



## ***Situation analyses of Montenegrin legal, institutional and financial framework in the field of e-mobility***

Study prepared by Energy Institute Hrvoje Požar | Zagreb | February 2019



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# ACCRONIMS

AC	Alternating current
APEE	Action Plan of Energy Efficiency
MNE	Montenegro
CO <sub>2</sub>	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 <sup>1</sup>
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

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<sup>1</sup> „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

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# SUMMARY

The main goal of this document is to give an overview of the situation in Montenegro related to legal, strategic, planning, institutional and financial framework 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, which should first of all be sought in providing an appropriate regulatory framework for the development of business models for chargers for electric vehicles and in financial and fiscal incentives for a stronger penetration of electric vehicles in Montenegrin market.

Specifically, the analysis has shown 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-incentivising regulatory framework.

In addition, the non-adapted regulatory framework is one of the key obstacles for setting up the charging infrastructure for e-vehicles with faster pace, which would surely increase the number of electric vehicle users.

In the existing regulatory framework:

- There are no special tariff models related to fee for the use of the electric power network for charging stations for electric vehicles;
- A tariff model in which the peak power is accounted, with relatively high amounts, is applied to certain chargers. Consequently, the amount of fee for the use of the network is much higher than in the countries in the region. This applies to high-speed/fast chargers with a connection power that exceeds 34.5 kW.

In the new concept of the 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. The key element of the new tariff model should be to enable the commercialization of the infrastructure for charging electric vehicles in the early stage of e-mobility when 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 the e-charger should be considered as an end-user, i.e. a buyer who buys electricity for his own use. Providing the charging service of electric vehicles should not be considered as the sale of electricity, but only as providing services. The distribution system operator performs its regulatory activity to the point of connection of the charging station to the distribution network, and everything else represents the market activity in the field of e-mobility. The e-charger, as the ultimate/final buyer, should have the possibility 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 can be provided through various models and institutions, and especially through the Eco-Fund, whereby the characteristics of the financial incentives of the Eco-Fund will be confirmed after all the analyses carried out under this Project.

Lastly, it should also be emphasized that Montenegro, as a candidate country for the EU membership, is facing the obligations related to the adjustment of the legal and strategic framework. In this regard, there is a need for the drafting and adoption of the National Energy and Climate Action Plan in accordance with the EU Directive on energy community management, transposition of Directive 2014/94/EU on the establishment of alternative fuels infrastructure and the development of the 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 rational use of natural resources and protection of natural ecosystems with balanced economic and social development, and indicates that the system of management and control and integration of environmental protection measures has been successfully established through economic and legal instruments - a basis for preservation and a healthy environment. The Resolution obliges the Government of Montenegro to increase the allocation of budget funds for the environment to a level higher than the average allocation of the European Union (EU) for these purposes and the establishment of the 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 the cleaner transport. The MNE transport sector is characterized by a progressive increase in the total number of registered vehicles with the synchronised aging of the vehicle fleet. Road traffic is the dominant mode of transport, the share of public transport is very low and 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 congestions, which ultimately result in air pollution from exhaust gases and noise from the vehicles. With the increase of citizens' standards and the development of highway, an even greater increase in the number of road vehicles is expected.

Wider use of electric vehicles (e-vehicles) is one of the solutions to these problems. The precondition for the success of e-vehicles on the market is the establishment and acceptance of electromobility (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 established, user experiences and charging infrastructure developed.

There are two globally present approaches to foster 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 the development of e-mobility, therefore it is necessary to determine the optimal model, for the purpose of which UNDP initiated the development of the E-mobility Feasibility Study for Montenegro. This document is the first in a series of documents that will form the mentioned study, and presents an analysis of the current situation with the aim of determining the barriers for wider implementation and encouragement of e-mobility in Montenegro.

## *Structure of document*

In **Chapter 2**, the analysis of the current state of e-mobility in Montenegro, which includes the strategic, legislative, institutional and financial framework 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 from this area, were analysed. The objectives of the analysis are: 1) to determine whether there is clearly and unequivocally expressed strategic commitment of MNE to e-mobility; and 2) determine whether there are legislative barriers that prevent the wider use of e-vehicles in Montenegro

**Chapter 3** deals with the problem of infrastructure for charging e-vehicles. The overview of the technical solutions of the chargers is given, and the criteria for setting up the chargers and the 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, with the aim of identifying deficiencies and barriers, on the basis of which improvements are proposed. Each chapter ends with the main conclusions based on the conducted analyses, with recommendations for the following activities.

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# ANALYSES OF THE CURRENT SITUATION OF E-MOBILITY

## LEGAL FRAMEWORK FOR E-MOBILITY

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

Particularly important is the **environmental aspect**, since e-mobility is 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 the share of energy from renewable sources including transport, and in this direction, only for the longer horizon (2030), 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), which expects e-mobility to constitute a significant part of renewable energy in the transport sector in the period up to 2030. It should therefore, provide further incentives in view of the rapid development of e-mobility and potential in the sector.

When charging e-vehicles at charging stations, **intelligent measuring systems** should be used if technically and financially feasible, in periods in which 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, enable the production of real-time data, which is necessary to ensure the stability of the electricity grid and 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 the infrastructure for e-vehicles, it should be ensured that the installation and use of the electric vehicle charging station is developed in a manner of **a competitive market** with an open access to all parties interested in the introduction or management of 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 of DSOs may be part of a vertically integrated company that owns charging stations or manage those sites. In any case, when developing their plans and programs, DSOs should cooperate with other owners of charging stations without any discrimination, in particular through providing 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 the EU institutions. The Chapter IV of the proposed revised Directive, lists some clarifications of the tasks of DSOs, especially with regard to their activities related to the introduction of network services to ensure flexibility, integration of electric vehicles and data management. Member States may allow DSOs to own or develop charging stations for e-vehicles or operate them only if the following conditions are met: 1) that the other parties, after an open and transparent tender procedure, did not express an interest in owning or developing charging stations for electric vehicles or operating them, and 2) that the regulatory authority approved 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, biofuels, 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 infrastructure for alternative fuels to minimize dependence on oil and mitigate the negative impact of transport on the environment and 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 to development of 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 e-mobility infrastructure for the construction of new and reconstruction of existing buildings.

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

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

**In order to determine the treatment of e-mobility from all these aspects, legal documents have been analysed in all these areas, and the results of the analysis 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 and on a timely and complete information of its condition, and the obligation to preserve and improve the environment. Such a definition is the starting point for the legislative framework for environmental protection.

Constitutional definitions are further elaborated through environmental laws, the Law on Environment as a fundamental law for this topic, and laws for certain segments of the environment, primarily related to protection of air, bearing in mind the 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, 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 through the use of the funds of the Environmental Protection Fund (Eco- Fond).

In the context of the problem of identifying and creating strategic planning and legal framework for e-mobility, the air protection that, according to the LoE, is achieved by conducting measures of systematic monitoring of air quality, reduction of air pollution by polluting substances and conducting technical, technological and other necessary measures for reducing emissions of polluting substances into the air, as

well as monitoring of the impact of polluted air on human health and the environment. Systematic monitoring of the state of the environment encompasses both air quality control and emissions of polluting substances and greenhouse gas emissions in the air.

The LoE stipulates the obligation for legal entities and entrepreneurs who put new passenger vehicles on the market to make available information 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, fuel consumption guidelines and carbon dioxide emissions and other promotional literature and materials.

Pursuant to Article 50 of the LoE and 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 the Annual Consumption of Fuel and Emissions of Carbon Dioxide, which contains official data on fuel consumption and CO<sub>2</sub> emissions for each given model, a list of ten models of new passenger cars with the most economical fuel consumption and the lowest specific CO<sub>2</sub> emissions, graded according to rising CO<sub>2</sub> emissions, drivers' tips for improving fuel economy and CO<sub>2</sub> emissions, and explaining the impact of greenhouse gas emissions and the use of passenger vehicles and different types of fuel on the environment.



**LoE does not provide specific treatment of e-mobility, except indirectly, through the principles and goals of environmental protection and financing possibilities using Eco Fund funds**

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

LoAP regulates the way of monitoring air quality, protection measures, assessment and improvement of air quality, as well as planning and air quality management. Sources of air pollution are stationary and mobile emission sources (motor vehicles), as well as certain products and activities that cause emissions of polluting substances in the air.

The law also established an institutional framework for air protection in order to establish that the efficiency of protection and improvement of air quality is provided 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 e-mobility treatment except for the introduction of e-mobility in order to improve air quality and the determination of motor vehicles as sources 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)***

The Law regulates the procedure for assessing the impact of projects that can have a significant impact on the environment, the content of the impact assessment study, the participation of stakeholders and organizations and the public, the assessment and approval process, notification of projects that can have a significant impact on the environment of other countries, supervision and other issues of importance for environmental impact assessment. The environmental impact assessment determines, in each individual case, the possible direct and indirect impacts of the planned project on human and animal life, flora and fauna, land, water, air, climate and landscape, material assets and cultural heritage, and mutual relations of the mentioned elements. The subject of environmental impact assessment are projects that are planned and performed, which can significantly affect the environment or human health, in the fields of industry, mining, **energy, transport**, tourism, agriculture, forestry, water management and utilities, as well as for

all projects planned in a protected natural asset and in a protected environment of immovable cultural properties.

***The Decree on the projects for which the 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 the environment impact assessment is mandatory and projects for which an impact assessment can be required, without recognizing a particular category of e-vehicle chargers.

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



**Laws on Environmental Impact Assessment do not give special treatment to projects in the field of e-mobility.**

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

International conventions in the field of climate change

By adopting the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, a global initiative on combating climate change began

The implementation of the general objective of the UNFCCC is more closely defined by the Kyoto Protocol, which recognizes the improvement of the level of energy efficiency and the use of renewable energy sources as instruments that contribute to reducing the negative impact of climate change, i.e. achieving limitations related to the amount 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 countries that play an active role in international efforts to tackle climate change.

Also, Montenegro signed and in October 2017 ratified the Paris Agreement and committed itself to contributing to the reduction of greenhouse gas emissions at the global level. The contribution of Montenegro to the efforts of the international community in the fight against climate change, expressed through the Intended National Contribution to Reducing GHG Emissions, is at least 30% in the period up to 2030 compared to the level of emissions in the base year of 1990. This goal is defined by the National Strategy on Climate Change by 2030 and will be realized through the development of industrial technology, increasing the share of RES, overall energy efficiency increase as well as modernization of the energy sector. More detailed information on the sources and scope of energy use from renewable sources has been determined by 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)***

The Law stipulates the conditions and manner of carrying out activities of public transport of passengers and cargo in road transport, 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 and further consultations and discussions on the Draft Law with the Ministry continued.

***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 LoP regulates the legal position, development, maintenance and protection of roads, which implies every area on which traffic is continuously taking place. 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 as the possibility of placing electric cables and similar objects and devices of general interest, that can be acquired under the condition that the use of this right does not jeopardize the stability of road, safety and traffic regime on public roads. On the road surfaces, outside the traffic lanes of the public road intended for the provision of services to traffic participants, the right to use under special conditions can be exercised. The administrative authority is responsible for issuing approval for the placement of power lines and similar on the state road. For the use of public roads, fees are paid including the charge for placing electrical lines.

