NATIONAL REPORT IN IMPLEMENTATION OF THE PROVISIONS OF ARTICLE 10(1) OF DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 22 OCTOBER 2014 ON THE DEPLOYMENT OF ALTERNATIVE FUELS INFRASTRUCTURE

Introduction

The National Policy Framework for the Development of the Market as Regards Alternative Fuels in the Transport Sector and the Deployment of the Relevant Infrastructure developed by the Ministry of Transport, Information Technology and Communications was approved by Decision No 87 of the Council of Ministers of 26 January 2017 and amended by Decision No 323 of the Council of Ministers of 11 May 2018.

It was prepared in accordance with the requirements of Article 3 of Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. The overall objective of the policy framework is to create a suitably favourable environment for the broader use of alternative fuels and drive systems in the transport sector and to put in place conditions that are comparable with those in other developed EU countries.

This report is prepared in accordance with the provisions of Article 10(1) of Directive 2014/94/EU and contains information concerning the elements set out in Annex No 1 to said Directive.

1. Legal measures

In October 2018 the Act Amending and Supplementing the Energy Act was adopted (SG No 83/9.10.2018), whereby the requirements of Article 4(7), (8) (first sentence), (11) and (12) of Directive 2014/94/EU were transposed. This act establishes the necessary legal framework concerning the operators of publicly accessible recharging points for electric vehicles. It provides for the personae of the operator of a publicly accessible recharging point and of the users of electric vehicle recharging services. The procedure for connection of a recharging point to the electricity distribution network is also provided for.

Furthermore, in view of transposing of the provisions of Article 4(8) (second sentence) and (9) of Directive 2014/94/EU, as well as having regard to the provisions of Article 92a(4) of the Energy Act, in accordance with which the relations concerning provision of services for recharging of electric vehicles are regulated in the rules referred to in Article 91(2) of the Energy Act (Rules of Trading in Electricity), the Transitional and Final Provisions of the Rules for Electricity Metering establish the respective provisions for amending and supplementing of the Rules of Trading in Electricity (SG No 35/30.04.2019).

In accordance with Article 56(10) of the Spatial Development Act (SG No 25/26.03.2019), an Ordinance of the Municipal Council sets out the terms and procedure for deployment of recharging units for electric vehicles as elements of the urban decor.

In July 2018 amendments were adopted to the Ordinance setting out the procedure and the rate of product charges paid, aiming at additional changes of product charges for motor vehicles, whereby the rate of product charge for new hybrid motor vehicles and hybrid electric vehicles (categories M1 and N1) and fully electric vehicles (categories M1 and N1) was reduced.

Table 1: Annex No 2 to Article 3(1), point 2 of the Ordinance for determining the procedure and the rate of product charges (amended, SG No 60/20.07.2018)

Rate of the product charge for motor vehicles (MV)					
Motor vehicle age	Engine type				
	Motor vehicles with internal combustion engine (categories M1 and N1)	Motor vehicles with internal combustion engine (Categories M2 and N2)	Motor vehicles with internal combustion engine (Categories M3 and N3)	Hybrid motor vehicles and hybrid electric vehicles (categories M1 and N1)	Fully electric vehicles** (categories M1 and N1)
	(BGN per unit)	(BGN per unit)	(BGN per unit)	(BGN per unit)	(BGN per unit)
New*	125	625	938	100	102
Up to 5 years old	194	970	1 455	170	
From 5 to 10 years old	290	1 450	2 175	240	
Over 10 years old	310	1 550	2 325	255	

* For the purposes of the Ordinance, new motor vehicles are the vehicles that meet at least one of the following conditions:
1. Motor vehicles with mileage of less than 6 000 km which are placed on the market for the first time or are acquired for personal use as a result of their entry into the territory of the Republic of Bulgaria from another EU Member State, or the import of motor vehicles from a non-EU state, or
2. Not more than 6 months from the date of their first registration have elapsed.
** A product charge shall be payable from 1 January 2022.

The 2019 amendments to the Ordinance on sustainability criteria for biofuels and bioliquids and a Calculation methodology of greenhouse gas emissions reduction throughout the whole life cycle of the biofuels taking into account indirect land-use changes (also in relation to transposing of texts from Directive 2015/1513 into the national law) are aimed at preventing materials from being intentionally modified into waste to be used in production of new generation biofuels, and set out rules for calculation of greenhouse gas emissions resulting from indirect land-use change.

In September 2019, a draft Ordinance on the conditions and procedures for designing, construction and commissioning into operation and control of refuelling stations for hydrogen-driven vehicles was published for public consultation. It was prepared by the Ministry of Regional Development and Public Works pursuant to Article 169(4) in relation to the Spatial Development Act, (1) and §18(1) of its Final Provisions.

The adoption of this Ordinance was necessitated by the analysis of the regulations in the National Policy Framework for the Development of the Market as regards Alternative Fuels in the Transport Sector and the Deployment of the Relevant Infrastructure which found lack of regulations on the requirements for designing, construction and commissioning into operation and control of hydrogen fuelling points. The main objective of said Ordinance was to enable the construction of an infrastructure for refuelling of hydrogen-driven cars, thus contributing to the development of the market for alternative fuel vehicles.

The draft Ordinance on the conditions and procedures for designing, construction and commissioning into operation and control of refuelling stations for hydrogen-driven vehicles lays down:

- The technical requirements for designing, construction and commissioning into operation and control of refuelling stations for hydrogen-driven vehicles, hereinafter referred to as ‘hydrogen fuelling stations’ for stationary applications;

- Control of hydrogen fuelling stations with regard to the minimum safety design characteristics in the process of designing, construction and operation.

The expected result is the deployment of an infrastructure for refuelling of hydrogen-driven cars in the territory of the Republic of Bulgaria as part of the core trans-European transport network.

After the completion of public consultations at the national level, the draft is expected to be finalised and adopted by the end of March 2020.

In relation to the newly adopted European legislation in the field of type-approval of motor vehicles and their trailers, measures will be taken to ensure compliance with the requirements at national level, where this is required by the provisions of the relevant regulations.

2. Policy measures in support of the implementation of the National Policy Framework

Strategic documents in support of the implementation of the National Policy Framework

The Integrated Transport Strategy in the period until 2030, approved by Decision No 336/23.06.2017 of the Council of Ministers, sets out 3 strategic objectives covering 9 strategic priorities, each of them including a framework of specific targets. On this basis, the most appropriate measures for achieving the relevant objectives were identified.

The measure 'Promotion of the use of biofuels and other renewable fuels in transport' is envisaged for achieving strategic priority 5 'Reduction of the consumption of fuel and increasing the energy efficiency of transport'.

In 2019 a draft of the Integrated National Energy and Climate Plan of the Republic of Bulgaria until 2030 was developed at the Ministry of Energy.

The main objectives set out in the draft Plan are, as follows: promoting low-carbon economic development; competitive and secure energy sector; reducing dependence on import of fuels and energy, and ensuring affordable energy for all consumers.

The plan envisages that, with a view to promoting the development and deployment of electric mobility, obligations will be imposed on the local authorities to introduce within their short – and long-term programmes their own specific measures on their territory that would make the use of such transport more attractive. Actions undertaken in some municipalities will be promoted as good practices with a view of their wide-spread implementation, for example: tax reliefs, simplified access, ensuring a minimum number of parking spaces, etc. for use of electric vehicles.

