cases); they have a third, overtaking lane on steep sections. The maximum allowed speed on main roads is 80km/h.

Regional roads connect regional centres, converge traffic onto the main network and provide traffic connections with border crossings.

MNE plans to develop a network of motorways in the upcoming future, including the Bar-Boljare motorway and a coastal version of the Adriatic-Ionian motorway – an expressway along the Montenegrin coast.

MNE is characterized by a notable seasonal usage of certain road routes. Namely, during the summer tourist season (June-September) traffic intensity increases by up to 5 times when compared with the remainder of the year.



Image 5. Main and regional roads in Montenegro (marked in blue and yellow respectively); SOURCE: Transport Development Strategy Report

Traffic intensity on main roads in Montenegro can be analyzed based on data collected from traffic counters; this is one of the key criteria for selecting potential locations for the deployment of charging stations. According to the data for 2017, the road sections with the highest traffic intensity are Radanovići - Budva, Herceg Novi - Kamenari and Virpazar - Podgorica. Peak traffic amounting to 25,568 personal vehicles was recorded on the Radanovići – Budva section on Saturday, 12 August, 2017. The data on monthly traffic on main roads and on the annual average of daily traffic in 2017 is shown in **Appendix 3** of the study herein.

The capital city of Podgorica is the prominent urban centre in terms of population (according to the 2011 population census, it has 185,937 inhabitants), followed by Nikšić with 72,443 inhabitants. Besides these two large cities, the population of the remaining, dozen or so, urban centres, ranges between 5,000 and 20,000.

Multimodal passenger transport in MNE is achieved through a combination of personal vehicles, buses, railroad and air transport.

After a close look at the status and needs of the individual elements of passenger traffic in MNE, recommendations were made for the optimal location of e-vehicle charging stations in a future network of publicly available stations. Additionally, an indicative number of charging stations required to fulfil minimal user requirements was also provided.

Table 3-5: Overview of indicative locations in Montenegro for the deployment of charging stations accessible to the public

Location type	Location	Description	Indicative number of charging stations
Urban areas	Podgorica, Nikšić	<p>In addition to the capital city of Podgorica (approximately 150,000 inhabitants), the other prominent city size-wise is Nikšić, with approximately 60,000 inhabitants. Bearing in mind that these are the largest cities with the absolute maximum passenger transport frequency throughout the whole year, they represent the highest potential in terms of the development of e-mobility in Montenegro. Smart planning and the deployment of a charging infrastructure would encourage potential e-vehicles buyers and would also contribute to overcoming key barriers.</p> <p>In urban areas, public parking spaces (outside and in garages) in the vicinity of various facilities (city centres, sports facilities, cultural institutions, markets, fairgrounds and the like) are generally recognized as potential sites for the deployment of charging stations.</p> <p>It should be noted that with the emergence of e-vehicles in cities, the private sector would quickly recognize the added value that it could provide to its customers and would decide to build charging stations within certain service facilities (sales centres, catering facilities).</p>	<p>Approximately 68,000 passenger cars were registered in Podgorica in 2016 and about 18,000 in Nikšić. It can be said that the construction of charging stations at about 16 locations in Podgorica and 8 in Nikšić would significantly contribute to the faster development of e-mobility; it would be important to carefully plan the spatial distribution of locations in order to achieve good coverage throughout both cities.</p>
	Other larger towns	<p>Regarding other towns in Montenegro with between 10,000 and 20,000 inhabitants, it is recommended that the vehicle fleet should first be analyzed, along with the influence of seasonality, in order to prioritize the development of charging station networks and to assess, within such networks, what would represent an adequate number of charging stations. The influence of seasonality is bound tightly to tourist activities; thus, it is expected that a higher number of charging stations would be needed in coastal towns.</p>	<p>Namely, for all other urban environments it is recommended that the number of charging stations should correspond to the number of major locations with higher numbers of parked vehicles (large public parking spaces, public garages), as well as to favourable locations in city centres.</p>
Intercity road routes	Main and regional roads	<p>The length of the main and regional road network is approximately 1,900 km and of this, 900 km are main roads; this represents the sections of the road network with the highest traffic intensity, as they link the most important cities in the country, and connect traffic to economic centres and border crossings. Regarding the initial selection of potential locations for charging stations, it is recommended that data on traffic frequency on certain roads should be used (Annex 2).</p>	<p>Assuming that the criteria for the maximum distance between two charging stations was set at 50km, it would be necessary to determine approximately 20 locations for the deployment of charging stations on the main road network. The most favourable locations for the construction of charging stations on such routes would be gas stations</p>