The Law on Roads was adopted in 2004, and was amended in 2009, 2010, 2011, and 2017. Considering that since passing of the Law there have been significant changes in the legislation in Montenegro, which imposes the need to harmonize the regulations in the field of roads, it was necessary to draft a new law that will regulate the issues referring to legal position of roads, conditions, management methods, their protection and maintenance, as well as the sources and methods of financing, and in particular the conditions for road construction and reconstruction and inspection.

The Draft Law, which was at the public consultations in the summer of 2018, should resolve the identified shortcomings and irregularities in the enforcement of relevant legal regulations in the field of roads, to regulate more precise conditions and manner of management, protection and maintenance of roads, provide a solution for the ways and sources of financing, enable harmonization of requirements regarding the construction and reconstruction of roads with the Law on spatial planning and construction of structures, as well as necessary harmonization with the regulations of the European Union. The Draft Law initially recognizes the **places for charging electric vehicles as accompanying facilities** of the road or surface and facilities for providing different services 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 part related 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 the new Law on Roads has been developed.**

Most Member States have transposed the Directive and have developed their NPFs, which set out objectives relating to the infrastructure for charging e-vehicles. However, the ambition and detail of these goals varies among Member States. One of positive examples is the Polish NPF, which analyzes the needs of agglomerations, densely populated areas and the entire TEN-T network in view of the needs related to infrastructure for alternative fuels, including market needs. In Germany, the largest service provider at highway stops will install high-power charging stations at all its service points. 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. The European priority is to provide places for charging high power in the basic TEN-T network at each charging point<sup>2</sup>. In any case, through the legal framework

<sup>2</sup> 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

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 **Error! No text of specified style in document.**-1: Legal arrangement related to infrastructure for alternative fuels in countries in the region*

<b>Country</b>	<b>Legal arrangement</b>
<b>Slovenia</b>	<p>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 the obligation of the ministry responsible for transport to provide a comprehensive database of locations of publicly available supply and charging stations for alternative fuels and to allow users free and non-discriminatory access to such data. The regulation also defines the technical conditions that the charging plants have to fulfill.</p> <p>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 is 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 the Market Development Strategy for the establishment of an appropriate infrastructure related to alternative fuels in the transport sector in the Republic of Slovenia, which implements the obligation of the Member States under Directive 2014/94 / EU to adopt a national policy framework.</p>
<b>Croatia</b>	<p>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). The Law also stipulates the technical conditions that the charging stations have to fulfil.</p> <p>The Law establishes the obligation to adopt the NPF, which was done in 2017. The Law also found that the ministry responsible for transport is responsible for the development of 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 the policy.</p>
<b>Czech Republic</b>	<p>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, and approved it at the Government session on November 20, 2015.</p> <p>This document is based on the requirements of Directive 2014/94 / EU. It can be said that the Czech NPF puts relatively low emphasis on electric vehicles compared to other types of alternative fuels.</p>

***Law on spatial planning and construction of structures (LoPPaCoS) ("Official Gazette of Montenegro", no. 64/2017, 44/2018, 63/2018 and 11/2019 - corr.)***

The Law regulates the system of spatial planning, the manner and conditions for the construction of buildings, the legalization of illegal buildings and other issues of importance for spatial planning and construction of structures. The goals of planning and construction are the rational and efficient use and preservation of spatial and other resources and the protection of natural assets and the rational use of natural resources, energy and an increase in the level of energy efficiency. The law promotes the principles of spatial sustainability of development and quality of planning and construction in accordance with which the economic and social development of the society is encouraged, as well as sustainable development, environmental protection, development of economy and infrastructure, and the prevention or mitigation of the effects of climate change in accordance with which measures are being planned to mitigate climate

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>



change and adapt to climate change. The term infrastructure refers to utility, traffic, energy, electronic communications and other communications that provide common supply, services and other forms of increasing the quality of life in the settlement or users of space in a given area, and under engineering facilities, among others, stations for the supply of motor vehicles oil derivatives and gas, but not electricity and other forms of alternative fuels.



**The LoSPaCoS does not provide treatment for e-vehicle charging stations in terms of identifying the charging/supplying stations for electric motor vehicles, the obligation to incorporate them into spatial planning acts, or possibly to facilitate the conditions for their construction.**

In the table below, an example of the treatment of e-vehicle chargers in legislation related to the construction of facilities in Croatia and Slovenia.

*Table **Error! No text of specified style in document.**-2: an example of Legal arrangement for the treatment of e-vehicle chargers*

Country	Legal arrangement
<b>Croatia</b>	The Rulebook on Simple Structures and Other Structures and Works (Official Gazette No. 112/17, 34/18), which is adopted on the basis of the Construction Act (Official Gazette No. 153/13, 20/17), stipulates that without construction permit, and in accordance with the main design, works can be carried out on the existing building or its building part, on which equipment intended for charging electric vehicles is to be installed, without or with the associated canopy where the photovoltaic modules for the production of electricity for charging vehicles are placed.
<b>Slovenia</b>	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, taking into account the requirement in the previous article that the stations for the supply of motor vehicles with fuel must be fully in line with the legislation of spatial planning, building construction, environmental protection, fire protection, health and safety at work, explosion protection.

## **ENERGY ASPECTS - INFRASTRUCTURE, TARIFFS AND ENERGY EFFICIENCY**

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

The Energy Law stipulates energy activities, regulates the conditions and manner of their performance in order to provide quality and safe supply of end-users with energy, stimulating the production of energy from renewable sources and high efficiency cogeneration, the way of organizing and managing the electricity and gas market, as well as other issues of relevance to energy. Having in mind all 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 related 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)***

The 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 with electricity delivery, planning the development of the distribution system and the category of customers.

***Decision on determination of fees for connection to the electricity distribution system („Official Gazette of Montenegro", no. 90/2017, 24/2018)***

The fee for connection to the distribution system consists of the fee for the connection to the distribution system and the fees for creating the technical conditions in the distribution system. According to the type of connection, the fees for carrying out the connections to the distribution network are determined for: connections to the 0.4 kV voltage level, connections to the 10 kV voltage level and connections to the 35 kV voltage level. The process of installing the e-vehicle charger includes a connection contract with a distribution system operator that identifies one-time connection costs according to the regulation described 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 of the fee for creating the technical conditions in the distribution system, calculated according to 1kW, the amounts for connections at 0.4 kV are **21.05 EUR** (excluding VAT). In the table below for the purpose of comparison, the values of this fee in countries in the region are given.

*Table Error! No text of specified style in document.-3: Legislative arrangement of the connection of the charging station to the power distribution network*

Country	Legal arrangement
<b>Slovenia</b>	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 the coupling power for the consumer group "Charging EV". Price per kW (excl. VAT) at <b>71,82 EUR on 1.1.2019</b> . The VAT rate in Slovenia is 22%.
<b>Croatia</b>	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), and for 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 %.

**The one-time unit fee for the coupling force does not represent a significant obstacle to the construction of the infrastructure for charging e- vehicles in MNE.**

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

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

***Measurement rules in the electricity distribution system ("Official Gazette of Montenegro", no. 7/2017)***

The 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; method of installation, reception, testing and maintenance of measuring equipment; the method of collecting metering and other data at the measuring point and the manner of processing, availability and transfer of measurement and other data on measuring points to users of data, as well as the method of grouping and archiving data.

***Rules on minimum quality of supply and supply of electricity ("Official Gazette of Montenegro", no. 50/2017)***

The 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 transmission / distribution system operator for connection and repair, 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 and the manner of determining the tariffs for the purchase of electricity supplied and the services provided in connection with this supply to consumers / customers by energy/electricity entities in accordance with the Energy Law. The following is especially arranged:

- the structure of fees by activities including determination of unit prices for electricity and services;
- the methodology for determining regulated permitted income,
- classification/categorization of consumption according to the voltage level of connection of customers to the network;
- determining the tariff elements and tariff standing points according to the place of delivery and the place of measurement, the category of consumers, the day in the week and the time of the day on which the electricity and delivered services are supplied to consumers;
- procedure for approving and changing fees, etc.

***The prices for the supply of end-users with electricity (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 has published the prices for the electricity supply of end-users and the relevant acts.

The fee for using the distribution network, which is relevant for fast charging stations with a connection power exceeding 34.5 kW, is defined by the tariff model T3 or T4, which contains the tariff items for 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 amount of tariff items of these two models is only in the part of the reactive energy, and the fact that 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 at the 0.4 kV voltage level which does not belong to the category of households that purchase electricity for their own consumption, has less than 50 employees, electricity consumption in the previous calendar year up to 30,000 kWh and an annual income of less than EUR 8,000,000 or total assets (assets per balance sheet) of less than EUR 8,000,000. It should be noted that the amount of the fee for engaging the network capacity has not changed in relation to the current price list (enforced until 1.5.2019), and it amounts to a high of 17.2733 € / kW.

Regarding the prices of active electricity, they are defined by tariff models for: 1) households and small customers, and 2) other customers. In Category 1) with the Basic Model, there are still Blue, Red and Green models in the double-tariff measurements, which is relevant for e-mobility. In category 2) there is only Green with the Basic model. The Green model in both cases includes an additional fee for 100% supply from RES, with prices from the Basic Model.

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

*Table Error! No text of specified style in document.-4: Tariff models in the countries in the region*

Country	Legal arrangement
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<b>Slovenia</b>	<p>The Regulation on the Establishment of an Alternative Fuel Infrastructure defines electricity distribution system operators that perform economic public service in accordance with Article 78 of the Energy Act 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 the 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 network of highways of Slovenia, a total of 26 fast charging stations which enable simultaneous charging of two vehicles (50 kW DC and 43 kW AC) were put into operation.</p> <p>In 2015, Slovenia recognized a special group of customers who use electricity to charge e-vehicles on a publicly accessible infrastructure of high-speed/fast chargers (on highway and beyond) in the 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 is privileged in relation to others, with the aim of the initial encouragement of development of e-mobility. The tariff system has the following tariff items:</p> <ul style="list-style-type: none"> <li>• Working energy at a higher daily rate (EUR / kWh);</li> <li>• Working energy at a lower daily rate (EUR / kWh) i</li> <li>• Calculated peak working power (EUR / kW).</li> </ul> <p>In the last amendments to the Act, from June 21, 2018, tariff items for fast chargers are abolished, and in Article 131, a special group of customers who use electricity to charge electric vehicles on publicly available infrastructure has been identified (not exclusively for fast charging).</p>
<b>Croatia</b>	<p>The Law on the Establishment of Infrastructure for Alternative Fuels (Official Gazette No. 120/16) defines that an operator of publicly available charging points who is the ultimate buyer of the electricity, is free to choose electricity supplier. This means that the provision of charging service for e-vehicle is not considered to be the sale of electricity but solely as providing a service.</p> <p>The role of DOS in the process of construction of a particular charging unit is not different from other structures that require a simple connection, according to the Rules on connection to the distribution network, and refers to:</p> <ul style="list-style-type: none"> <li>• issuance of electric energy consent (EES), based on the request of the user for the issuance of electric energy consent;</li> <li>• entering into a contract for connection with the network user;</li> <li>• connection to the distribution network.</li> </ul> <p>According to the Law on the Establishment of Alternative Fuel Infrastructure, all chargers with a power of over 22 kW are 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"> <li>• active energy at a higher daily rate (HRK / kWh);</li> <li>• active energy at a lower daily rate (HRK / kWh);</li> <li>• excessive reactive energy (HRK / kVarh);</li> <li>• fee for the calculated metering point (HRK / point) and</li> <li>• calculated peak workforce (HRK / kW).</li> </ul> <p>The tariff model applies to all consumers of power higher than 20 kW, i.e. there is no special tariff model for e-chargers.</p>