Supporting measures

- **Direct incentives for purchase of alternative fuel vehicles or for building the infrastructure**

In 2016, a programme of the National Trust EcoFund (NTEF) was launched for support of public institutions in purchasing of electric and plug-in hybrid vehicles.

Funds are raised from international trade in assigned amount units (AAUs) for greenhouse gas emissions, from sale of greenhouse gas emission allowances for aviation activities.

The subsidy foreseen by NTEF depending on the respective category of the electric vehicle is, as follows:

- BGN 20 000 for fully electric vehicles categories M1 (4+1 seats) and N1
- BGN 10 000 for hybrid (plug-in) electric vehicles categories M1 (4+1 seats) and N1
- BGN 20 000 for fully electric vehicles category L7e, as well as for additional superstructures (for cleaning, for watering, for transportation of bulky loads, isothermal boxes, rubbish bins) up to 50 % of their value but not exceeding BGN 3 000
- BGN 30 000 for fully electric vehicles (vans 7+1; 6+1 seats), category M1 or N1
- BGN 40 000 for fully electric vehicles categories M2 and N2

As at 2018, 19 electric vehicles and 4 hybrid electric vehicles were purchased under the Scheme for promoting the use of electric vehicles within the NTEF Climate Investment Programme. 16 projects have been successfully completed by: The Ministry of Environment and Waters, the Ministry of Economy, the Ministry of Labour and Social Policy, Directorate General Civil Aviation Administration and the municipalities of Plovdiv, Asenovgrad, Samokov, Gorna Oryahovitsa, Burgas, Slivnitsa, Smolyan, Gabrovo, Vratsa, Gotse Delchev and Blagoevgrad. Contracts were signed under 3 projects and payment is forthcoming (Ministry of Education and Sciences, Sofia Municipality, Burgas Municipality). 10 projects are currently being implemented by: Sofia Municipality Inspectorate and the municipalities of Nikola Kozlevo, Varna, Sliven, Ivanovo, Haskovo, Kazanlak, Elin Pelin, Kozloduy.

In 2019, a new call for project proposals under the Scheme for promoting the use of electric vehicles was published.

- **Support under the operational programmes for purchase of electric buses in large cities**

Operational Programme 'Environment' 2014—2020 states that public transport is a key sector contributing to ambient air pollution in Bulgaria, the major polluters being fine particulate emissions (PM10) and Nitrogen Oxides (NOx). Priority axis 5 'Improvement of Ambient Air Quality' of the Operational Programme supports measures for reducing emissions from public transport vehicles by:

- Reduction of the use of conventional fuels in public transport
- Retrofitting of public transport vehicles.

In July 2019, within the framework of the said priority axis a new procedure was announced 'Measures for addressing transport as a source of ambient air pollution' with a budget of BGN 500 million.

The objective of the above procedure is to contribute to:

- Improvement of the ambient air quality by reducing the levels of fine particulate emissions (PM10) or nitrogen oxides (NOx);
- Environmental protection by improvement of the characteristics of public transport vehicles – replacement of the obsolete and amortised rolling stock with environmentally-friendly equipment;
- Improvement of the reliability, comfort and travel times of public transport which will change transport patterns and reduce personal car journeys, thereby reducing harmful gases from internal combustion engines.

The procedure comprises the following 2 separate components:

- Component 1: Implementation of activities for improvement of ambient air quality by the purchase and delivery of electric road vehicles – electric buses and trolleybuses.
- Component 2: Implementation of activities for improvement of the ambient air quality by purchase and delivery of electric vehicles for rail transport – tramway rolling stock.

The procedure is for direct award of grants. Eleven municipalities with deteriorated ambient air quality were selected as specific beneficiaries – Burgas, Varna, Vratsa, Pernik, Pleven, Ruse, Sliven, Stara Zagora, Sofia Municipality, Haskovo and Shumen. The eligible candidates were determined according to their powers, as regulated in the national legislation – Article 19(2) of the Clean Ambient Air Act, as well as in accordance with the measures and activities provided for implementation in the said procedure.

It is within the powers of municipal councils to determine the arrangements, procedures, manner and conditions for use of public transport. Municipal councils approve municipal transport schemes for public transportation of passengers by bus lines in accordance with Article 17(5) in relation to paragraph 1 of the Carriage By Road Act.

The respective municipal public transport companies are partners of the municipalities in the said procedure.

The activities eligible for funding under that procedure are, as follows:

- Activities for preparation of a project proposal: preparation of a project proposal, preparation of documentation for a public procurement award procedure, expert analyses and studies – preparation of financial and economic analyses, preparation of feasibility studies, cost-and-benefit analysis; other analyses related to the applicable State aid regime.
- Activities for purchase and delivery of electric vehicles for the public transport:
  - for component 1 – electric buses and trolleybuses
  - for component 2 – tramway rolling stock.
- Activities for purchase, delivery and installation of recharging stations at bus depots and fast-charging points for electric buses
- Activities for optimising the operation of newly acquired transport vehicles:
  - Provision of elements of the integrated transport control systems and their integration into the systems already available in the municipality: for e-ticketing systems, for automatic positioning of transport vehicles, for real-time passenger information, for on-board video surveillance of vehicles, etc.
  - Providing the necessary infrastructure: design and construction of cable routes to charging stations; reworking of existing cable lines, design and construction of complete transformer substations for feeding the charging stations; connection of newly built charging points to the electricity transmission networks; renewal, restructuring, overhaul of the existing overhead contact system aiming at improving the energy efficiency, etc.
- Activities for initial registration and insurance of delivered transport vehicles under each procedure component.

The grant under the procedure is provided to the selected beneficiary municipalities in their capacity as public authorities and owners of public infrastructure which are obliged to ensure the provision of basic services to the population within their territory and to ensure the maintenance of the respective infrastructure.

3. Support for deployment and production

The take-up of hydrogen technologies in transport will be achieved by introduction and production of green hydrogen.

The implementation will start by purchase of buses for the public transport and construction of the respective infrastructure for hydrogen.

in Bulgaria there is no centralised production of hydrogen, which is necessary for a hydrogen fuelling infrastructure. The longest distance in Bulgaria is about 500 km, which makes reasonable the construction of several production plants, for which there is already interest by renewable energy producers. At present the total cost of ownership is being evaluated to determine suitable locations and to prepare financial mechanisms for construction of the plants (including support by the European Investment Bank).

The planned budget in thousands of EUR by year is shown in Table 2.

Table 2: Budget for deployment and production support projects

	Budget by year			Overall budget	Start year	End year
Projects	**2020**	**2021—2025**	**2026—2030**			
Purchase of 50 hydrogen buses by three municipalities	10 000	50 000	90 000	150 000	2020	2030
Construction of a hydrogen fuelling station in Sofia	1 500	4 000	4 000	9 500	2020	2030
Construction of a mobile hydrogen fuelling station in Sofia	300	500	-	800	2020	2030
Production of green hydrogen		10 000	25 000	35 000	2021	2030

Source: Institute of Electrochemistry and Energy Systems at the Bulgarian Academy of Sciences

4. Scientific research, technological development and demonstration activities

Support for technological development under operational programmes and budgets of ministries

The Innovative Strategy for Smart Specialisation of the Republic of Bulgaria 2014—2020 adopted by the government in 2015 defines four priority fields in which Bulgaria has competitive advantages and available economic, scientific and technical capacity for smart specialisation. In two of them – 'Mechatronics and Clean Technologies' and 'Informatics and ICT', development of propulsion technologies is given priority.