			and rest stops with additional amenities.
	TEN-T and highway	<p>In the future, Montenegrin transport network is expected to be integrated into the Trans-European Transport Network. The deployment of charging stations on roads that would eventually become an integral part of the European network would be of common interest both to Montenegro and to the European Union, because this would contribute to the multimodal development of transport and the elimination of bottlenecks. Therefore, financial support provided within EU projects (CEF) for the deployment of an electric vehicle charging infrastructure on such corridors can be expected. (An example in Croatia is the 'EAST-E Project' - here 27 fast DC charging stations have been deployed on the Mediterranean TEN-T corridor route; work was financed by the CEF fund). An overview of an indicative extension of the TEN-T transport network to Montenegro is provided in Annex 3.</p> <p>The planned Bar-Boljare motorway - works on this officially started on 11 May 2015, with the construction of the priority section, Smokovac – Uvač – Mateševo - will be a part of the future TEN-T corridor.</p>	<p>The key criterion for the selection of locations on such routes would be the maximum possible distance between two charging stations; it is recommended that this should not be more than 50 km.</p> <p>The total length of the planned Bar-Boljare motorway will be 129 km in length; therefore, it is envisaged that charging stations would need to be deployed at three locations in both directions of the highway.</p>
Intermodal locations	Airports	There are two international airports in MNE: Podgorica and Tivat.	Each international airport represents one location for the deployment of a charging station.
	Train and bus stations	All train and bus stations in urban environments are potential locations for the deployment of charging stations; the dynamics of deployment and the selection of priority locations need to be coordinated within the development of the whole charging station network within each urban environment.	When planning for a charging station network in a certain urban environment, it is recommended that 1-2 intermodal locations should be selected (main bus station, main train station).
Tourist locations and facilities	Road routes	<p>According to border police data, in 2016 slightly more than 1.5 million foreign vehicles entered MNE. During the peak tourist season, the average daily road traffic intensity at border crossing points doubles, or even triples, in comparison with other typical days of the year. On certain road sections (Herceg-Novi – Kamenari and Budva-Bar), daily frequency during the tourist season and over weekends is more than 25,000 vehicles. Certain main routes that are particularly heavily used include: Debeli Brijeg (the border with Croatia) - Sukobin (border with Albania), which is about 124 km in length, Budva-Cetinje-Podgorica-Barski Most (border with Serbia), which is about 200 km long, and the Sozina-Podgorica Bar-tunnel route.</p> <p>The deployment of an infrastructure for charging e-vehicles on routes used by foreign tourist vehicles in Montenegro is of key importance as it would have a direct impact on their entire experience of visiting MNE; to some tourists, the availability of charging stations may even be a decisive factor when deciding whether or not to come to Montenegro.</p> <p>The private sector should respond aptly to the emergence and increase of demand for charging</p>	<p>Tourist routes are usually on main roads, where the deployment of charging stations is already recommended; however, more charging stations would certainly need to be deployed on those routes. In order to fulfil user needs, the deployment of fast DC charging stations is recommended at these locations, since it is assumed that users would want to recharge their vehicles as quickly as possible.</p> <p>The deployment of three charging stations on the Debeli Brijeg - Sukobin route is recommended, as well as 5 charging stations on the route from Budva to the border with Serbia.</p>

		tourists' e-vehicles, by providing an appropriate infrastructure at the users' destination points (within hotels, apartments, camps). On the other hand, publicly available charging stations on road routes would be an essential infrastructural requirement to enable tourists using electric vehicles to reach their final destinations.	
	Final destinations	In addition to specified routes, an important additional aspect is that of the final destination; such places, suitable for the deployment of charging stations, would include national parks, parks of nature and other protected areas of nature. Deployment of an infrastructure in such locations would not only enable domestic and foreign visitors to come and visit, but would also contribute to preserving some of the characteristics of protected areas, as well as generally promoting eco-friendly vehicles. It would be preferable to deploy lower-power charging stations that require smaller investments at such locations, bearing in mind that visitors would be expected to spend more time at these locations.	Each final destination for tourists represents a potential location for the deployment of a charging station. Since users usually stay at such locations for several hours, it would be rational to deploy lower-powered charging stations in these places. For example, Tesla's destination chargers could be offered at final destinations such as hotels and restaurants; they could be deployed in cooperation with local partners, who would thus attract the attention of their clients as well as providing them with additional services.