**In MNE, the tariff system is not used to promote e-mobility, i.e. there is no tariff model that relates exclusively to the 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 the underdeveloped market conditions, as currently in MNE.**

The comparison of the cost of the network fee according to the existing tariff models and the amounts 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 way of efficient use of energy, measures for improving energy efficiency and other issues of importance for energy efficiency in final consumption. As final consumption includes transport, this implies that implicitly e-mobility is also within the scope of this law. The law envisages the adoption of the Energy Efficiency Action Plan (EEAP) as a core document defining measures to improve energy efficiency in line with the 2012/27 / EU Energy Efficiency Directive, and 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 has its representative 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 and 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 has obliged to apply the above agreements, that is, to carry out the approval of vehicles and their equipment and parts in accordance with the regulations issued by UNECE, and that they will recognize the approvals issued by authorized laboratories of other countries under the ECE Regulations. Thus, in MNE all UNECE Regulations are in force. Also, based on the aforementioned agreements, MNE, after the restoration of statehood in 2006, received an international mark for the 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 directives as 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 the directives and regulations at the EU level, that is, on the basic directive on vehicle type-approval (homologation) as a whole and individual directives for equipment and parts of vehicles**

In the EU for vehicles as a whole, a vehicle type approval (WVTA - Whole Vehicle Type Approval) is issued, based on the type-approval for equipment and vehicle parts according to individual directives and 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)***

The Law regulates traffic rules on roads, obligations of participants and other transport actors, traffic restrictions, traffic signs, posts, cryptograms and commands that must be observed by the participants in the traffic, the conditions that must be met by drivers for driving vehicles, the requirements for vehicles, special measures taken in traffic, and other rules and measures to ensure the safety of road traffic.

In the 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 does not specify specific types of drives.

The Law regulates the type-approval process and it is stipulated that the vehicles that are imported or for the first time put on the market in Montenegro, as well as their parts, devices and equipment, according to their design and safety characteristics, must be harmonized with the 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)***

The Regulation specifies technical requirements and conditions regarding safety features for vehicles whose parts, devices and equipment are imported, that is, for the first time put on the market in Montenegro, detailed contents of the requirements and technical documentation, the method of carrying out vehicle type approval (homologation), the content and appearance of the certificate of the type of vehicle type approval, the type of issuance, the content and the manner of keeping records of the implementation of vehicle type-approval, as well as the conditions regarding personnel, equipment and space for a legal entity that performs the type-approval tasks. 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 all categories.**

## **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)**

The Law introduces an 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 and natural persons who own the 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 volume of vehicles, it does not recognize e-vehicles. Technical inspection is not carried out for newly produced vehicles, but only three years upon 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 the Republic of Montenegro" No. 60/2005)** determines the amount of annual road usage fee within registration of road motor vehicles, tractors and trailers, based on the type and working volume of the engine, depending on the type of vehicle (e-vehicles are not specifically identified).

**Decision on determining the amount of special fee for road motor vehicles and their trailers ("Official Gazette of the Republic of Montenegro" No. 60/2005)** determines the amount of special fee for road motor vehicles and their trailers for the purpose of ensuring unhindered traffic and provision of information services to road users, depending on the type of vehicle (e-vehicles are not specifically recognized).

**The Regulations on Vehicle Registration (Official Gazette of Montenegro, No. 10/2015, 21/016, 43/2016, 42/2017)** defines the price of the 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 actual 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 and regulates public procurement procedures prior to the conclusion of a public procurement contract and 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.

The proposal of the new Public Procurement Law (from 2018) has been prepared. It is harmonized with the EU public procurement legislation and introduces new documents related to enabling the use of sustainable procurement criteria, taking into account social aspects of public procurement, fostering innovation in public procurement and easier access of SMEs, and enabling the use of cost-benefit criteria throughout the life cycle. For example, the **PPL proposal defines the principle of environmental protection and the provision of energy efficiency** according to which the procuring entity is obliged to acquire goods, services and works that minimize the 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 public procurement of goods and services is carried out by the administration body - the Property Administration, for the needs of state administration bodies, administrative units within the state administration bodies and independent administrative bodies, as contracting authorities. There are no specific criteria for green and sustainable procurement.

In conclusion, in addition to supplementing the legal framework that would create the prerequisites for the implementation of the Green Public Procurement, it is necessary to conduct the education of persons in charge of public procurement for applying the listed criteria of sustainability, environmental protection and energy efficiency in the tenders they implement.

In the table below, an example of an additional legal arrangement related to the promotion of more environmentally friendly vehicles in Croatia is given.

*Table **Error! No text of specified style in document.**-5: An example of legal arrangement for procurement of ecologically friendly vehicles in Croatia*

Country	Legal arrangement
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<b>Croatia</b>	The Law on the Promotion of Clean and Energy Efficient Vehicles in Road Transport (Official Gazette No. 127/13) transposed the 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 take energy and environmental impacts over the lifetime of a vehicle as a public procurement criteria, including energy consumption and emissions of CO <sub>2</sub> .
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**Public procurement has a strong potential for promoting e-mobility. The use of the criteria for environmental protection and energy efficiency must be followed by instructions/manuals and recommendations to relevant institutions, as well as with education on how to apply these criteria in the public procurement process.**

## STRATEGIC-PLANNING FRAMEWORK FOR E-MOBILITY

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

*Table Error! No text of specified style in document.-6: Overview of strategic and planning documents relevant for e-mobility*

<b>Title of document</b>	<b>Treatment of e-mobility in document</b>
<b>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)</b>	<ul style="list-style-type: none"> <li>• It is 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</li> <li>• The need for transposition of Directive 2014/94 / EU on the establishment of alternative fuels infrastructure was not identified, most likely for the above reasons, or the competence of the Ministry of Transport and Maritime Affairs</li> </ul>
<b>National Sustainable Development Strategy till 2030.</b>	<ul style="list-style-type: none"> <li>• Recognizes traffic as an important sector in energy consumption</li> <li>• Among the proposed measures is the introduction of hybrid and electric vehicles</li> </ul>
<b>National Climate Change Strategy</b>	<ul style="list-style-type: none"> <li>• Foresees a measure - Introduction of alternative measures as a replacement for existing fossil fuels, which includes the use of hybrid and electric vehicles</li> </ul>
<b>Transport Development Strategy</b>	<ul style="list-style-type: none"> <li>• The actual Strategy does not address the issue of energy efficiency in the field of transport, nor does it mention e-mobility or the use of alternative fuels in road transport - a new Strategy is being drafted and the draft of this Strategy states that MNE should promote initiatives, studies and inclusion of private sector in the introduction of electromobility into the country, and as one of the goals it places the replacement and innovation of the country's fleet</li> </ul>
<b>Energy Development Strategy till 2030</b>	<ul style="list-style-type: none"> <li>• considers traffic as a significant sector from the point of view of energy consumption</li> <li>• 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</li> </ul>
<b>National Action Plan for the Use of energy from RES</b>	<ul style="list-style-type: none"> <li>• The plan covers the timeframe until 2020 and does not foresee use of electricity in road transport</li> </ul>
<b>National Action Plan for Energy Efficiency</b>	<ul style="list-style-type: none"> <li>• Foresees development of action plan for energy efficiency in transport</li> </ul>

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", which envisages the development of the Energy Efficiency Action Plan in transport. The draft EEAP in transport has been developed and foresees the following measures concerning e-mobility:

- Establishing a system for using alternative fuels and implementing energy efficiency measures
- Implementation of support/incentive schemes for green public transport vehicles
  - Taxation of vehicles based on CO<sub>2</sub> emissions at the annual registration
  - Introduction of subsidies for the purchase of green vehicles
  - Measures to raise awareness on alternative fuels in transport and 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, but it is expected that all institutions involved in the preparation of the Action Plan, will identify the measures for which implementation they are responsible through their planning documents.

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



**In the process of joining the EU, MNE will also have the obligation to transpose Directive 2014/94 / EU on the establishment of alternative fuel infrastructure and to develop a NPF.**

It needs to be emphasized that this obligation has not been identified in any strategic or planning document being analysed.



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

This Plan combines the goals of reducing greenhouse gas emissions, share of RES and energy efficiency improvements, and discusses issues of safeguarding of energy supply, free energy market, competitiveness, innovation and research. This Plan will, for the period 2021-2030, combine the current energy efficiency action plans and plans for the use of renewable energy sources. The transport sector is important both for the dimension of decarbonisation and for the dimension of energy efficiency, and it will have to clearly define the implementation measures by 2030 to achieve the set goals. In line with the Law on Environment, Montenegro will also develop its own low-carbon development strategy, in which it is also crucial to define the strategic directions of low-carbon development of transport.

## INSTITUTIONAL FRAMEWORK FOR E-MOBILITY

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

*Table Error! No text of specified style in document.-7: Overview of institutions in MNE with responsibilities in regard to e-mobility*

Institution	Organisational unit	Description of their responsibilities referring to
<b>Enactment of strategic-legislative documents and determining incentive measures</b>		
<b>Ministry of Sustainable Development and Tourism</b>	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 Eko-Fund
	Directorate for climate change and Mediterranean affairs	Strategic-legislative documents in the field of climate change
<b>Ministry of Economy</b>	Directorate za energy	Strategic-legislative documents in the field of energy market
	Directorate za energy efficiency	Strategic-legislative documents in the field of energy efficiency, including measures for transport sector



<b>Ministry of Transport and Maritime Affairs</b>	Directorate for road transport	Strategic-legislative documents in the field of development of road transport, including regulations for the motor vehicles and homologation of vehicles
<b>Ministry of Interior</b>	Directorate for citizens affairs and personal documents – Directorate for drivers, vehicles and weapons	Proposing laws and regulations in the field of drivers and registration of vehicles and their enforcement
<b>Institutions for implementation of specific aspects of e-mobility</b>		
<b>Eco-Fund</b>	/	Financial incentives for cleaner transport and use of alternative fuels in transport
<b>Faculty of Mechanical Engineering, University of Montenegro in Podgorica</b>	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 for the first time imported in MNE market („Official Gazette of Montenegro” no. 5/15) and Changes and Amendments to the Rulebook („Official Gazette of Montenegro” no. 63/18)
<b>Montenegrin Energy Distribution System (CEDIS)</b>	/	Approval of connections to the distribution grid
<b>Regulatory Agency for Energy</b>	/	Analyses and considerations in terms of introducing tariff models for energy that will enable faster development of e-mobility in Montenegro

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

**No changes or amendments to the institutional framework are required, but it is necessary to ensure that each institution within its competencies also deals with issues relevant to e-mobility and to ensure effective cooperation and coordination among those institutions.**

## FINANCIAL FRAMEWORK FOR E-MOBILITY

Financial framework for fostering e-mobility usually encompasses investment incentives for procurement of e-vehicles and/or building infrastructure for charging e-vehicles or tax policy measure giving preference to e-vehicles.