With regard to the priorities of the innovation strategy, the Operational Programme 'Innovations and Competitiveness' 2014—2020 provides support for development and implementation of clean technologies, accentuating on transport and the energy sector (storage, saving, and efficient distribution and management of energy, electric vehicles and eco-mobility, hydrogen-based models and technologies, etc). Within the frameworks of Priority axis 1 'Technological Development and Innovation', funding is ensured for 10 projects at total value of BGN 6 506 378, of which the grant amounts to BGN 4 681 590. The projects are closely related to development or implementation of innovations in the relevant field.

The Ministry of Economy launched the process of preparation of the Innovation Strategy for Smart Specialisation 2021—2027 and an Action Plan to it. It will account for and contribute to meeting all criteria for fulfilment of the basic conditions pursuant to Annex IV to the draft Regulation laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, and the European Maritime and Fisheries Fund. Intentions are for the new strategy to build on and further develop the current one, addressing the key challenges and needs arising to date.

At the same time, participation of consortiums of Bulgarian entrepreneurs and clusters, representatives of the academia and regional and local government authorities in European partnerships under Horizon Europe is of key importance. First and foremost, these are partnerships in the field of the following three clusters – Digitalisation, industry and space; Climate, energy and mobility, and Foodstuffs, organic economy, natural resources, agriculture and environment.

In accordance with the national priorities for the period 2021—2027 and the indicative list of programmes adopted by the Council of Ministers (Decision No 196/11.04.2019 of the Council of Ministers) and the allocation of funds from the ESF+, ERDF and the Cohesion Fund for the programme period 2021—2027 (Decision No 335/07.06.2019 of the Council of Ministers), the Operational Programme 'Competitiveness and Innovation' will focus its support on the following policy objectives:

- Objective 1: A smarter Europe by promotion of innovative and smart economic transformation – EUR 1 402 million
- Objective 2: A greener, low-carbon Europe by promotion of clean and fair energy transition, green and blue investments, the circular economy, adaptation to climate change, and risk prevention and management – EUR 188 million.

In 2018 several National Research Programmes were approved by decree of the Council of Ministers of the Republic of Bulgaria.

The largest of them is the Low Carbon Energy for Transport and Households Program (EPLUS), with the Bulgarian Academy of Sciences set as the leading scientific organisation.

EPLUS Programme focuses on a key point of the updated European Strategy – accelerated development and commercialising of technologies for storage and recovery of energy from renewable energy sources (RES) and capture and utilisation of CO_2. It operates in synergy with the working programmes of the Joint Undertakings in Horizon 2020 such as 'Fuel Cell and Hydrogen', as well as with the leading thematic strand 'Secure, clean and efficient energy'.

Societal challenges targeted by the programme are, as follows: storage and conversion of renewable energy, carbon technologies and eco-mobility. The programme ends on 31 December 2020 and its overall budget is BGN 7 300 000, allocated as follows:

- 2018 – BGN 2 920 000
- 2019 – BGN 2 190 000, indicative amount
- 2020 – BGN 2 190 000, indicative amount

Programme funding is provided by the Ministry of Education and Science.

It supplements the Allocated National Research Infrastructure 'Energy Conservation and Carbon Energy' where the emphasis is on the development of hardware infrastructure, while the focus of the national research programme is on activities.

The programme includes the following priority themes in which Bulgaria specialises:

- Storage and conversion of renewable energy
- Electric vehicles and carbon mobility
- Efficient methods of capture and utilisation of CO_2.

The selected themes are of key importance for achieving the strategic goal of creating 'Smart Cities' in Bulgaria.

The programme is aimed at providing conditions for pursuing scientific research, applied research and demonstration activities for the development of new and emerging technologies that enhance the share of utilised renewable energy and ensure accelerated decarbonisation of the economy. The funding for the two groups of activities is allocated 50-50 %.

The activities included in the programme are grouped into three main components.

Component 1 Storage and Conversion of Renewable Energy is aimed at development and implementation of materials, technologies and systems for generation, storage and consumption of clean energy, using resources from renewable energy sources.

There are 5 work packages (WPs) in C1, 4 of which are dedicated to research developments of lower technology development levels – from a concept to the realisation of a laboratory prototype, and the last work package is a demonstration one.

Within WP 1 Analytical Reports, a critical review is made of cutting-edge research developments and technological solutions in Europe and worldwide in the area of renewable energy storage and conversion technologies and systems. The expected results are specific conclusions and recommendations of specialisation and possible 'niches' of accelerated development of Bulgarian science and industry.

WP 2 Storage of Energy in Batteries is dedicated to the development of materials and technologies for production and recycling of a new generation of batteries for storage of energy from renewable sources (RES).

WP 3 Production of Hydrogen by Electrolysis of Water with Electricity from RES focuses on the creation of a new generation of materials, technologies and systems for storage of energy in the form of hydrogen, including by electrolysis of water in polymer electrolyte cells, in solid oxide cells, in reversible fuel cell systems, through photo-electrolysis and biochemical systems.

In WP 4 Other Methods for Conversion and Storage of Renewable Energy, scientific efforts are aimed at creating materials, methods, technologies and systems for conversion of solar, wind, geothermal and mechanical energy. The development of biochemical and catalytic technologies to derive hydrogen from renewable resources and waste is also part of the topics covered.

The fifth work package is Autonomous Energy Supply of Single-family Houses – Demonstration and Analysis of Possibilities. The construction of a 'green hydrogen home' is envisaged, in which heat and electricity will be supplied entirely from renewable energy by a hybrid energy system with 'zero emissions'. Various combinations of alternative components will be implemented, as follows: solar panel – battery/solar panel – hydrogen generator; polymer electrolyte membrane fuel cell/electricity and heat cogeneration system based on solid oxide.

Component 2 Electric Vehicles and Hydrogen Mobility envisages scientific and applied research activities comprising technology readiness levels from 2 to 6, such as fundamental scientific developments and demonstration applied research projects in the area of transport.

As part of WP 1, 3 analytical reports will be prepared, with topical information of:

1. Modern trends in the development of fuel cells

2. Status and outlook for the development of urban mobility

3. Legislative initiatives and barriers to the implementation of hydrogen mobility.

WP 2 combines research for the development of the next generation of fuel cells using innovative approaches. Thematic strands harmonised with the programme of the European Energy Research Alliance were selected: reversible solid oxide fuel cells based on a fundamentally new design; new generation of biofuel cells for electricity generation and bioremediation; new inorganic and hybrid materials with hydrogen conductivity, filling the yet untapped 300-400°C temperature niche for development of fuel cells.

The last three work packages deal with Bulgaria's specialisation in battery/fuel cell-based hybrid electric mobility in terms of expertise and economic model. Combining fuel cells with batteries benefits from the advantages of both technologies. In the National Policy Framework for the Development of the Market as regards Alternative Fuels in the Transport Sector and the Deployment of the Relevant Infrastructure, this approach was assessed as the fastest and economically appropriate for the uptake of hydrogen-based technologies in the transport sector.

A demonstration project of a trolleybus with a hybrid battery/fuel cell extension of the electric range of the vehicle will be developed as part of the programme. The trolleybus will be provided to Sofia Municipality which will participate as an associated partner. The advantages of the selected hybridisation system are, as follows: use of an available infrastructure, existence of an electric motor, provision of flexible transport independent from the electrical infrastructure, achieving a positive impact on the public perception of hydrogen.