Selection of final locations for the deployment of charging stations

After the initial identification of potential locations, in accordance with the aforementioned recommendations, the final decision determining the most suitable locations for charging station deployment should be made through a synergy of adequate multi-criteria decision making (MCDM) and the use of spatial analyzes tools. The Geographic Information System (GIS) is an important system which supports the process of deploying charging stations, enabling simultaneous management and analyzing semantic and spatial data.

An overview of factors which is usually included in a multi-criteria analysis for selection of the most suitable locations, is provided below.

Numerous factors have an impact on the final selection of locations for th deployment of charging stations; the most significant are economic and land-related, but practicality, safety, feasibility and engineering factors are all also taken into account. From the aspect of service availability, charging stations should be located where there are good traffic connections and where there is a high demand for service. Finally, a charging station infrastructure forms an important element of a whole transport infrastructure; thus, its development should be directly linked to that of the society that it serves, whilst also taking into account significant social factors. In order to achieve sustainable development, environmental factors also need to be taken into account. Comprehensiveness and rationality be only be ensured if all of the aforementioned factors are taken into account regarding the selection process for charging station locations.

Table 3-6: Overview of the criteria for the selection of final locations for charging stations in MNE

Criteria type	Criterion	Description
Economic	Construction costs	Construction costs include the following: purchasing land, preparatory works at the location (demolishing the existing facilities, terrain preparation), procurement of a charging station, project design, connection fee etc.
	Operative costs	Includes all costs and depreciation resulting from the daily operation and maintenance of a charging station.
Engineering feasibility	Availability of infrastructure for connecting to the power grid	Distance from a substation, i.e. the point from which it would be possible to connect a charging station to the grid is a very important factor regarding the feasibility of a project, reliability of electric energy supply, energy losses, as well as the total project

		cost.
	Impact on the power grid	Electric vehicle charging stations are an integral element of the power grid, i.e. of medium and low voltage electricity distribution networks; therefore they can have a significant impact such networks. Selected locations should, therefore, be in areas where they would not have a negative effect on the stability of the distribution network.
Availability of electricity	Practicality	Good accessibility to a charging station is an important criterion for the selection of a location; the status of access roads and hubs should be taken into account.
	Service capacity	This is defined as the daily volume of services provided and the number of e-vehicles able to access charging services at a given location.
	Service radius	When selecting a location, the distance from other locations within the charging station network accessible to the public should be taken into account. Regarding intercity transport, maximum distances between charging stations should be calculated to enable longer distance trips. In urban environments, the context of a planned location should be considered, i.e. the demands of the potential user should be taken into account.
Social factors	Possibility of expansion	Social development and environmental protection will, without any doubt, contribute to a continuous increase in demand for e-vehicle charging; thus it is recommended that the criterion for the potential expansion of existing locations, i.e. the installation of additional recharging points at that location, should be taken into account.
	Local population's point of view	It is recommended that the point of view of the local population living in the vicinity of the charging station should be considered; negative perceptions could potentially arise due to existing parking spaces being taken over for e-charging and due to additional traffic and noise occurring near the charging station.
	Support of local authorities	Different local government policies providing support for the development of e-mobility in both financial and non-financial terms.
Environmental and geographic factors	Environmental impact of charging station deployment	When selecting a location for the deployment of a charging station, the potential impact on the environment should be taken into account. This factor is usually negligible, since charging stations are almost always deployed in already developed areas.
	Topography	A relevant location needs to fulfil the facility safety and stability criteria. Thus it is recommended that locations on unsafe elevations or slopes should be avoided.

Locations in the vicinity of gas stations

Image 6 provides an indicative overview of potential locations for the deployment of charging stations within existing gas stations. The deployment of fast chargers is recommended at these locations. The final selection of locations would result from a multi-criteria analysis, whereby the willingness of the local distributor or the owner of the petrol pump to cooperate would definitely play an important role.