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

*Table Error! No text of specified style in document.-8: Examples of incentives for procurement of e-vehicles in the region*

<b>Country</b>	<b>Incentive description</b>
<b>Slovenia</b>	<p>Slovenian Public Fund for Environmental Protection (Eko sklad) offers subsidies for 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"> <li>• 7,500 EUR for M1 category electric vehicles;</li> <li>• 4,500 EUR for N1 and L7e category electric vehicles;</li> <li>• 4,500 EUR for M1 and N1 category plug-in hybrid vehicles with CO<sub>2</sub> emissions below 50 g CO<sub>2</sub>/km;</li> </ul>

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

Tax policy regarding vehicles has been 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). The tax on use of passenger motor vehicles is paid annually, 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 are levied for electric motor vehicles, so this tax exemption is the only financial incentive for e-vehicles and e-mobility currently existing in Montenegro.

In the tax policy domain, we should also mention the Law on Sales Tax on Used Passenger Motor Vehicles, Vessels, Airplanes and Aircrafts ("Official Gazette of Montenegro", No. 55/03), which states that the buyer, i.e. the purchaser of used passenger and other motor vehicles, vessels, airplanes and aircrafts is obliged to pay a tax in the amount of 5% of vehicle's estimated value. Exceptions from this liability are defined only in cases when the motor vehicles, vessels, airplanes and aircrafts are 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 **Error! No text of specified style in document.**-9: An overview of tax exemptions for electric vehicles in the EU-28*

<b>Country</b>	<b>Description of tax exemption</b>
<b>Austria</b>	Electric vehicles are exempt from fuel tax and monthly tax on vehicles, and a lower VAT rate is applied to them.
<b>Belgium</b>	In all three regions of this state, the lowest tier of annual tax on vehicle use is applied to the electric vehicles.
<b>Bulgaria</b>	Electric vehicles are exempt from the vehicle ownership tax.
<b>Cyprus</b>	Vehicles with emissions lower than 120g of CO2/km are exempt from paying registration tax and they are paying the lowest tax rate for annual road tax.
<b>Czech Republic</b>	Electric, hybrid and other vehicles using alternative fuels are exempt from road tax.
<b>Denmark</b>	Electric vehicles pay registration tax at a reduced rate, 40% in 2017. This rate increased to 65% in 2018, 90% in 2019 and it will go to 100% in 2020.
<b>Estonia</b>	/
<b>Finland</b>	Electric vehicles pay a minimal vehicle registration tax, based on their CO2 emissions
<b>France</b>	Regions have the possibility to introduce registration tax exemptions (total or a 50% exemption) for vehicles that use alternative fuels. Electric vehicles are exempt from company car taxes.
<b>Greece</b>	Electric and hybrid vehicles are exempt from registration tax and luxury tax. Electric and hybrid vehicles (with engine displacement up to 1.549 cc) are also exempt from the vehicle use tax.
<b>Croatia</b>	Registration tax and vehicle use tax are tied to CO2 emissions.



<b>Ireland</b>	Up to December 2021, electric vehicles shall be taxed at a lower registration tax rate, up to the maximum amount of 5,000 EUR. For plug-in hybrid vehicles maximum tax deduction was 1,500 EUR (up to December 2018). In addition to that, when purchasing a new electric or plug-in hybrid vehicle, buyers get a grant in the amount of 5000 EUR (valid until December 2021 for electric vehicles and 2018 for plug-in hybrid vehicles). Electric vehicles pay the road tax at a minimal rate (120 EUR).
<b>Italy</b>	Electric vehicles are exempt from the annual vehicle use tax (ownership tax) for the period of 5 years after the initial registration. After this five year period they will have the right to a 75% tax deduction compared to the rate applied to equivalent conventional vehicles.
<b>Latvia</b>	Electric vehicles are charged with company car tax at a minimal rate (10 EUR).
<b>Lithuania</b>	/
<b>Luxembourg</b>	Electric vehicles have the right to a tax deduction during initial registration in the amount of 5,000 EUR. Also, minimal amount for annual vehicle use tax is levied for electric vehicles.
<b>Hungary</b>	Electric vehicles are exempt from registration tax, annual vehicle use tax and company car tax.
<b>Malta</b>	Registration tax is not charged for electric vehicles.
<b>The Netherlands</b>	Registration tax is not charged for electric vehicles. Up to 2020, passenger vehicles with zero emission of CO <sub>2</sub> are exempt from motor vehicle tax and they are charged with the lowest income tax (4%) for private use of company cars.
<b>Germany</b>	Electric vehicles are exempt from the annual vehicle use tax for the period of 10 years after the initial registration.
<b>Poland</b>	Electric and plug-in hybrid vehicles shall be exempt from registration tax.
<b>Portugal</b>	Electric vehicles are exempt from paying registration tax, and plug-in hybrid vehicles with electric range up to 25 km have a 75% deduction.
<b>Romania</b>	Electric vehicles are exempt from the annual vehicle use tax (ownership tax).
<b>Slovakia</b>	Electric vehicles are charged with the registration tax at the lowest rate (33 EUR) and are exempt from annual vehicle use tax.
<b>Slovenia</b>	Electric vehicles are charged with the motor vehicle tax at the lowest rate (0.5%).
<b>Spain</b>	In large cities (Madrid, Barcelona, Saragossa, Valentia, etc.) electric vehicles are charged with the annual vehicle use tax (ownership tax) at a reduced tax rate in the amount of 75%. Deductions in the amount of 30% are applied in taxing electric and plug-in hybrid company vehicles.
<b>Sweden</b>	Exemption from annual vehicle use tax in the duration of 5 years is applied to electric vehicles and plug-in hybrids. For electric and plug-in hybrid company vehicles a 40% vehicle tax deduction is applied.
<b>United Kingdom</b>	Electric vehicles (with CO <sub>2</sub> emissions up to 100 g/km) are exempt from annual vehicle use tax, while vehicles using alternative fuels get a 10£ discount to the amount paid. Pure electric vehicles are exempt from taxes on company vehicles, while all vehicles with CO <sub>2</sub> emissions lower than 50 g/km in 2015/2016 paid 5%

Source: ACEA - European Automobile Manufacturers' Association

[https://www.acea.be/uploads/publications/EV\\_incentives\\_overview\\_2018\\_v2.pdf](https://www.acea.be/uploads/publications/EV_incentives_overview_2018_v2.pdf) (25.02.2019.)

There are no financial incentives for buying e-vehicles and infrastructure development in Montenegro. It is expected that this situation will change with the start of operative work of the Eco-Fund. There are fiscal incentives, i.e. there is an exemption from passenger motor vehicles tax. Still, it should be pointed out that there is space and reasoning for amending 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 for older vehicles does not have an environmental character, since it in no way takes into account the ecological characteristics of a vehicle, such as the data on CO<sub>2</sub> emissions. This should definitely be amended in the foreseeable future, while retaining tax incentives for e-vehicles.

## CONCLUSIONS AND PROPOSED ACTIVITIES

Main conclusions of the Table are shown in the following Table:

Table **Error! No text of specified style in document.**-10: An overview of tax exemptions for electric vehicles in the EU-28

E-mobility aspect	Conclusions and proposals
<b>Environmental protection</b>	In strategic and legislative documents in this area, transport is recognized as one of important sources of pollution, which implicitly adds to the e-mobility's relevance. Cleaner transport is also one of the areas covered by the Eco-Fund, which is expected to significantly contribute to 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 infrastructure in the foreseeable future through the Eco-Fund.
<b>Energy and climate policy</b>	Montenegro, being a member of the Energy Community and an EU candidate country, shall have to adopt the National Energy and Climate Plan, in accordance with the Governance of the Energy Union Regulation - that plan shall replace the current APEE and AP for promotion of use of renewable sources of energy, and it shall have to define the measures for promotion of e-mobility, with the goal to advance decarbonization, achieve an adequate share of use of renewable sources of energy in transport and enhance energy efficiency.
<b>Transport policy</b>	Transport policy in Montenegro did not deal with the issues of e-mobility up until now. Montenegro, being an EU candidate country, shall have to transpose the Directive 2014/94/EU on the deployment of alternative fuels infrastructure and develop a NPF.
<b>Construction of facilities</b>	Exemptions from the requirement to obtain building licences for simple facilities, such as e-vehicle charging stations, should be added to the legislation relevant to this category.
<b>Connection and use of electric power distribution grid</b>	There are no significant barriers regarding fees for connecting to the electric power distribution grid. The requirement for development of business models for construction of charging stations is a favourable tariff model. <b>The current tariff system in MNE does not recognize charging stations as a separate category, so the introduction of such a category should be considered as a measure for initial development of the e-mobility market.</b>
<b>Homologation of vehicles</b>	No barriers were noted to entry of e-vehicles of all categories on the Montenegrin market.
<b>Financial and fiscal incentives</b>	While <b>financial incentives need to be ensured through the Eco-Fund and a favourable tariff model for charging stations</b> , in the tax policy domain the focus is on the tax on use of motor vehicles. The revenue from that tax should be directed to the Eco-Fund, and the Law should be applied in such a way as to ensure the ecological character (introduce the CO2 emissions criterion), while retaining a tax exemption for electric vehicles.
<b>Public procurements</b>	Prescribing the obligation that the state bodies, when purchasing transport vehicles, ought to take energy effects and environmental impact of a vehicle during its life, including energy consumption and CO2 emissions, as one of the selection criteria in public procurement procedures, could act as an additional incentive for e-mobility. That request is in accordance with the Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles, and it should be ensured that it is enforced in practice, through instructing and educating the participants in public procurement procedures.

# ANALYSIS OF EXISTING SITUATION REGARDING E-MOBILITY INFRASTRUCTURE

## EXISTING SITUATION AND FUTURE NEEDS REGARDING E-MOBILITY INFRASTRUCTURE

Electric vehicles have a negligible share in the structure of registered vehicles in Montenegro. According to the data from 2017<sup>3</sup>, diesel-powered vehicles have a dominant share, amounting to 70%. The rest is made of petrol-powered (26%) and liquid petroleum gas (LPG) powered vehicles (4%). In 2017 there were 49 registered electric vehicles in total. According to the Ministry of Interior's data, at the time of writing this study, there were 81 registered electric vehicles in Montenegro.