The existence of a hydrogen vehicle will motivate the construction of the first hydrogen fuelling station that, according to projections in the National Policy Framework for the Development of the Market as Regards Alternative Fuels is scheduled for 2020. The implementation of the project is expected to encourage the development of a spin-off for the subsequent conversion of trolleybuses in Sofia and in other cities in the country and the region.

The main goal of the scientific research under Component 3 is the creation of new efficient

materials and processes for capturing and utilisation of CO_2. Research will be focused both on methods established in the scientific and applied practice of capturing, separation and conversion of CO_2 , and on new unconventional methods. The planned specific scientific and applied research is grouped into five independent work packages, namely:

WP 2 – Sorption methods for capturing CO_2 : absorption and adsorption methods

WP 3 – Methods of membrane separation of CO_2

WP 4 – Methods of catalytic conversion of CO_2

WP 5 – Methods of biocatalytic conversion and storage of CO_2

WP 6 – Unconventional methods of conversion and utilisation of CO_2 .

In addition to this specifically applied research, WP 1 envisages the preparation of an analytical report entitled Critical Analysis pf Modern and Viable Methods for Capture, Storage and Utilisation of CO_2 addressed to the state authorities, while WP 7 will provide for the establishment of a National Research Network for Capture, Storage and Utilisation of CO_2

Work on WPs 2 through 6 will include both identification, design and research of the most suitable materials for sorption, separation and catalytic conversion of CO_2 , and study and optimisation of CO_2 capture and conversion processes, with a view to developing efficient technologies with a potential for implementation in Bulgaria.

Important results from the programme implementation will be both the accumulation of scientific knowledge on the issues of CO_2 emission control, and the pooling together of the scientific community's efforts to prepare the country for participation in the European programmes for limiting climate change.

Interest to the programme has already been expressed by Sofia City Municipality, Burgas, Varna and Ruse municipalities, Burgas administrative region, the Automotive Cluster Bulgaria Association and the Centre for Excellence in Mechatronics and Clean Technologies, and by various ministries.

For many years there had been no suitable infrastructure for participation in demonstration projects, which is a necessary step for development of hydrogen technologies and attracting the industry. Since the end of 2018, this situation has quickly changed.

Three national infrastructure projects were launched:

- Energy Storage and Hydrogen Energy is a project included in the National Roadmap for Scientific Research Infrastructures with an estimated budget of around EUR 6 million for the period 2018—2023, funded by the Ministry of Education and Science. Around EUR 1.5 million are to be used for the development of the relevant infrastructure for transport applications:

- Cyber-physical platform for development and demonstration of battery/fuel cell hybrid vehicles (over 100 kW)
- Platform for development of natural gas/biogas and hydrogen fuel blends to be implemented in transport.

- The Clean Energy Production, Storage and Application Technologies and Systems Competence Centre (HITMOBIL) (2019—2023), funded under Operational Programme 'Science and Education for Smart Growth', with overall budget of EUR 8 000 000, of which EUR 2 000 000 for transport. The focus is on infrastructure development and growth of the expert potential in the production of 'green hydrogen' with the construction and demonstration of a mobile hydrogen fuelling station as the project deliverable.

- National Centre for Mechatronics and Clean Technologies, funded under Operational Programme 'Science and Education for Smart Growth', with overall budget of BGN 69 184 530, of which BGN 58 806 850 as EU funding and BGN 10 377 680 as

national co-financing. The main objective of this project is to establish a sustainable and modern national centre that is to ensure a fundamentally new level of knowledge in several overlapping areas: mechanics, robotics, energy efficiency, sustainable use of raw materials and resources, reduction of greenhouse gas emissions and will contribute to the implementation of the sustainable and smart growth programme of the Republic of Bulgaria.

Table 3: Budget for technological development

Draft	Budget by year ('000 EUR)			Total budget ('000 EUR)
	2019—2020	2021—2025	2026—2030	
Cyber-physical platform for battery/fuel cell hybrid vehicles	50	400	0	450
Retrofitting of battery/fuel cell extension of the electric range of a trolleybus	400	250	0	650
Electrolysis system for production of hydrogen from renewable energy sources	0	700	0	700
Mobile hydrogen fuelling station	50	700	0	750

Source: Institute of Electrochemistry and Energy Systems at the Bulgarian Academy of Sciences

5. Objectives and Tasks

Electric and hybrid vehicles can contribute to the reduction of CO_2 emissions but as of 2018 the biggest share in the vehicle fleet is held by diesel engine vehicles – 1 656 676, followed by petrol engine ones – 1 589 685.

As at 31 December 2018, there were 2 773 325 passenger cars registered in Bulgaria. Of them 710 were electric vehicles, and only 3 – biofuel-powered ones.

The number of passenger cars and buses by type of fuel used is shown in Table 4.

Table 4: Number of passenger cars and buses by type of fuel as at 31.12.2018

Fuel type	Passenger cars	Buses
Unknown	11,879	109
Hydrogen	0	0
Petrol/Natural gas	15,639	8
Petrol/Liquefied gas	157,116	13
Natural gas	2,190	494
Diesel/Electricity	223	2
Petrol/Electricity	5,355	0
Biofuel	3	3
Liquefied gas	324	21
Gas	28	8
Electric motor	710	23
Diesel/Gas	17	8
Diesel fuel	1,218,211	18,655
Petrol/Gas	21,811	19
Petrol	1,339,819	1,079

Source: National Police General Directorate – Ministry of the Interior

Petrol-fuelled passenger cars prevail, totalling at 1 339 819, followed by diesel-fuelled passenger cars – 1 218 211. Passenger cars that run on petrol and gas are 21 811, and those running only on liquified gas are 28. 223 vehicles run on diesel and electricity and 5 355 on petrol and electricity. There are only 2 190 vehicles running on natural gas. Of a total of 20 442 buses, the largest share – 18 655 – run on diesel.

Of a total of 387 186 lorries, the largest share run on diesel – 329 853, followed by petrol-fuelled ones – 44 880. 6 365 lorries run on petrol and liquified gas. Only 857 cars are built to run on natural gas only.

77 vehicles are powered by electric motor only. 630 cars run on petrol and electricity and only 13 on diesel and electricity. Of a total of 35 481 special-purpose vehicles, most numerous are those run on diesel – 30 829.

Table 5: Number of lorries and special-purpose vehicles by type of fuel as at 31.12.2018

Fuel type	Lorries	Special-purpose vehicles
Unknown	797	73
Hydrogen	0	0
Petrol/Natural gas	2,431	61
Petrol/Liquefied gas	6,365	218
Natural gas	857	27
Diesel/Electricity	13	1
Petrol/Electricity	630	0
Biofuel	5	1
Liquefied gas	19	1
Gas	27	0
Electric motor	77	0
Diesel/Gas	26	10
Diesel fuel	329,853	30,829
Petrol/Gas	1206	63
Petrol	44,880	4,197

Source: National Police General Directorate – Ministry of the Interior (MoI)

Table 6: Total number of vehicles by type of fuel as at 31 December 2018

Fuel type	Total number of vehicles
Unknown	12,880
Hydrogen	0
Petrol/Natural gas	18,139
Petrol/Liquefied gas	163,712
Natural gas	3,684
Diesel/Electricity	239
Petrol/Electricity	5,985
Biofuel	12
Liquefied gas	365
Gas	63
Electric motor	810
Diesel/Gas	65
Diesel fuel	1,647,984
Petrol/Gas	23,099
Petrol	1,390,539

Source: National Police General Directorate – Ministry of the Interior (MoI)

Of a total of 3 276 576 registered cars, 1 390 539 have petrol engines and 1 647 984 – diesel ones. There are 23 099 vehicles running on petrol and gas, 163 712 – on petrol and liquefied gas, and 18 139 on petrol and natural gas. There are 3 684 vehicles built to run on natural gas only.