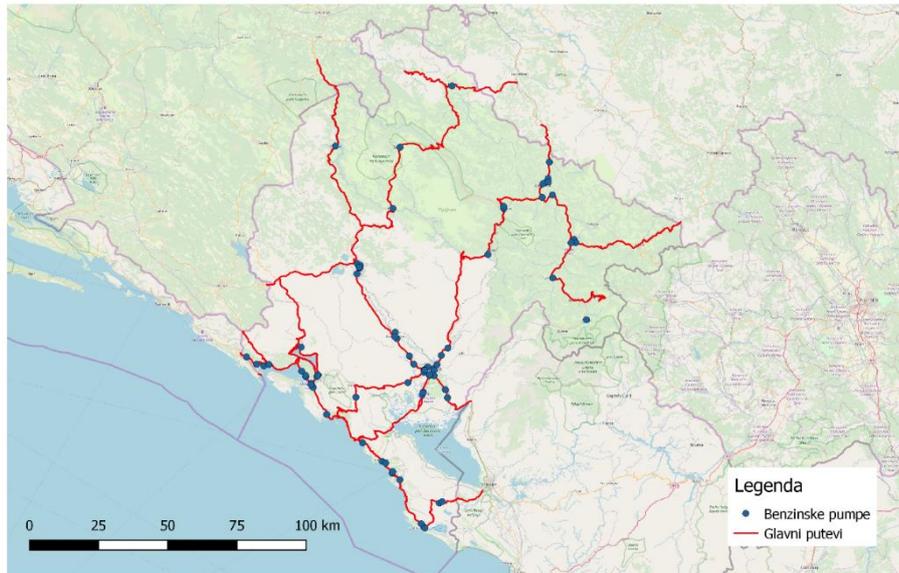


Image 6. Locations in the vicinity of gas stations

Intermodal locations

Image 7 provides an indicative overview of potential locations for the deployment of charging stations that fulfil intermodal criteria. These are located at train and bus stations and at taxi stops. Final decisions on the selection of locations should be made in accordance with the development of other segments of e-mobility within the region.

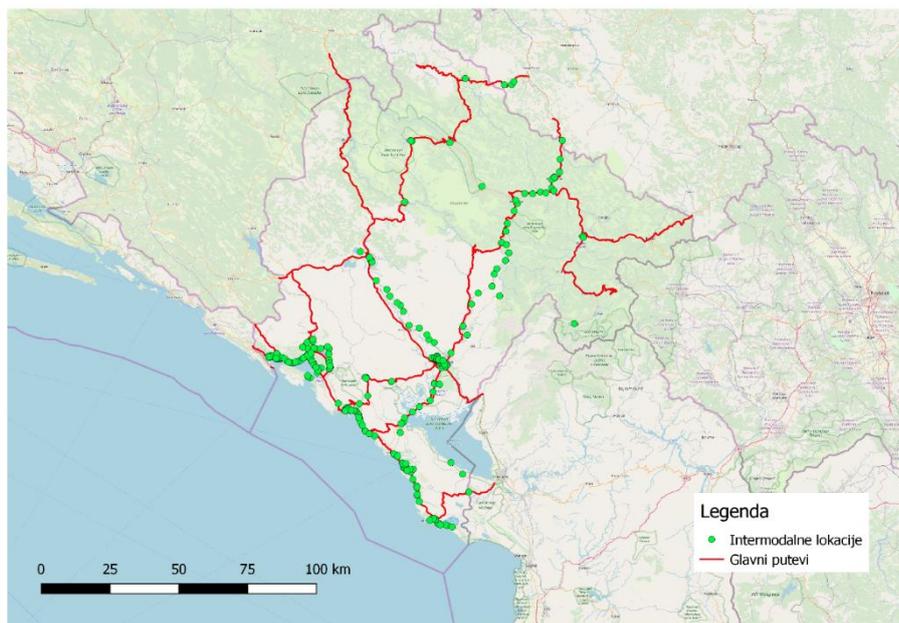


Image 7. Intermodal locations

PROCEDURES FOR THE DEPLOYMENT OF AN E-VEHICLE CHARGING STATION

The deployment of an e-vehicle charging station includes 2 key steps: 1) the deployment itself, and 2) connecting it to the electric energy distribution grid. The guidelines for this, along with examples of good practice for both of these steps, are provided below.

Construction of an e-vehicle charging station facility

The key elements which influence the complexity of the process of deploying a charging station depend largely on two factors: 1) on the legal entity deploying the charging station; 2) on the ownership of the

land where the charging station is to be deployed. Regarding legal persons, differentiation can be made between (a) legal entities from the private sector and (b) local self-government entities, public institutions and companies. Any legal person can deploy a charging station on his own land or elsewhere.

Unlike the procedure that is employed when a business entity from the private sector deploys a charging station, the procedure for a local self-government entity, or a public institution or companies is more complex due to an obligation to implement public procurement procedures. On the other hand, the ownership status regarding the land on which it is planned to deploy the charging station, often plays a key role in the dynamics of implementing the whole project. In practice, the agreement process for building a charging station on land that is not owned by the investor, often represents a barrier to success for the entire process.