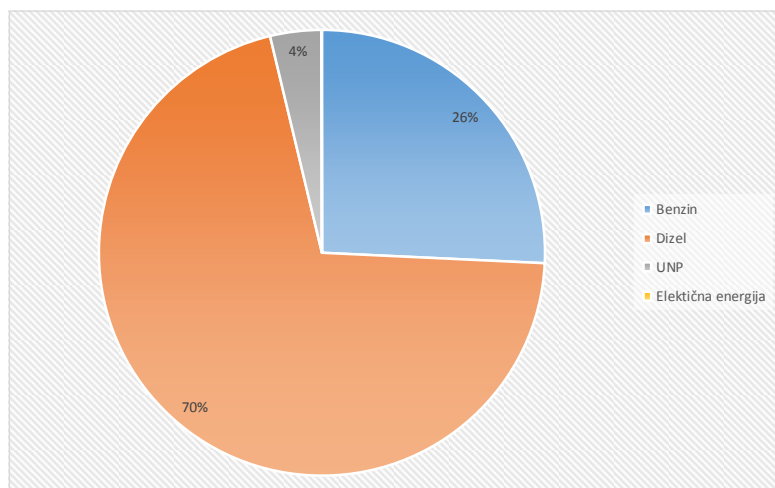


Image 1. Structure of registered motor vehicles in 2017

According to PlugShare<sup>4</sup> interactive database, in Montenegro there are in total 7 charging stations offering charging services. As a rule, these are wall-mounted connectors (Level 1 charging), where users can connect free of charge by using their own connection cables. The exception is the charging station located at the address Obala Bijela bb, Bijela 85343 (within the premises of the hotel Bela Roza), where users can benefit from Type 2 connection (25 A / 230 V) if they are hotel or restaurant guests. Charging fee for users who are not guests is 5€/hour. A Destination Charger for the users of Tesla's vehicles has been installed at the address Radovici bb (within the premises of the

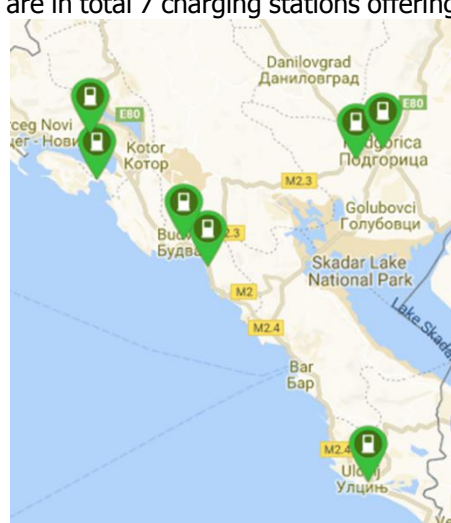


Image 2. Locations of publicly available charging stations according to PlugSurfing interactive database

<sup>3</sup> Source: MONSTAT Annual statistic of transport, storage and communications 2017, April 2018

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

hotel Chedi Luštica Bay) According to Puni.hr<sup>5</sup> interactive database, in Montenegro there is in total just one publicly available charging station, located at Aman Sveti Stefan (with Montenegrin Telekom as the service provider). At that location it is possible to use two Type 2 (32 A/230 V) parallel connections.

In order to determine future needs for electric vehicle charging infrastructure, first of all it is necessary to define the potential market's scope. A simplified MAED model was used for the needs of modelling and long term assessment of the number of electric vehicles and required chargers, developed under the umbrella of the International Atomic Energy Agency<sup>6</sup>. The analysis takes into account key economic, technical and social factors, which influence the level of adoption of electric vehicles in the period up to 2035. Passenger transport by using passenger cars has been recognised as the key, dominant segment on which the aforementioned analysis is based. The share of passenger cars in the total amount of registered vehicles amounts to over 90%.

Having in mind that the average distance travelled by an individual citizen is the basic parameter determining the activity of passengers, it is necessary to define the factor of ownership of personal cars, since they are the dominant means of mobility in urban and intercity transport. In other words, for the needs of modelling the number of vehicles in the future, it shall be necessary to consistently determine the ratio between the number of inhabitants and the number of registered cars in MNE, which is expected to grow in parallel with the growth of GDP per capita. A graphic representation of historical dependence of the factor of ownership of personal cars (number of inhabitants per registered vehicle) on GDP per capita in certain European countries, including Montenegro, can be found below. Several conclusions can be made after analysing this graphic representation: European countries that are considered as more developed, like Germany, the Netherlands or Italy in principle have a higher percentage of registered vehicles per capita compared to the countries with a lower GDP per capita, like Bulgaria, Romania or Croatia. Furthermore, during the previous decade developed countries have witnessed a slight increase in specific ownership of registered vehicles, despite the intensive growth of GDP. During the same period, developing countries that are European Union Member States, like Poland, Bulgaria or Croatia, have seen an intensive growth in car ownership and, despite the fact that they did not follow the same development path, they are already achieving the specific values 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 there will be a convergence of the aforementioned ratio, which will be closer to the European Union average, which in 2016 was approximately 511 registered personal vehicles per 1000 inhabitants<sup>7</sup>. In accordance with the stated presumptions and analogous comparison with similar countries, as well as taking in to account the expected economic and demographic indicators, by using this model, it was envisaged that the ratio between the number of registered vehicles and number of inhabitants in Montenegro in 2035 should be around 0.45, resulting in an increase in the total number of personal vehicles to a total of 284,000 (in the realistic scenario), or 0.53 (approximately 329,000 personal vehicles) in the optimistic scenario.

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

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

<sup>7</sup> ACEA Report, *Vehicles in use Europe 2018*

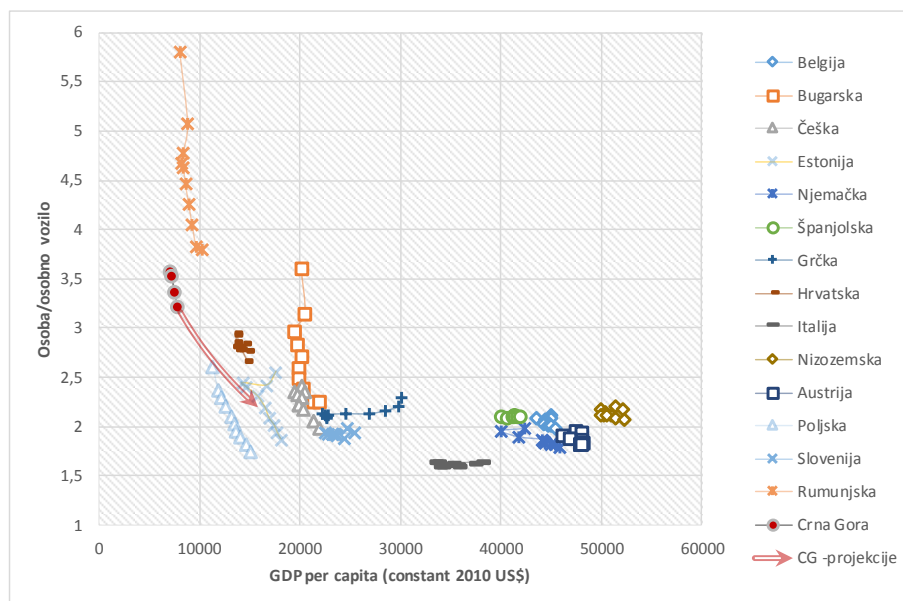


Image 3. Expected shifts in factors of ownership of personal vehicles in relation to GDP per capita in Montenegro (EIHP)

In the context of road transport electrification dynamics, the factors like level of development of technology and related infrastructure, preparedness of business models for private investors, as well as acceptability of electric energy as an alternative option for end users were taken into account during the modelling, in the end resulting in realistic limitations to market development during the period up to 2035. The expected number of registered electric vehicles in 2035 in Montenegro is approximately 60,000 in the realistic scenario and 96,000 in the 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 alternative fuels infrastructure, it is possible to define and 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, while 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 number of registered vehicles by the end of 2020 at the 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 specificities of the Montenegrin market, it is assumed that this ratio shall be achieved between 2025 and 2030. The analysis has determined that the number of recharging points accessible to the public in 2035 in Montenegro shall 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.

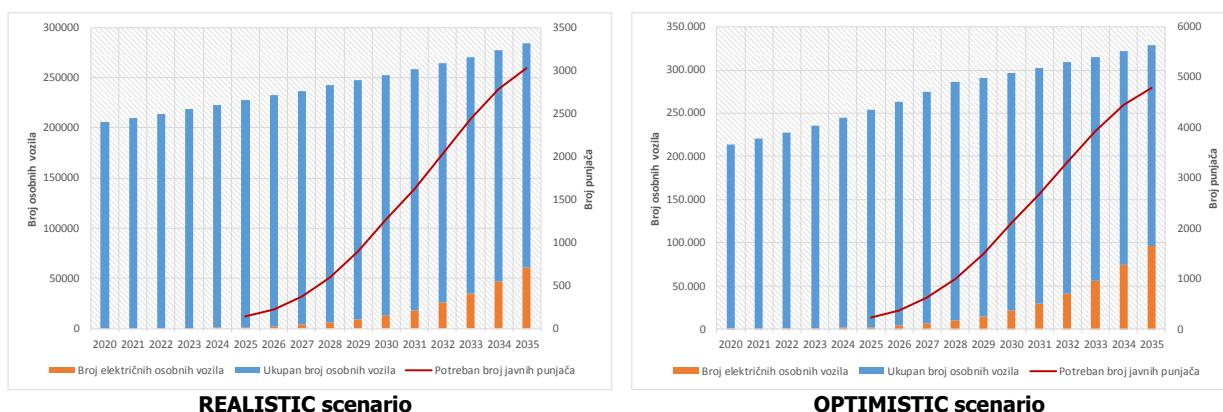


Image 4. Forecasts on the number of electric personal vehicles and the number of publicly available charging stations in Montenegro (EIHP).

Table **Error! No text of specified style in document.**-11: Forecast on the share of electric personal vehicles in 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
Share in 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
Share in 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 an adequate coverage is achieved, so that electric vehicles can circulate in urban/suburban agglomerations and other densely populated areas, as well as in principal intercity road networks. In that context special relevance needs to be given to intermodal locations, therefore the importance of adequate number of recharging points accessible to the public in locations such as passenger terminals in ports, airports and train stations needs to be underlined. In addition to that, owners of electric vehicles greatly depend on access to recharging points on public parking lots, for example on parking lots near apartment blocks, offices and commercial properties. Public authority bodies should implement measures to assist users of such vehicles by taking care that investors ensure adequate infrastructure with an additional number of parking spots for charging electric vehicles.

## OVERVIEW OF TECHNICAL SOLUTIONS FOR E-VEHICLE CHARGING STATIONS

Below is a review of the equipment for charging electric vehicles and its specific applicability. Three specific characteristics which mark every single charging station are:

- 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, it would be desirable that the sockets have protection against contact surge voltage. This mode is common for recharging smaller vehicles, like electric bikes and motor bikes.



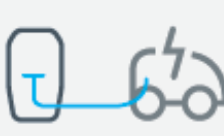

**Mode 2** implies there is the possibility of determining different charging parameters, and the connection between the charger and the vehicle is achieved via a cable with a built in protective relay. Protective relay also has a control function, since it can control and manage the charging current. Communication is achieved via control pins that need to be present on the vehicle's socket. Protective relay contains a circuit breaker which protects 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, like checking the status of a connection, continuous checking of grounding status, activation and deactivation of charging, as well as the possibility to select charging output depending on vehicle's needs. Charging station has in-built protective and management relays, like fuses for protection from overvoltage and overload, a circuit breaker which protects 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 this specificity, this mode is suitable for connecting 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 up. 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 in regard to voltages and power outputs.