Tables 7, 8 and 9 show the registered vehicles run on liquid petroleum gas and natural gas by categories in the period 2016 – 2018.

Table 7: Categories of vehicles powered by liquefied petroleum gas and natural gas in 2016

Vehicle type	Liquefied petroleum gas	Natural gas	Petrol/Liquefied petroleum gas	Petrol/Natural gas
Motorcycles	0	0	4	0
Passenger cars	220	1202	140985	13434
Lorries	19	607	4692	1571
Special-purpose vehicles	1	22	237	49
Buses	5	341	26	12
Tractor trucks	0	44	0	0
Total	**245**	**2216**	**145944**	**15066**

Source: National Police General Directorate – Ministry of the Interior (MoI)

Table 8: Categories of vehicles powered by liquefied petroleum gas and natural gas in 2017

Vehicle type	Liquefied petroleum gas	Natural gas	Petrol/Liquefied petroleum gas	Petrol/Natural gas
Motorcycles	1	0	4	0
Passenger cars	263	1618	142721	14046
Lorries	19	722	5268	1973
Special-purpose vehicles	1	23	213	53
Buses	5	407	14	7
Tractor trucks	0	55	0	0
Total	**289**	**2825**	**148220**	**16079**

Source: National Police General Directorate – Ministry of the Interior (MoI)

Table 9: Categories of vehicles powered by liquefied petroleum gas and natural gas in 2018

Vehicle type	Liquefied petroleum gas	Natural gas	Petrol/Liquefied petroleum gas	Petrol/Natural gas
Motorcycles	1	0	3	0
Passenger cars	324	2190	157116	15639
Lorries	19	857	6365	2431
Special-purpose vehicles	1	27	218	61
Buses	21	494	13	8
Tractor trucks	0	116	0	0
Total	**366**	**3684**	**163715**	**18139**

Source: National Police General Directorate – Ministry of the Interior (MoI)

It should be noted that as at 31.12.2018, compared to 2017, the number of electric vehicles increased on an annual basis by 50 % (from 981 to 1 471), and the number of hybrid vehicles – by 55 % (from 4 009 to 6 226). As seen in Table 10, in the period 2012 – 2018 the number of electricity-driven vehicles increased 4.4 times, and of hybrid ones – nearly 10 times.

Table 10: Categories of electric and hybrid vehicles in the period 2012-2018

Vehicle type	2012		2013		2014		2015		2016		2017		2018	
	EV	HV	EV	HV	EV	HV	EV	HV	EV	HV	EV	HV	EV	HV
Moped	204	0	286	0	345		403	0	488	2	519	2	649	2
Motorcycle	4	0	4		5		5	0	6	0	6	0	7	0
Three-wheeled moped	1	0	1		1		1	0	1	0	1	0	1	0
Three-wheel vehicle	2	0	3		3		4	0	4	0	4	0	4	0
Four-wheel vehicle	51	0	79		95		101	0	111	0	112	0	125	0
Passenger car	72	558	91	929	147	1302	183	1748	289	2906	384	3487	710	5578
Lorry	32	25	33	99	34	230	43	358	58	469	64	517	77	643
Special-purpose vehicle	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Bus	0	2	1	2	2	2	2	2	3	2	3	2	23	2
Total	**366**	**586**	**498**	**1031**	**632**	**1535**	**742**	**2109**	**960**	**3380**	**1093**	**4009**	**1596**	**6226**

Source: National Police General Directorate – Ministry of the Interior (MoI)
Legend: EV – electric vehicles; HV – hybrid vehicles; V – vehicles.

The first fully electric car sharing company providing mobility in Sofia – SPARK – has been in operation since October 2017. In 2018 the company increased the number of vehicles to 60, 3 of which are light-duty vehicles.

In recent years, the systems of battery electric buses have been attracting more and more attention. New charging strategies and improved energy storage technologies allow for all-day operation of electric buses, e.g by using options for implementing fast-charging concepts. A considerable cost reduction is expected as a result of the standardisation of technologies and economies of scale.

That is why electric buses have significant potential to replace diesel-powered buses.

The total number of electric buses in Europe reached 1 273 units in 2016 (a 100 % increase in comparison to 2015). The increased number of electric buses in Europe indicates that the European market is already going beyond the demonstration phase and entering the commercialisation phase.

According to a market assessment of the development of the city bus market made as part of the ZeEUS Project, electric battery buses are expected to reach a share of 50 % by 2030.

Almost all major European cities and capital cities are currently implementing policies for inclusion of electric buses in their transport schemes.

Bulgaria is not an exception to this trend. The investment programme of Stolichen Electrotransport EAD (Sofia Public Electrical Transport Company EAD) envisages the purchase of 30 fast-charging standard low-floor buses and 12 recharging stations. To date, 20 electric buses have been commissioned into operation.

Projections for the use of electric vehicles within the 2020/2025/2030 horizon are presented in the following tables.

Table 11: Projections for the use of electric vehicles in the period 2020/2025/2030

Type of transport		**Number of electric vehicles expected to be registered**		
		2020	**2025**	**2030**
Road	**Electric vehicles, total**	**1,405**	**25,550**	**66,200**
	Electric passenger cars	1,000	20,000	55,000
	Electric light-duty commercial vehicles	200	5,000	10,000
	Electric heavy-duty commercial vehicles	5	50	200
	Electric buses and tourist coaches	200	500	1,000

**Source: Electric Vehicles Industrial Cluster*

The targets set out in the National Policy Framework concerning hydrogen-powered motor vehicles are, as follows:

- 2020 – 50 hydrogen vehicles
- 2025 – 400 hydrogen vehicles
- 2030 – 900 hydrogen vehicles.

Given that by the end of 2019 there were no hydrogen vehicles yet, these figures were reconsidered. The introduction of hydrogen vehicles will start from the public transport. Four

municipalities have included hydrogen vehicles in their green transport plans: Sofia, Burgas, Plovdiv and Stara Zagora (which is working on the 'Hydrogen Valley' concept).

Sofia Municipality applied for participation in the JIVE2 project for preferential purchase of hydrogen buses. Interest in hydrogen-fuelled urban transport is growing rapidly. The demo project for retro-fitting of a trolleybus with a battery/fuel cell extension of the electric range of the vehicle is expected to continue as a spin-off project for 50 trolleybuses.

All this makes the projection of 120 vehicles in 2025 look realistic, provided sufficient production capacity is available. The new projection for 2030 is about 600.