The table below shows the basic characteristics for the deployment of charging stations with four combinations of the aforementioned factors.

Table 3-7: Key factors influencing elements of the deployment procedures for charging stations

		Legal entity	
		Private business entity	Local self-government entity, public institutions and trading companies
Land	Owned by investor	<ul style="list-style-type: none"> • Simple procedure • Quick implementation • Offers for purchasing charging station are sought 	<ul style="list-style-type: none"> • Public procurement procedure is mandatory
	Not owned by investor	<ul style="list-style-type: none"> • Contract agreements with land owners 	<ul style="list-style-type: none"> • Public procurement procedure is mandatory • Contract agreements with land owners

The aforementioned Directive 2014/94/EU on the Deployment of an Alternative Fuels Infrastructure lists the basic technical requirements that should be fulfilled by publicly available charging stations. The key requirements are:

- **Interoperability**
 - High and low alternating current (AC) recharging points need to be equipped at least with sockets or connectors for Type 2 vehicles, in accordance with the EN 62196-2 standard.
 - High direct current (DC) recharging points need to be equipped at least with Combo 2 connectors for charging, in accordance with the EN 62196-3 standard.
- **Smart metering systems**
 - The directive states that smart metering systems should be used at charging stations accessible to the public, as long as it is technically feasible and economically justifiable.
- **Ad hoc charging**
 - All e-vehicle charging stations accessible to the public should enable ad hoc charging (without having a contract with the relevant electric energy supplier or operator).
- **Charging prices**
 - Fees charged by operators should be justifiable, easily and clearly comparable, transparent and non-discriminatory.

All of the aforementioned requirements should be taken into account during the procurement and installation of e-vehicle charging stations.

Additionally, the area where the charging station facility is to be constructed should be regulated during the installation procedure; this means that building permits should be obtained if they are legally required.

In order to promote e-mobility, it is of utmost importance to ensure that the public has access to information on the charging stations that are accessible to the public. A good practice example from the Czech Republic is presented below; this could be used as a template for designing a system in MNE.



- An example of good practice -

Registry of charging stations - Czech Republic

The Ministry of Industry and Trade of the Czech Republic, based on the aforementioned Fuel Act, is in charge of keeping records on electric vehicle charging stations available to the public. Namely, a charging station operator is obliged to submit to the Ministry the legally prescribed information on a charging station before it becomes operational.

Systematic records of all publicly available charging stations are thus ensured, and the line Ministry periodically publishes a publication with a list of charging stations.

Connecting a charging station to the electric power grid

The connection of a charging station to the electric power grid is carried out by the electric energy distribution system operator in accordance with the rules for connection. The purpose of the connection procedure is to successfully connect the grid user and to enable use of the grid within the prescribed framework. During the connection process the possibility of connecting to the grid was analysed, an optimal technical solution for connection was determined, and technical, economic and other requirements for connecting to the grid were defined, as well as other requirements for the deployment of a connection and for the creation of the appropriate conditions within the grid. The procedure was developed with the goal of connecting users in an optimal manner, and to make the process of connection transparent, whilst also ensuring equality for all grid users.

Croatia is listed as another example of good practice; charging stations in Croatia have the status of a simple facility.



- An example of good practice -

Connecting a charging station to the electric power grid - Croatia

Connecting a charging station to the power distribution grid is carried out based on the complexity of the connection and on the type and complexity of the facility. Based on the complexity of the connection, connection procedure can be either simple or complex.

A simple connection refers to the connection of a simple facility in accordance with the regulations on spatial planning and construction works; this includes electric vehicle charging stations for which there is no need to fulfill special conditions within the grid.

A complex connection is any connection to the distribution grid which is not a simple

CONCLUSIONS AND PROPOSED ACTIVITIES

The analyzes carried out in this, and in previous chapters, determined that the most significant barrier to the development of e-mobility in Montenegro lay in the absence of a tariff system regarding the use of electric energy and in the cost of services charged by the power distribution grid. In order to confirm this conclusion, a comparative analysis of charging station expenditure is detailed below for Slovenia, Croatia and Montenegro. A proposal for a business model for the development of an e-vehicle charging station is also provided.