Table **Error! No text of specified style in document.**-12: Modes of electric vehicle charging

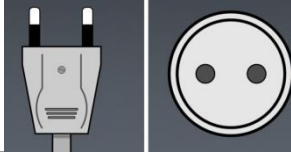
MODE 1	MODE 2	MODE 3	MODE 4
			
<b>Direct connection between vehicle and grid</b>	Direct connection between vehicle and grid	Direct connection between vehicle and grid	Indirect connection between vehicle and grid via external charger
<ul style="list-style-type: none"> <li>- <b>Non-dedicated socket</b></li> <li>- <b>Cable without communication link</b></li> <li>- <b>Risk from overheating</b></li> </ul>	<ul style="list-style-type: none"> <li>- Non-dedicated socket</li> <li>- Cable with a communication device</li> <li>- Charge monitoring option</li> </ul>	<ul style="list-style-type: none"> <li>- Dedicated socket with charge monitoring</li> <li>- Dedicated cable</li> </ul>	<ul style="list-style-type: none"> <li>- External socket with direct current and charge monitoring</li> <li>- Dedicated cable</li> </ul>

Below is a general overview of the different types of charging stations with the most important features that characterize them. Charging stations are connected to either alternating (AC) or direct (DC) current. In case of **AC charging stations**, the converter for charging batteries of electric vehicles is built-in in the vehicle, as well as the charging protocol itself. The installed charging station is just a source of AC which provides support to the required safety protocols and safe operation. DC charging stations are supplying direct current, and the charging protocol has been defined by the IEC 62196-3 standard. In this case the battery charging converter is located in the charging station, so apart from the power connections, charging the battery of a vehicle also requires signal connectors that 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 **Error! No text of specified style in document.**-13: Characteristics of e-vehicle charging stations

Type of charging station	Current	Level	Power	Mode	Connector	Approximate price	Charging time*
<b>House chargers</b> 	AC	Level 1	$\leq 3,7 \text{ kW}$	Mode 1-2	Type C (Euro connector) 	400-800 EUR	11 – 14 h
<b>Slow chargers</b> 	AC	Level 2	$\geq 3,7 \text{ kW}$ $\leq 22 \text{ kW}$	Mode 2-3	IEC 62196-2 Type 2 (7-22 kW);  Commando (7-22 kW)  Tesla connector 	1500-4000 EUR	2 – 6 h
<b>Fast chargers</b>	AC, three-phase	Level 2	$> 22 \text{ kW}$ $\leq 43.5 \text{ kW}$	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
<b>Fast chargers</b> 	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
<b>Ultra fast chargers</b> 	DC	Level 3	$\leq 350 \text{ kW}$	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 limitations for charging in relevant charging stations



Connection of a facility (in this case a charging station) to the electric energy distribution grid is performed based on the decision on issuing approval for connecting, which is issued by the Montenegrin Electricity Distribution System (Crnogorski elektrodistributivni sistem - CEDIS), to which grid the user's facility is connecting to. The proposed minimal technical specifications proposed for installation of fast chargers are provided in **Annex 1**.

In addition to the previously described types of charging, there are also several technological options for wireless charging (Magnetic Coupling Resonance and Electromagnetic Induction) or battery switching. Both options are not realistic in the context of the current Montenegrin market, therefore they shall not be considered further.

In the context of the integration of charging stations with renewable energy sources, there are technological solutions for modular application of photovoltaic cells coupled with electric vehicle charging stations. The relevant system can be deployed with or without battery-based energy storage solution.

## CRITERIA FOR DEPLOYMENT OF E-VEHICLE CHARGING STATIONS

Numerous studies conducted so far show that the largest share of electric car charging is done at home, and professional literature forecasts that this share shall be around 80% in the future. Despite of this, the availability of e-vehicle charging infrastructure is a key element of e-mobility, and its development in the initial stages of e-vehicle market development is of particular importance. Good planning of a publicly available fleet network meets the prerequisites for penetration of e-vehicles and overcoming the underlying barriers that their owners encounter, such as the possibility of travelling on longer distances and overcoming the fear of being stranded with an empty battery during the trip. Given that the process of planning, construction and maintenance of charging stations is complex from various aspects (financial, legal, logistical, etc.), special attention has to be paid to selecting locations and type of charging stations that will be given priority in construction, in order to create the basic network of charging stations accessible to the public that can meet customer needs. Therefore, it is necessary to determine the key criteria that will be used to select the locations and types of charging stations that will be built on them.

The location selection criteria are generally different for urban charging stations and those on intercity roads and expressways, and the location of the charging station itself determines the optimum type of charging station deployed. Since the charging stations located on intercity roads and expressways usually are not the final destination location of the users, in these locations is desirable to deploy fast DC charging stations (output power >50kW), while location selection should be guided by the criteria of 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 are the average time a car is parked at those locations, 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 the infrastructure for fast charging of vehicles at intermodal locations is not just an additional feature relevant to the existing e-vehicle users, but it opens up space for development of new services such as e-taxi or e-car sharing.

Finally, it should be mentioned that the number of tourists arriving with electric vehicles shall keep increasing in the future. While it is to be expected that charging of vehicles at the final destination is going to be carried out within private accommodation facilities (hotels, apartments, camps), the planning of locations for deployment of charging stations accessible to the public should take into account the routes used by the largest number of tourists.

Table **Error! No text of specified style in document.**-14: 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 deployment of charging stations in Montenegro

According to the described location types, the first step in identifying potential locations for deployment of charging stations is analysis of traffic situation in MNE.

The total length of the roads in MNE is approximately 5300 km, out of which 1700 km on a solid surface. At the moment there are no highways open to traffic (works are currently ongoing on the construction of the Mateševac – Smokovac section of the future Bar - Boljare highway), while the intercity/regional road transport takes place on main roads and regional roads.

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

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

MNE plans to develop a network of highways in the upcoming future, including the Bar-Boljare highway and coastal variant of the Adriatic-Ionian highway – 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 is up to 5 times higher compared to the remainder of the year.



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

Traffic intensity on the main roads in Montenegro can be analysed based on the data collected from traffic counters, which is one of the key criteria for selecting potential locations for deployment of charging stations. According to the data for 2017, the 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 at the Radanovići – Budva section on Saturday, 12 August, 2017. The data on monthly traffic on main roads and annual average of daily traffic in 2017 is shown in the **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 those two largest cities, the population of the remaining dozen or so urban centres is between 5 and 20 thousand.

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

After a deeper insight into the status and needs of individual elements of passenger traffic in MNE, indicative locations recommend for planning of a future network of publicly available charging stations for e-vehicles were recognized. In addition to that, an indicative number of charging stations that would fulfil the minimal user requirements has been provided.

*Table **Error! No text of specified style in document.**-15: Overview of indicative locations in Montenegro for deployment of charging stations accessible to the public*

Location type	Location	Description	Indicative number of charging stations
Urban area	<b>Podgorica, Nikšić</b>	<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. Having in mind that these are larger cities with the absolutely highest passenger transport frequency during the whole year, they represent the highest potential to the development of e-mobility in Montenegro. Smart planning and deployment of charging infrastructure shall encourage the potential buyers of e-vehicles and contribute to overcoming of key barriers.</p> <p>In urban areas, public parking spaces (outside and garage) in the vicinity of various facilities (city centre, sports facilities, cultural institutions, markets, fairgrounds and the like) are generally recognized as potential sites for deployment of charging stations.</p> <p>It should be noted that with the emergence of e-vehicles in cities, the private sector quickly recognizes the added value that it can provide to its customers and decides to build charging stations within facilities where it provides certain services (sales centres, catering facilities).</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, whereby a good planning of spatial distribution of locations would be important in order to achieve good coverage throughout the city.
	<b>Other larger towns</b>	Regarding other towns in Montenegro with between 10,000 and 20,000 inhabitants, it is recommended to first analyse the vehicle fleet and the influence of seasonality, in order to select the priorities for the development of charging station network and assess what would be the adequate number of charging stations. The influence of seasonality is tightly tied with tourist activities, therefore it could be expected that there shall be a need for a higher number of charging stations in coastal towns.	Namely, for all other urban environments it is recommended that the number of charging stations corresponds to the number of major locations with a higher number of parked vehicles (large public parking spaces, public garages), as well as favourable locations in city centres.
Intercity road routes	<b>Main and regional roads</b>	The length of main and regional road network is approximately 1,900 km, and out of that 900 km are main roads, which represent the sections of the road network with the highest traffic intensity, as they link the most important cities in the country, economic centres and border crossings. For initial selection of potential locations for charging stations, it is recommended to use the data on traffic frequency on certain roads ( <b>Annex 2</b> ).	Taking into account the criteria for maximum distance between two charging stations set at 50km, it can be estimated that it is necessary to determine approximately 20 locations for deployment of charging stations at the main road network. The most favourable locations for the construction of charging stations on these routes are gas stations and rest stops with additional amenities.
	<b>TEN-T and highway</b>	In the future, the integration of the Montenegrin transport network into the Trans-European Transport Network is expected. Deployment of charging stations on roads that shall become an integral part of the European network is of common interest both to Montenegro and to the European Union, because it contributes to multimodal development of transport and elimination of bottlenecks. Therefore financial support provided within EU projects (CEF) for deployment of electric vehicle charging infrastructure on these corridors can be expected. (An example from Croatia: "EAST-E Project" - deployment of 27 fast DC charging	<p>The key criterion for selection of locations on these routes is the maximum distance between two charging stations, and it is recommended that it should not be longer than 50 km.</p> <p>The total length of the planned Bar-Boljare highway shall be 129 km, therefore it is envisaged that there is a need to deploy charging stations at three locations in each of the directions of the highway.</p>

		<p>stations on the route of the Mediterranean TEN-T corridor, financed by the CEF fund). An overview of indicative extension of TEN-T transport network to Montenegro has been provided in <b>Annex 3</b>.</p> <p>The planned Bar-Boljare highway, the works on which officially started on 11 May 2015, with the construction of the priority section Smokovac – Uvač – Mateševo, shall be a part of the future TEN-T corridor.</p>	
<b>Intermodal locations</b>	<b>Airports</b>	There are two international airports in MNE, namely airport Podgorica and airport Tivat.	Each international airport represents one location for charging station deployment.
	<b>Train and bus stations</b>	All train and bus stations in urban environments are potential locations for charging station deployment, and the dynamic of deployment and selection of priority locations need to be coordinated with the development of the whole charging station network in that urban environment.	When planning for a charging station network in a certain urban environment, it is recommended to select 1-2 intermodal locations (main bus station, main train station).
<b>Tourist locations and facilities</b>	<b>Road routes</b>	<p>According to border police data, in 2016 there were slightly more than 1.5 million entries of foreign vehicles. During peak tourist season, average daily road traffic intensity at border crossing points is doubled or even tripled compared to typical days of the year. At certain sections (Herceg-Novi – Kamenari and Budva-Bar), daily frequency during tourist season and over weekends is more than 25,000 vehicles. Particularly burdened are the main routes, 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, as well as the Bar-tunnel Sozina-Podgorica route.</p> <p>Deployment of infrastructure for charging e-vehicles on routes used by foreign vehicles by tourists arriving to Montenegro is of key importance, since it shall have a direct impact on their whole experience of staying in MNE, and to some tourists the availability of charging stations may be the decisive factor when deciding whether to come to Montenegro.</p> <p>The private sector shall aptly respond to the emergence and increase of demand for charging of tourists' e-vehicles, by providing the appropriate infrastructure offer that shall be built at the users' destination points (within hotels, apartments, camps). On the other hand, publicly available charging stations on road routes are an infrastructural requirement, so that the tourists using electric vehicles can arrive to their final destination.</p>	<p>Tourist routes are usually on main roads, where the deployment of charging stations is recommended anyway, but most definitely more charging stations need to be deployed on those routes. In order to fulfil user needs, deployment of fast DC charging stations is recommended at those locations, since it is assumed that users at these locations will want to recharge their vehicles as quickly as possible.</p> <p>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>
	<b>Final destinations</b>	In addition to routes, an additional aspect are the final destinations suitable for deployment of charging stations, like national parks, parks of nature and other protected areas of nature. Deployment of infrastructure in those locations does not only enable domestic and foreign visitors to come and visit, but also contributes to the preservation of characteristics that are the reason why some areas were proclaimed as protected, as well as general promotion of eco-friendly vehicles.	<p>Each final destination for tourists represents a potential location for charging station deployment. Since users are usually staying several hours when visiting such locations, it would be rational to deploy lower-powered charging stations.</p> <p>As an example, Tesla's destination chargers could be mentioned, which are being</p>

		It would be preferable to deploy lower-power charging stations that require smaller investments at those locations, having in mind that it is expected that the visitors spend more time at those locations.	offered at final destinations such as hotels and restaurants, and are being deployed in cooperation with local partners, who are thus attracting attention of and providing additional services to their clients.
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### Selection of final locations for charging station deployment

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

Below is provided an overview of factors which are usually included in the multi-criteria analysis for selection of the most suitable locations.