Projections for the use of hydrogen-powered vehicles are shown in the table below:

Table 12: Projections for the use of hydrogen-powered vehicles

Type of transport		Number of hydrogen-powered vehicles expected to be registered		
		2020	2025	2030
Road	Vehicles with hydrogen fuel cells and electric vehicles with fuel cells, total	0	120	595
	Two-wheel vehicles	0	10	40
	Passenger cars	0	20	100
	Light-duty commercial vehicles	0	10	50
	Heavy-duty commercial vehicles	0	0	5
	Buses and tourist coaches	0	80	400

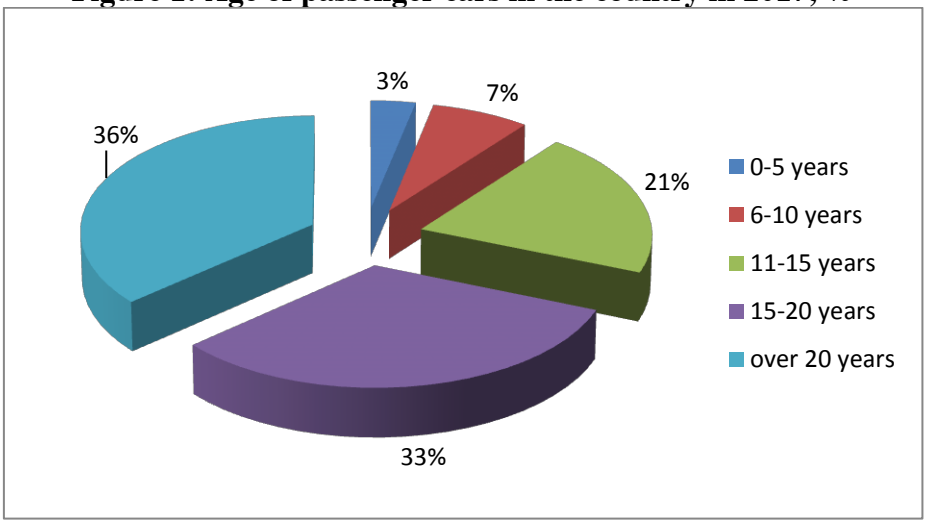
Source: Institute of Electrochemistry and Energy Systems at the Bulgarian Academy of Sciences

A specific feature of the Bulgarian vehicle fleet is its age structure. In 2017, around 86 % of vehicles were over 10 years old, while new vehicles (from 1 to 5 years old) accounted for 5 % of the total number, and 9 % were in the age range of 6 to 10 years.

Compared to previous years, the age structure of passenger cars in the country remains unchanged. The predominant share is represented by vehicles aged over 20 years (1 009 424), with 69 % (1 909 182) of all passenger cars being over 15 years old. As is clearly seen in the chart, the smallest share is held by new passenger cars that are up to 5 years old – only 91 022, and those in the 6-10 years age range – 7 %.

Figure 1 shows the age distribution of passenger cars in Bulgaria in 2017

Figure 1: Age of passenger cars in the country in 2017, %



Source: Security Police General Directorate – MoI

Given the age of the fleet, it is clear that only an insignificant percentage of vehicles meet the emission standards introduced over the past 10 years. At the same time, to date in Bulgarian cities and towns there are no areas where access is permitted only for low-emission vehicles; this is one of the causes for air pollution caused by transport in large cities.

The matter of the renewal of the country's vehicle fleet needs to be considered.

To measure the renewal of the freight and passenger fleet of motor vehicles, national statistics uses the indicator 'share of newly registered and registered new motor vehicles'.

This indicator covers the most active part of the fleet which produces the largest volume of greenhouse gases and therefore has a significant impact on the environment and society, as well as on road safety.

Table 13: Share of newly registered and registered new motor vehicles (MV) of the respective type, %

Types	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Newly registered passenger cars	6.6	10.3	16.8	14.9	8.0	7.2	7.1	7.0	6.9	7.0	7.1	7.6
New passenger cars	1.0	2.0	2.1	1.9	0.8	0.5	0.5	0.5	0.5	0.6	0.5	0.6
Newly registered buses	5.9	6.3	7.8	9.3	4.9	3.1	3.1	3.2	4.5	5.8	5.5	7.0
New buses	2.3	3.6	2.3	4.3	1.7	0.4	0.2	0.2	1.1	1.6	1.4	2.2
Newly registered trucks and tractor trucks	6.7	10.9	14.2	14.5	8.2	8.0	8.0	8.3	8.0	8.7	9.2	9.3
New trucks and tractor trucks	2.3	4.5	4.7	4.6	1.7	1.7	2.4	2.8	2.4	2.6	3.1	2.8
Newly registered motor vehicles	6.6	10.4	16.2	14.7	8.1	7.2	7.1	7.1	6.9	7.1	7.3	7.7
New motor vehicles	1.2	2.3	2.4	2.3	1.0	0.7	0.8	0.8	0.8	0.8	0.9	0.9

Source: National Statistical Institute

Compared to 2005, in 2016 the newly registered motor vehicles as a share of the total number of vehicles registered in Bulgaria marked a slight increase of 1.1 percentage points. The share of registered new motor vehicles decreased by 0.3 percentage points in 2016 compared to 2005.

6. Development of the alternative fuels infrastructure

Electric vehicle charging infrastructure in road transport

A positive trend for Bulgaria is the phased-in build-up of electric vehicle charging infrastructure in the road transport that is implemented mainly at the municipality level by private investors.

In October 2019, there were 149 charging stations in total. For comparison, in October 2018 there were 82 charging stations.

As at 18 December 2019, there were 153 charging stations for electric vehicles on the territory of our country. More information is available on the following website: https://vsichkotok.bg/.

Table 14: Alternative fuel infrastructure

Type of transport	Alternative fuel infrastructure	Current and previous number of fuel recharging/charging points			Target number of fuel recharging/charging points		
		2016	2017	2018	2020	2025	2030
	ELECTRICITY						
Road	**Total number of charging stations (public*+private)**	**32**	**89**	**145**	**300**	**2,000**	**5,000**
	Recharging stations (publicly accessible)	**32**	**89**	**145**	**300**	**2,000**	**5,000**
	Normal power recharging stations, P ≤ 22kW (public)	32	80	120	200	1,500	3,000
	High power recharging stations, P > 22kW (public)	0	9	25	100	500	2,000
	• AC fast-charging, 22 kW < P ≤ 43 kW (public)	0	3	10	50	500	1,000
	• DC fast-charging, P < 100 kW (public)	0	2	8	20	200	500
	• DC ultra fast-charging, P ≥ 100 kW (public)	0	0	0	1	10	50
	Recharging stations (private)	0	0	0	0	0	0
	Normal power recharging stations, P ≤ 22 kW (private)						
	High power recharging stations, P > 22 kW (private)	0	0	0	0	0	0
	• AC fast-charging, 22 kW < P ≤ 43 kW (private)						
	• DC fast-charging, P < 100 kW (private)						
	• DC ultra fast-charging, P ≥ 100 kW (private)						

**Source: Electric Vehicles Industrial Cluster*

Having regard to the differences in functionality and price levels, the charging infrastructure to be deployed in Bulgaria will include both fast-charging stations (of minimum capacity of 50 kW DC) along the TEN-T core network, and a massive number of standard charging points (capacity per unit at least 22 kW AC) at publicly accessible locations where consumers typically park their e-vehicles for periods long enough to charge the batteries without having to adjust their daily itineraries to the charging requirements (e.g. shopping malls, entertainment and recreation centres, office buildings, hotels, restaurants, industrial plants, etc.).