Costs of connecting to and using the services of the distribution grid - a comparative analysis: SLO, CRO and MNE

A comparative analysis was carried out for a 50 kW charging station. The comparative analysis determined that a one-time cost connection fee was several times lower in MNE than, for example, it would be in Croatia. This expenditure was also lower than in Slovenia, despite the fact that Slovenia provides an incentive for the development of e-mobility.

Table 3-8: An example of a fee calculated for the connection of a 50 kW charging station to the distribution grid

Country	Unit grid fee for nominal capacity (EUR/kW)	Grid fee for nominal 50kW capacity (EUR)
Slovenia	71.82	3,591.
Croatia	226.67 (City of Zagreb)	11,333.
Montenegro	21.05	2,740 (includes a 0.4 kV connection fee, voltage level via an underground NN connection with water type XPOO-A 4X150 mm ² , 31-60 meters in length)

In the context of realizing sustainable business models, the existing tariff system is a significant factor. The table below provides a framework overview of the cost of using the distribution grid's services in each of the analyzed states. During the preparation of this, the following assumptions were taken into account.

- charging at a 50 kW charging station, i.e. using 50kW power output,
- charging duration 0.5 h, i.e. 25 kWh of used electric energy
- charging to be performed during the most expensive/day-time tariff,
- charging cost, i.e. cost of using a charging station is based on one charge per month.

Table 3-8: An example of a fee calculated for the use of a 50 kW charging station to the distribution grid

Country	Fee for usage of the distribution grid					Note
	Unit cost of used / leased power output during the higher tariff (EUR/kW)	Unit cost of used / leased energy during the higher tariff (EUR/kW)	Cost of used / leased power output (for 50 kW) (EUR/month)	Cost of el. energy (for 25kWh) (EUR/month)	Grid usage fee TOTAL (EUR/month)	
Slovenia	3.24	0.01	162.15	0.29	162.45	\
Croatia	5.93	0.03	296.67	0.83	303.01	includes metering service fee 5.5 EUR/month
Montenegro	17.27	0.02	863.67	0.41	864.07	\

*Regulated Reactive Power Charge is not included (in Croatia 0.02 EUR / kVArh, in Slovenia 0.00851 EUR / kVArh, in MNE 0.010485 EUR / kVArh)

There are two principal obstacles to the establishment of market models for e-mobility in MNE:

- insufficiently large e-vehicle user base;
- regulatory framework is not adapted / stimulating.

The fact that the regulatory framework is not adapted is a key obstacle for the building of an infrastructure for e-vehicle charging; this would most definitely increase the number of e-vehicle users.

Within the existing regulatory framework:

- there are no separate tariff models for fees for using the power grid to charge e-vehicles;
- a tariff model is applied to charging stations, where the peak used power is calculated with relatively high amounts for that item. As a consequence, the fee for using the grid is multiple times higher than is the case in other countries within the region.

The biggest problem with this approach, and also with the tariff model, is that peak power is charged at the highest average rate measured during each billing cycle and during the higher daytime tariff; this means that peak power is probably not being used for majority of the time.

Therefore, in a new concept for a regulatory framework, relevant for the construction and management of charging stations in MNE, it would be necessary to consider the introduction of new power grid tariff models for e-vehicle users. The key characteristic of such a new tariff model should allow the commercialization of an infrastructure for charging e-vehicles in the early phase of e-mobility development, whilst there are still a low number of users of e-vehicles present in the market.

More detailed analyses may show whether a new tariff model could be structured in such a manner as not to contain a billing item for calculating peak power used, but that any fees accrued for peak power would be decreased or subsidised. The Czech Republic can be used as an example of good practice. Here there are two tariffs for the charging of electric vehicles; one is for households, and the other is for companies (the fee for using the grid during the low tariff is approximately 25 times less per unit of energy delivered compared with the high tariff). The lower price tariff is charged for at least 8 hours per day, between 6 p.m. and 8 a.m., and the schedule and the duration of the lower tariff is determined by competent DSOs in their respective areas. The companies using this tariff benefit from the fact that they can use all of their appliances during the lower tariff, while other companies can choose to use the lower tariff only for charging e-vehicles.

Market model

Well established market relations between main entities form the foundation for the development of business models and for the comprehensive development of e-mobility. Special attention needs to be paid to the positioning of distribution system operators whose principal activity falls under regulated activities; charging station deployment and management, however, as well as the provision of charging

services, should be considered as market activities. Such relations between entities, where distribution system operators do not participate in the deployment of electric vehicle charging stations and management, are present in many countries where the concept of e-mobility is well developed; however, countries that are in the initial phases of developing e-mobility and where distribution system operators are in charge of the deployment of charging stations, are now abandoning such models and are trying to reshape them.