Numerous factors have an impact on the selection of the final location for charging station deployment, chief of which are economic and land-related, and in regard to practicality and safety, engineering factors of feasibility are taken into account. From the service availability aspect, charging stations need to be located where there are good traffic connections and a high demand for the service. Finally, charging station infrastructure is an important element of the whole transport infrastructure and is directly linked with the society's development, therefore it is necessary to take into account social factors as well, and in order to achieve sustainable development, environmental factors need to be taken into account as well. Only if all the aforementioned factors are taken into account, comprehensiveness and rationality of the selection process of charging station locations can be ensured.

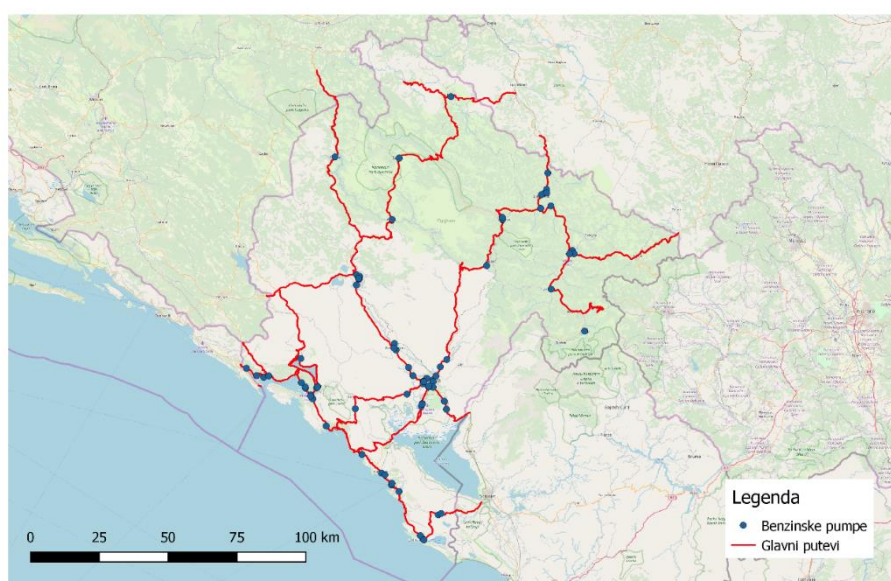
*Table **Error! No text of specified style in document.**-16: Overview of the criteria for the selection of final locations for charging stations in MNE*

Criteria type	Criterion	Description
<b>Economic</b>	<b>Construction cost</b>	Construction cost includes the following: purchasing the land, preparatory works at the location (demolishing the existing facilities, terrain preparation), charging station procurement, project design, connection fee and such
	<b>Operative costs</b>	Include all costs and depreciation resulting from daily operation and maintenance of a charging station.
<b>Engineering feasibility</b>	<b>Availability of infrastructure for connecting to the power grid</b>	Distance from the substations, i.e. from the point where it would be possible to connect the charging station to the grid is a very important factor which impacts the project's feasibility, reliability of electric energy supply, energy losses, as well as the total cost of the project.
	<b>Impact on the power grid</b>	Electric vehicle charging stations are an integral element of the power grid, i.e. of the medium and low voltage electricity distribution networks and therefore can have a significant impact on it. It is therefore necessary that the selected locations are in areas where they will not cause negative effects on the stability of the distribution network.
<b>Availability of electricity</b>	<b>Practicality</b>	Good accessibility of a charging station is an important criterion for selection of location, taking into account the status of access roads and hubs.
	<b>Service capacity</b>	It is defined as the daily volume of services provided and the number of e-vehicles that can access charging services at the relevant location.
	<b>Service radius</b>	When selecting a location, the distance from other locations within the charging station network accessible to the public needs to be taken into account. In regard to the intercity transport, it is necessary to determine the maximum distance between two charging stations, which shall enable longer distance trips. In urban environments the content offered in the

		vicinity of the planned location, i.e. assessment of the potential user demand needs to be taken into account.
<b>Social factors</b>	<b>Possibility of expansion</b>	Social development and environmental protection shall without a doubt contribute to the continuous increase of demand for e-vehicle charging, therefore it is recommended to take into account the criterion of expansion of an existing location, i.e. installation of additional recharging points at that location.
	<b>Local population's point of view</b>	It is recommended to take into account the point of view of the local population living in the vicinity of the charging station because of possible negative perception due to additional occupying of the existing parking spots and additional traffic and noise near the charging station.
	<b>Support of local authorities</b>	Different local government policies that support the development of e-mobility in both financial and non-financial sense.
<b>Environmental and geographic factors</b>	<b>Environmental impact of charging station deployment</b>	When selecting the location for charging station deployment, possible environmental impacts need to be taken into account. This factor is mostly negligible, since charging stations are usually deployed in already developed areas.
	<b>Topography</b>	The relevant location needs to fulfil the facility safety and stability criteria. Therefore it is recommended to avoid locations on unsafe elevations or slopes.

## Locations in the vicinity of gas stations

*Image 6* provides an indicative overview of potential locations for deployment of charging stations within existing gas stations. Deployment of fast chargers is recommended at those locations. The final selection of locations shall result from multi-criteria analysis, whereby the willingness of the local distributor or the owner of the petrol pump to cooperate shall 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 deployment of charging stations that fulfil intermodal criteria. These are train and bus stations and taxi stops. Final decisions on selection of locations need to be made in accordance with the development dynamic of other segments of e-mobility in the region.



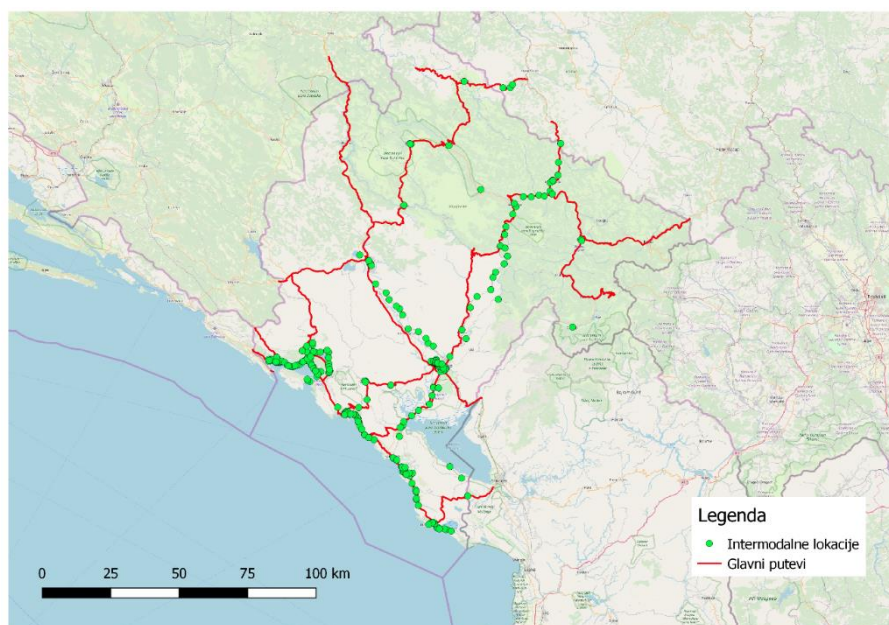


Image 7. Intermodal locations

## PROCEDURE FOR DEPLOYMENT OF E-VEHICLE CHARGING STATIONS

Deployment of e-vehicle charging stations includes 2 key steps: 1) the deployment itself, and 2) connecting it to the electric energy distribution grid. Below are provided the guidelines and examples of good practice for both of these steps.

### Construction of an e-vehicle charging station facility

Key elements of charging station deployment which influence the complexity and the dynamic of the process largely depend on two factors: 1) on the legal entity deploying the charging station; 2) on the ownership over the land where the charging station is being deployed. In regard to legal persons, we can differentiate between (a) legal entities from the private sector and (b) local self-government entities, public institutions and companies. Every legal person can deploy a charging station on its own land or elsewhere.

Unlike the procedure when a business entity from the private sector is deploying a charging station, the procedure for local self-government entities, public institutions and companies is more complex due to their obligation to implement public procurement procedures. On the other hand, the ownership status over the land on which the charging station deployment is being planned often has a key role in the implementation dynamic of the whole project. The agreement process on building a charging station on land that is not owned by the investor in practice often represents a bottleneck for the entire process.

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

Table **Error! No text of specified style in document.**-17: Key factors influencing the elements of the charging station deployment procedure

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

			<ul style="list-style-type: none"> <li>Contract agreements with land owners</li> </ul>
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The aforementioned Directive 2014/94/EU on the deployment of alternative fuels infrastructure lists the basic technical requirements that the publicly available charging stations need to fulfil. 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, if that is technically feasible and economically justified.
- **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 the operators need to be justified, easily and clearly comparable, transparent and non-discriminating.

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

In addition to that, regulation in the area of facility construction needs to be taken into account during the charging station installation procedure, which means that building permits need to be obtained, if that is the **legal requirement**.

In order to promote e-mobility, it would be of utmost importance to ensure that the public has access to information on charging stations accessible to the public. Below is presented a good practice example from the Czech Republic, which can be used as an example for system design in MNE.



#### - An example of good practice -

##### Registry of charging stations - Czech Republic

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

Systematic record of all publicly available charging stations is 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

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 enable it to use the grid within the prescribed framework. During the connection process the possibility of connecting to the grid is analysed, optimal technical solution for connection is determined, and technical, economic and other requirements for connecting to the grid are defined, as well as requirements for connector deployment and creating the conditions within the grid. The procedure is developed with the goal to connect users in an optimal manner, to make it transparent and to ensure equality for all grid users.