Fast-charging electric vehicle stations have already been built along the international routes from Sofia to the borders with Greece and Turkey, at key locations – Sofia, Varna, Veliko Tarnovo, Blagoevgrad, Sandanski, Rakovski, Stara Zagora, Lyubimets and Burgas.[1]

In 2017, the Central European Ultra Charging Project was funded under the Connecting Europe Facility, with the purpose of setting up a network of ultra-fast-charging stations (up to

[1] https://new.abb.com/docs/librariesprovider22/general-documentation/abb-infographic-terra-bg_dec12.pdf?sfvrsn=7a89a213_2

350 kW) for electric vehicles in Central Europe, ensuring coverage for long-distance travels and cross-border travels in Austria, Czechia, Hungary, Northern Italy and Slovakia, as well as cross-border connection to the main urban nodes of the TEN-T network in Southern Italy, Romania and Bulgaria. The deployment of 118 stations is envisaged within the project along the TEN-T core network with main emphasis on corridors.

Deployment of charging infrastructure for electric buses in the cities

Aiming at increasing the energy efficiency of Sofia electric urban transport and reducing the levels of pollutant emissions in the city of Sofia, at the end of 2017 Stolichen Electrotransport EAD adopted a plan for setting up 6 new electric bus lines, using fast-charging technologies (battery-based or ultracapacitor-based). The planned new lines will completely replace 2 or 6 existing routes currently run by diesel-powered buses, which will bring about considerable environmental effect. The use of this new technology will contribute to the reduction of both ambient air pollution and CO_2 emissions from public transport, and of the operating costs of Stolichen Electrotransport EAD.

The successful implementation of such an innovative transport solution would significantly increase the attractiveness of the transport service offered. It will help achieve one of the main goals of the European transport and urban development policy – turning cities into zero greenhouse gas emission zones, separate from urban transport. Given its specifics (required time for recharging at the start and end terminus), the project will be implemented in the peri-urban areas of Sofia Municipality, some of which are particularly environmentally sensitive, and in the central urban area.

The project is subdivided into two stages:

The first stage covers the construction of 6 recharging stations at the start and end stops of the proposed bus lines and at the depot. For charging they will use the overhead contact system of Stolichen Electrotransport EAD or other sources. In addition, the delivery of 15 electric buses with EU type approval is also envisaged over a two-year period.

The bus lines planned to be thus serviced are No 84 and No 30, or No 65. The electric buses will use cutting-edge technologies based on ultracapacitors or fast-charging batteries. This will enable them to capture energy when they brake and to use it to cover distances of at least 20 km. These new technologies have been tested and used for more than 10 years. The average daily energy consumption along the new lines is expected to reach 1.1-1.3 kWh/km (air conditioning and heating not included). As a result, the energy price per kilometre will be 7-9 times lower than that of the polluting diesel-powered buses (at that time).

Looking forward (at the second stage, after a decision is made by the Sofia Municipal Council), the number of buses may be increased to 30, and of the recharging stations – to 12. Lines No 42, No 47, No 48 и No 14 will be serviced by these buses.

The advantages of the new electric buses are, as follows:

- They have the autonomy and carrying capacity of a normal diesel or gas-powered city bus.
- They do not use the overhead contact system which affords them unrestricted freedom of movement and reduces the maintenance costs for a more complex and expensive infrastructure.
- They enable so far unknown levels of energy recovery in their own ultracapacitor/battery, as recuperation in trolleybuses depends on the availability of other vehicles within the network to give off or take recuperated energy.
- They will have European type approval, at least 10-year warranty for the ultracapacitor/battery and a body made of stainless components.

Projections for building a hydrogen fuelling infrastructure

According to the National Policy Framework, there are two projections regarding hydrogen fuelling stations:

- The so-called optimistic scenario with 4 hydrogen fuelling stations by 2020, 10 hydrogen fuelling stations by 2025 and 50 hydrogen fuelling stations by 2030.
- The more pessimistic scenario features 2 hydrogen fuelling stations after 2020 and 4 hydrogen fuelling stations by 2030.

The current situation in terms of adopting hydrogen as a fuel and its ambitious and indispensable implementation necessitates review of the projection data of hydrogen fuelling stations, which should correspond to the projected number of hydrogen vehicles.

The reviewed scenario envisages 5 hydrogen fuelling stations by 2025 and another 14 by 2030.

Table 15: Projections for hydrogen fuelling stations

Hydrogen fuelling stations	2025	2030
Total number of fuelling stations	5	14
Total number of 350-bar fuelling stations	3	8
350-bar fuelling stations, public	1	2
350-bar fuelling stations, private	2	6
Total number of 700-bar fuelling stations	2	6
700-bar fuelling stations, public	1	2
700-bar fuelling stations, private	1	4

Source: Institute of Electrochemistry and Energy Systems at the Bulgarian Academy of Sciences

Shore-side electricity supply in sea and inland waterway ports

Shore-side electricity supply to waterborne vessels is a maritime technical service regulated in the Maritime Space, Inland Waterways and Ports Act of the Republic of Bulgaria. This service is provided by port operators and this option is noted in the Port Operability Certificate.

Presently, the service is provided both in public transport ports of national and regional importance, and in yacht harbours, fishing harbours, and special purpose harbours. Shore-side electricity supply and the relevant infrastructure are available in the public transport sea ports and the inland waterway ports for public transport as part of the core and the comprehensive TEN-T network. A slight increase in provision of the service is observed in sea ports in the period 2016–2018.

The table below shows the number of available charging points located at the berths/pontoons of the respective sea ports and inland waterway ports, for public transport within the core and the comprehensive TEN-T network. Information on the available infrastructure is based on the data of electricity supply to vessels provided by the respective owner/port operator at the time of port registration.

Table 16: Shore-side electricity supply in sea and inland waterway ports

	2016	2017	2018
Shore-side electricity supply to seagoing vessels in sea ports	160	164	172
Shore-side electricity supply to inland waterway vessels in inland ports	90	89	90

Source: Maritime Administration Executive Agency

With regard to the legislative measures undertaken in the period 2016–2018, it should be noted that the requirement that shore-side electricity supply for maritime transport deployed or updated after 18 November 2017 should comply with the technical specifications provided for in Article 4(6) and point 1.7 of Annex II to Directive 2014/94/EU on the deployment of alternative fuels infrastructure, is transposed in national law by its inclusion in Ordinance No 9 on the requirements for operability of ports and specialised port facilities.

The legislative framework providing that port owners are to ensure compliance of shore-side electricity supply installations with the applicable new standards and requirements should be updated at the national level.

Presently, Bulgarian ports have an infrastructure for shore-side electricity supply to waterborne vessels which is obsolete and needs modernising. In this regard, the state-owned Bulgarian Ports Infrastructure Company has taken steps to examine the condition of the electricity supply network for seagoing vessels at Varna and Burgas ports. The objective is to set up a system which enables seagoing vessels to transition to shore-side electricity supply which fully covers their needs, so that they do not need to use their own electricity generators while berthed.

A recharging point for electric vehicles is built in the car park area at port terminal Burgas-East 1, town of Burgas. The recharging unit is suitable for all types of electric vehicles – cars, buses, scooters, mopeds and bicycles. Two motor vehicles may be simultaneously recharged there with 22 kW power at 400 V. Its high-tech display provides information to users in three languages – Bulgarian, English and Russian. A suitable infrastructure compliant with the needs of this type of facility is available to the place allocated for construction of an electric vehicle recharging station. The installation of the recharging unit is financed with own funds of the state-owned company Bulgarian Ports Infrastructure, budgeted in the company's 2018 annual investment programme.