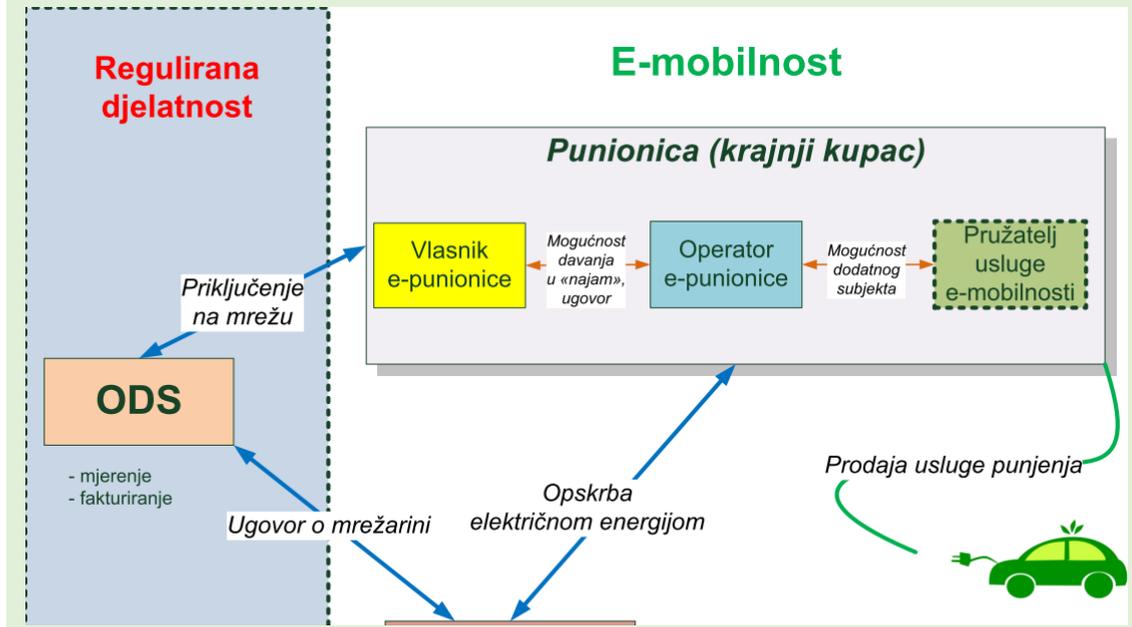


- An example of good practice -

Market model

Examples of good practice show that a favorable environment is one in which, within the context of electric energy market, owners of electric vehicle charging stations are considered as end buyers, i.e. as buyers who purchase electric energy for personal use. In this regard, the service of charging electric vehicles is not considered as selling electric energy, but as the exclusive provision of a service. Therefore, activities that take place up to the point that an electric vehicle charging station is connected to the distribution grid fall under the regulated activities performed by the Distribution System Operator (DSO); everything else represents market activities in the area of e-mobility.

The owner of an electric vehicle charging station, being the end buyer, has the opportunity to convey certain activities, encompassed by e-mobility, to other entities via contractual relations. Thus, it is possible for a charging station to be managed and maintained by a different entity, one that is not its owner. Similarly, the provision of e-mobility services (the charging of electric vehicles, the identification of users, the provision of subscriber services, charging, etc.) to end buyers (users of electric vehicles) is possible through separate entities via contractual relations.



The pricing and structure of e-vehicle charging fees are products of business models that should result from an established market model. The establishment of a regulatory framework, capable of supporting and developing e-mobility in Montenegro, is necessary to establish competitive and attractive charging fees.