Croatia is listed as another example of good practice, since 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 complexity of connection and 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 a connection of a simple facility in accordance with the regulations on spatial planning and construction works, which include electric vehicle charging stations for which there is no need to fulfil 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 analysis carried out in this and previous chapter has determined that the most significant barrier to the development of e-mobility in Montenegro lays in the tariff system for using electric energy distribution grid's services. In order to confirm this conclusion, below is provided a comparative analysis of expenditures of a charging station in Slovenia, Croatia and Montenegro. After that, a proposal of a business model for development of e-vehicle charging stations is provided.

### Costs of connecting to and using distribution grid' service - a comparative analysis SLO, CRO and MNE

The comparative analysis has been carried out for a 50 kW charging station. The comparative analysis has determined that one-time cost for connection fee is several times lesser than for example in Croatia. That expenditure is also lower than in Slovenia, notwithstanding the fact that Slovenia is providing an incentive for e-mobility development.

*Table **Error! No text of specified style in document.**-18: An example of calculation of the connection to the distribution grid fee for a 50 kW charging station*

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

In the context of realization of sustainable business models, the existing tariff system is a significant factor. The table below provides a framework overview of the cost of using distribution grid's services in each of the analysed states, during the preparation of which 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 is being 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 **Error! No text of specified style in document.**-19: An example of calculation of the grid use fee for a 50 kW charging station

Country	Fee for distribution grid usage					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)	
<b>Slovenia</b>	3.24.	0.01.	162.15.	0.29.	162.45.	\
<b>Croatia</b>	5.93.	0.03.	296.67.	0.83.	303.01.	includes the metering service fee 5.5 EUR/month
<b>Montenegro</b>	17.27.	0.02.	863.67.	0.41.	<b>864.07.</b>	\

\*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 establishment of market models for e-mobility in MNE:

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

Regulatory framework that is not adapted is one of the key obstacles for accelerated dynamic of building infrastructure for e-vehicle charging, which 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 what is the case in the countries of the region.

The biggest problem with this approach and tariff model is the fact that peak power is charged as highest average power measured during each billing cycle during higher daytime tariff, which means that it is possible that this peak power is not being used for majority of the time.

**Therefore, in the new concept for regulatory framework relevant for construction and management of charging stations in MNE, it will be needed to consider the introduction of new tariff models for using the power grid for the users of e-vehicles. The key characteristic of the new tariff model should be the enabling of commercialisation of infrastructure for charging e-vehicles in the early phase of e-mobility development, while there is still a low number of users of e-vehicles present at the market.**

More detailed analyses may show whether the new tariff model can be structured in such a manner as to not contain the billing item for calculating peak used power, that the fees for peak used power are decreased or such. Czech Republic can be used as an example of good practice, where there are two tariffs for charging electric vehicles, where one is for households, and the other one is for companies (the fee for using the grid during the low tariff is approximately 25 times lesser per unit of energy delivered compared to the high tariff). The lower price tariff should be 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 the competent DSOs for their respective areas. The companies using this tariff have the benefit that they can use all of their appliances during the lower tariff, while companies can use the lower tariff only for charging e-vehicles.

### Market model

Well established market relations between main entities are the foundations for development of business models and 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, while charging

station deployment and management, as well as provision of charging services, should be considered as market activities. Such relations between entities, where distribution system operators do not participate in electric vehicle charging station deployment and management, are present in many countries in which the concept of e-mobility is well developed, while the countries that are in the initial phases of e-mobility development that put distribution system operators in charge of charging station deployment are now abandoning those models and/or trying to reshape them.

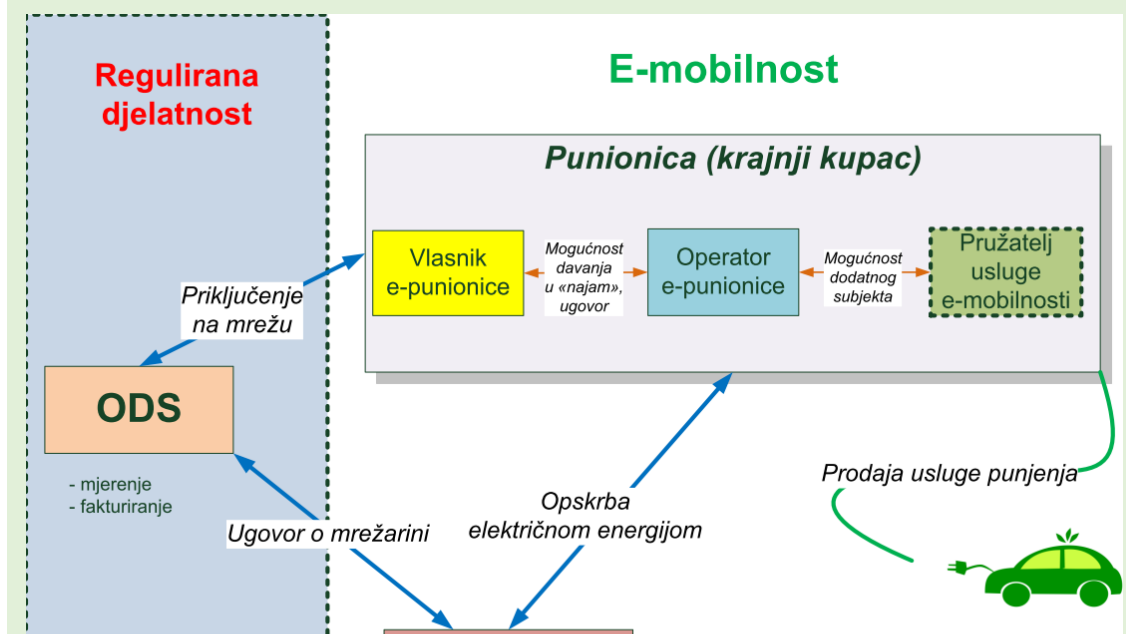


### - An example of good practice -

#### Market model

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

The owner of the electric vehicle charging station, being the end buyer, has the possibility to convey certain activities which encompass e-mobility to other entities via contractual relations. So it is possible that the charging station is managed and maintained by a different entity, which is not its owner. In the same vain, the provision of e-mobility services (charging of electric vehicles, identification of users, subscriber services, charging, etc.) to end buyers (users of electric vehicles) is possible to be conveyed to separate entities via contractual relations.



The pricing and structure of e-vehicle charging fees are a product of business models that shall result from the established market model. The establishment of regulatory framework which shall be supportive to the development of e-mobility in Montenegro is a requirement for establishing competitive and attractive charging fees.

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# ANNEXES

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

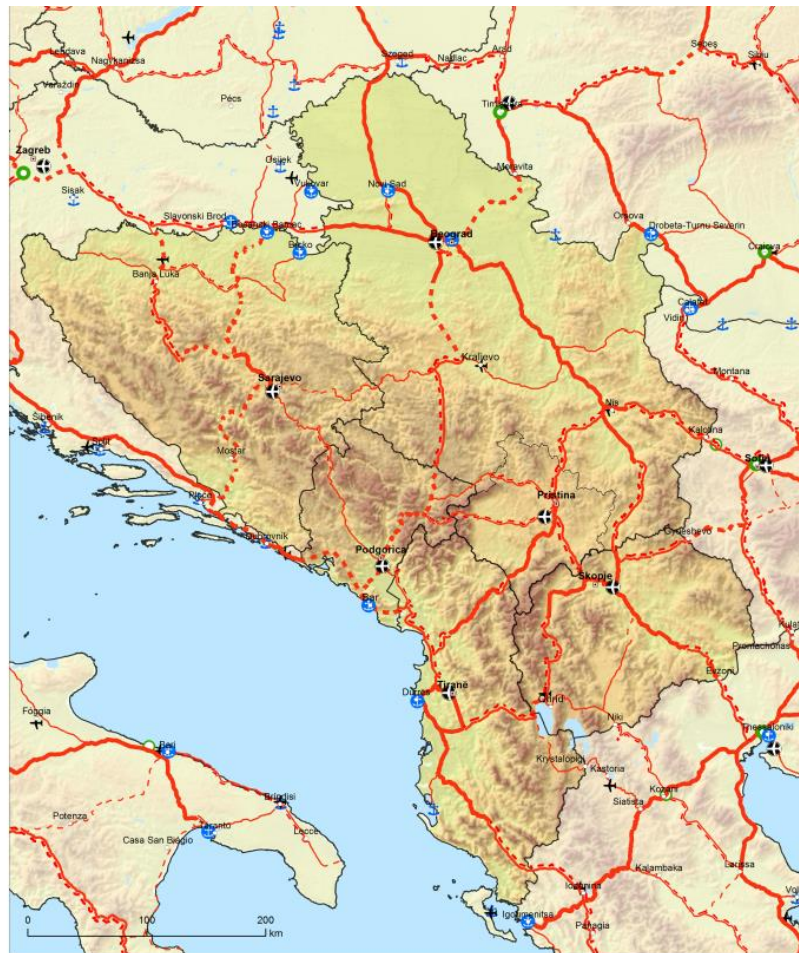
INPUT SIDE	SPECIFICATION
Input voltage range	400 VAC (+/-10%)
Input frequency	50 Hz
Maximum input current and power	145 A, 103 kVA
Maximum THD	max 2.5 %
Minimal efficiency	93%
Minimum power factor	95%
Minimum life span of a charging station	15 years
<b>AC OUTPUT SIDE</b>	
AC output power	22kW – 43kW
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
<b>DC OUTPUT SIDE</b>	
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)
<b>GENERAL</b>	
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
<b>CONNECTOR</b>	
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, 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
<b>FUNCTIONS AND DESIGN</b>	

<b>Charger operation indicators</b>	Visible on the display while the vehicle is charging for all the vehicles being charged simultaneously
<b>User authentication / activation</b>	RFID system ISO/IEC14443A/B, ISO/IEC15693
<b>Communication with the CSCC (Charging Station Control Centre)</b>	GSM/GPRS/3G 10/100 Base-T Ethernet
<b>Power limit control</b>	AC and DC software
<b>Minimum OCCP protocol</b>	v1.5
<b>Maximum dimensions (height x width x length)</b>	1900 x 950 x 800 mm
<b>Maximum weight</b>	600 kg
<b>NORMS AND STANDARDS</b>	
<b>General</b>	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

Trans-European Transport Network contributes to the sustainable and multimodal development of transport and elimination of bottlenecks. In this regard, transport networks play a significant role in ensuring sustainable mobility, by combining European competition with taking care of its own citizens, and at the same time ensuring transport of goods and passengers in Europe. European Commission's plan regarding transport infrastructure is to modernize the existing routes for all types of transport and build new routes in less connected regions.

Indicative representation of road routes envisaged to be integrated into the Trans-European Transport Network.



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

## ANNEX 3 - TRAFFIC INTENSITY IN 2007 AND 2017

Traffic intensity at main roads in Montenegro during 2017 is shown in the table below.

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	-
<b>Total vehicles in 2017</b>	<b>2.605.347</b>	<b>3.741.040</b>	<b>1.506.717</b>	<b>5.790.196</b>	<b>899.958</b>	<b>3.898.656</b>
<b>PGDS 2017</b>	<b>7.138</b>	<b>10.249</b>	<b>4.128</b>	<b>15.864</b>	<b>2.466</b>	