In relation to the challenges to deployment of hydrogen technologies in the transport sector, the state-owned company Bulgarian Ports Infrastructure continues to explore the potential possibilities for securing funding for the construction of the first hydrogen fuelling station at Port Burgas under various EU programmes.

Stationary electricity supply at airports

Sofia Airport

With regard to air transport, Directive 2014/94/EU addresses as a key strand of action the development of the infrastructure for stationary aircraft (stationary airplanes at the airport, at passenger boarding bridges, with inoperative engines, in the period between the end of taxiing-in after landing and before taxiing-out for the next flight). Terminal 2 of Sofia Airport has 6 passenger boarding bridges equipped with:

- Fixed Electrical Ground Power (FEGP), and
- Stationary Pre-Conditioned Air (PCA) systems providing airplanes with energy from alternative energy sources – electricity from the airport electricity grid. Thus, the use of the Auxiliary Power Unit (APU) of the airplane and the consumption of kerosene during the stationary stage is avoided.

In the period 2016–2018, there were 6 airbridge-equipped gates in operation at Terminal 2 of Sofia Airport, providing 400 Hz power supply and pre-conditioned air by stationary power converters and air conditioners fixed on the passenger boarding bridge. The service is part of the overall passenger boarding package and is used by all airlines using a passenger boarding bridge at Terminal 2. Regarding the use of passenger boarding bridges, it can be said that the available infrastructure meets at almost 100 % the demand from airlines for use of the passenger boarding bridge service.

It is expected that a new passenger boarding bridge will be delivered in 2021.

Table 17: Data on Sofia Airport

	2016	**2017**	**2018**
Number of different aircraft (with unique registrations) using a passenger boarding bridge	935	914	953
Number of different aircraft (with unique registrations) to have flown from and to Sofia Airport	2424	2596	2901
Number of instances of using a passenger boarding bridge	8166	7802	8491
Number of flight movements	51829	57673	60771

Source: Sofia Airport

For airplanes serviced at Terminal 1 and for those not using Fixed Electrical Ground Power supply at Terminal 2, ground service operators provide upon request diesel-powered mobile Ground

Power Units (GPU) as an alternative to the airplanes' Auxiliary Power Units (APU's) (with lower fuel consumption, lower noise levels and higher efficiency).

Since January 2018, Sofia Airport EAD has had 3 charging stations for electric vehicles with charging power of 22 kW. They are located near Terminal 2 and are provided for use under a subscription contract. A contract has been signed for the SPARK service.

In relation to the policy of Sofia Airport EAD of limiting greenhouse gas emissions, in the period August 2017 – August 2018 the airport used an electric bus for transportation of passengers between Terminal 1 and Terminal 2. The electric bus, together with the charging station for it, were leased from the manufacturer. It is expected that at the end of 2020 a new electric bus will be purchased and delivered.

Table 18: Alternative fuel vehicles at Bulgarian airports

Airport	Alternative fuel vehicles (AFV)	Reported data			Projection data		
		2016	2017	2018	2020	2025	2030
ELECTRIC							
Sofia Airport	Aircraft*	935	914	953			
Plovdiv Airport	Electric vehicles	11	11	9	11	20	30
Varna Airport	Electric vehicles	34	34	34			
	Battery electric vehicles (BEV)			2			
	Heavy duty commercial battery electric vehicles (BEV)	34	34	32			
Burgas Airport	Electric vehicles	30	32	32	31		
	Battery electric vehicles (BEV)	1	1	1	1		
	Light duty commercial battery electric vehicles (BEV)	29	31	31	30		

Source: Data provided by the airports
**Number of different aircraft (with unique registrations) using alternative fuel in the stationary phase*

Table 19: Infrastructure for fuelling/charging with alternative fuels at Bulgarian airports

Airport	Infrastructure for fuelling/charging with alternative fuels	Reported data			Projection data		
		2016	2017	2018	2020	2025	2030
ELECTRIC							
Sofia Airport	Charging points for stationary airplanes	6	6	6	6	7	
Plovdiv Airport	Charging points for privately-owned vehicles	12	12	12	12	16	22
	Normal power charging points for motor vehicles, P ≤ 22 kW	12	12	12	12	14	17
	High power charging points for motor vehicles, P > 22 kW					2	5
Varna Airport	Charging points for privately-owned vehicles			18			
	Normal power charging points for motor vehicles, P ≤			16			

	22 kW						
	High power charging points for alternating current (AC), 22 kW < P ≤ 43 kW			1			
	High power charging points for direct current (DC), P < 100 kW			1			
Burgas Airport	Charging points for privately-owned vehicles		40	40			
	Normal power charging points for motor vehicles, P ≤ 22 kW		20	20			
	High power charging points for alternating current (AC), 22 kW < P ≤ 43 kW		20	20			

Source: Data provided by the airports

Conclusion

For Bulgaria the issues related to the development of alternative fuels and the deployment of the relevant infrastructure are a challenge which the country is endeavouring to overcome. Based on the National Report prepared in compliance with the provisions of Article 10(1) of Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure, the following conclusions can be drawn:

- Progress was made with regard to the legal measures in the field of alternative fuels.
- A number of national-level strategic documents contain texts on the implementation of the National Policy Framework for the Development of the Market as regards Alternative Fuels in the Transport Sector and the Deployment of the Relevant Infrastructure.
- A programme of the National Trust EcoFund in support of public institutions for the purchasing of plug-in hybrid electric vehicles has been implemented since 2016.
- Support was provided under various operational programmes for the purchase of electric buses in large Bulgarian towns.
- The country's vehicle fleet is obsolete, with a prevailing share of diesel and petrol-powered vehicles.
- Albeit at a slower rate, the number of electric vehicles and of hybrid vehicles is growing. An increase is registered in the number of vehicles powered by liquefied petroleum gas and natural gas.
- The number of electric buses used in the public transport is growing.
- The first fully electric car sharing company providing mobility in Sofia – SPARK – has been in operation since October 2017.
- The phased-in deployment of an electric vehicle charging infrastructure in the road transport is implemented at municipality level by private investors.
- In the waterborne transport, shore-side electricity supply and the relevant infrastructure are available in the public transport sea ports and the inland waterway ports for public transport as part of the core and the comprehensive TEN-T network. A slight increase in provision of the service is observed in maritime ports.
- On the territory of the largest Bulgarian airport – Sofia Airport EAD, there are 6 airbridge-equipped gates in operation at Terminal 2 that provide 400 Hz power supply

and pre-conditioned air by stationary power converters and air conditioners fixed onto the passenger boarding bridge. The service is part of the overall passenger boarding package and is used by all airlines using a passenger boarding bridge at Terminal 2.

- Since January 2018, Sofia Airport EAD has had 3 charging stations for electric vehicles with charging power of 22 kW. They are located near Terminal 2 and are provided for use under a subscription contract.
- An electric bus is used for passenger transportation between Terminal 1 and Terminal 2 of Sofia Airport.
- We believe the finances provided under the ESF+, ERDF, the Cohesion Fund for the 2021—2027 programming period and under the Competitiveness and Innovation Operational Programme will facilitate the rapid development of alternative fuels and the deployment of the relevant infrastructure.