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ANNEXES

ANNEX 1 - PROPOSAL FOR MINIMAL TECHNICAL SPECIFICATIONS FOR FAST CHARGING STATIONS

INPUT SIDE	SPECIFICATION
Input voltage range	400 VAC (+/-10%)
Input frequency	50 Hz
Maximum input current and power	145 A, 103 kVA
Maximum THD	max 2.5 %
Minimal efficiency	93%
Minimum power factor	95%
Minimum life span of a charging station	15 years
AC OUTPUT SIDE	
AC output power	22kW – 43kW
AC output current	32A - 63A
Nominal AC output voltage	400 VAC (+/-10%)
AC connector - 1 piece (mandatory with its own cable)	Mode-3, Type 2
DC OUTPUT SIDE	
DC output power	43 kW – 50 kW
Maximum DC output current	125 A
Output voltage range	50 – 500 V
DC connectors – 2 pieces (1xCCS + 1xChademo) (both mandatory with their own cable)	1x CCS COMBO 2 (IEC 61851-23/24) 1x CHAdeMO v.0.9 ili v.1.0 (IEC-61851-23/24; JEVS G105, IEC 62196-3)
GENERAL	
Display	Touch-sensitive display or display with keys, min 6 inch
Protection	Short-circuit protection Over-current protection (OCP), over-temperature protection (OTP) Overload protection, residual current device protection (RCD)
Safety mechanism	Remotely controlled power-off system on the connector cable Kill-switch on the outside of the body of the device
Minimum protection level internal/external	IP 54
Minimum protection level of the housing from vandalism	IK 10
Minimum operating temperature range	-20 °C to +45 °C
CONNECTOR	
Minimal length of all connection cables	3.5 m
Maximum noise	56 dBA
Maximum energy consumption when idle	100 W
Technical solution for the output power supply	Modular - several separate energy modules (if one of the modules fails, the charging station can still operate with a reduced capacity)
Possibility of simultaneous charging of 2 vehicles using full power	1 x DC connector and 1 x AC connector
FUNCTIONS AND DESIGN	

Charger operation indicators	Visible on a display while a vehicle is charging; this applies to all vehicles being charged simultaneously
User authentication / Activation	RFID system ISO/IEC14443A/B, ISO/IEC15693
Communication with the CSCC (Charging Station Control Centre)	GSM/GPRS/3G 10/100 Base-T Ethernet
Power limit control	AC and DC software
Minimum OCPP protocol	v1.5
Maximum dimensions (height x width x length)	1900 x 950 x 800 mm
Maximum weight	600 kg
NORMS AND STANDARDS	
General	EN 62196-1 v.2 (IEC 62196-1:2011; EN 62196-1:2012); EN 62196-2:2012 (IEC 62196-2:2011; EN 62196-2:2012).
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ANNEX 2 - TEN-T NETWORK

The Trans-European Transport Network contributes to the sustainable and multimodal development of transport and elimination of bottlenecks. In this regard, this transport network plays a significant role in ensuring sustainable mobility; it addresses competition from the European Commission by looking after its customers and by ensuring an infrastructure for the transport of goods and passengers across Europe. The European Commission's plan regarding a transport infrastructure is to modernize existing routes for all types of transport and to build new routes in less connected regions.

The map indicates the road routes that are envisaged to be integrated into the Trans-European Transport Network.



Comprehensive Core		Comprehensive Core		Comprehensive Core	
	Road / Completed		Ports		Airports
	Road / To be upgraded		Ports		Airports
	Road / Planned		RRT		

ANNEX 3 - TRAFFIC INTENSITY IN 2007 AND 2017

The table below shows traffic intensity recorded on main roads in Montenegro during 2017.

Counter		Section				
Bioče		Podgorica – Kolašin				
Train station Zeta		Virpazar – Podgorica				
Vitalac		Vilusi – Nikšić				
Radanovići		"Krtoli junction" – Budva				
Dragalj		Lipci - Grahovo				
Kumbor		Herceg Novi – Kamenari				
Counter Month	BIOČE	TRAIN STATION ZETA	VITALAC	RADANOVIĆI	DRAGALJ	KUMBOR
January	135,220	170,265	64,770	297,045	33,503	224,253
February	138,237	231,505	84,034	318,355	47,000	236,435
March	168,418	298,704	110,195	387,308	60,375	278,008
April	183,753	308,922	118,515	420,036	64,488	301,004
May	205,081	358,103	131,516	493,991	74,962	342,085
June	232,212	355,547	136,997	587,065	84,271	399,425
July	329,862	466,764	184,519	752,859	131,876	553,047
August	375,227	478,584	210,191	795,274	148,159	604,746
September	250,308	300,639	137,805	569,082	80,638	389,431
October	220,693	262,105	123,606	433,916	65,752	310,438
November	187,368	232,360	104,714	362,599	54,527	259,784
December	178,968	277,542	99,855	372,666	54,407	-
Total vehicles in 2017	2,605,347	3,741,040	1,506,717	5,790,196	899,958	3,898,656
PGDS 2017	7,138	10,249	4,128	15,864	2,466	



Image 8. Traffic intensity 2017