Ministry of Energy

National policy framework for the deployment of alternative fuels infrastructure

Warsaw, ... May 2018

Contents

Glossary of key terms

1. **'Alternative fuels'** (within the meaning of Directive 2014/94/EU): fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to make transport more climate neutral and enhance the environmental performance of the transport sector. They include, inter alia:
   - electricity,
   - hydrogen,
   - biofuels,[1]
   - synthetic and paraffinic fuels,
   - natural gas (CNG or LNG),
   - liquid petroleum gas (LPG);
2. **'Motor vehicle' ('vehicle'):** a motor-powered vehicle capable of reaching a speed of over 25 km/h;
3. **'Low-emission motor vehicle' ('low-emission vehicle'):** a vehicle using alternative fuels, in particular natural gas or electricity;
4. **'Passenger vehicle':** a motor vehicle (vehicle) designed for the carriage of up to nine persons (including the driver) and their luggage;
5. **'Heavy-duty vehicle':** a motor vehicle (vehicle) designed for the carriage of goods; the term applies also to goods and passenger vehicles designed for the carriage of goods and from four to nine persons, including the driver;
6. **'Natural gas vehicle':** a motor vehicle using natural gas (CNG or LNG) as fuel;
7. **'Electric vehicle':** a motor vehicle equipped with a powertrain containing at least one non-peripheral electric machine as an energy converter with an electric rechargeable energy storage system, which can be recharged externally;
8. **'PHEV' (plug-in hybrid electric vehicle):** a diesel-electric motor vehicle with externally rechargeable batteries;
9. **'BEV' (battery electric vehicle):** a motor vehicle powered exclusively by electricity from batteries, which are externally recharged or replaced;
10. **'Recharging or refuelling point accessible to the public':** a recharging or refuelling point to supply an alternative fuel which provides Union-wide non-discriminatory access to users. Non-discriminatory access may include different terms of authentication, use and payment;
11. **'Recharging point':** an interface that is capable of charging one electric vehicle at a time or exchanging a battery of one electric vehicle at a time;
12. **'High power recharging point (fast recharging point)':** a recharging point that allows for a transfer of electricity to an electric vehicle with a power of more than 22 kW;
13. **'Normal power recharging point':** a recharging point that allows for a transfer of electricity to an electric vehicle with a power less than or equal to 22 kW, excluding devices with a power less than or equal to 3.7 kW, which are installed in private households or the primary purpose of which is not recharging electric vehicles, and which are not accessible to the public;
14. **'Refuelling point for LNG':** a refuelling facility for the provision of LNG, consisting of either a fixed or mobile facility, offshore facility, or other system; equipment used by an energy company to provide CNG for propulsion purposes;

[1] This document does not take into account any measures for the deployment of infrastructure using bio-components in liquid fuels and biofuels, as these issues have been regulated as part of the implementation of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

15. **‘Refuelling point’:** a refuelling facility for the provision of any fuel with the exception of LNG, through a fixed or a mobile installation; equipment, including devices located on a vessel, used by an energy company to provide LNG for propulsion purposes;
16. **‘Recharging station’:** a device consisting of more than one electric vehicle recharging point;
17. **‘Refuelling station’:** a structure consisting of more than one refuelling point;
18. **‘Shore-side electricity supply’:** the provision of shore-side electrical power through a standardised interface to seagoing ships or inland waterway vessels at berth, when the auxiliary engines of these ships or vessels are switched off;
19. **‘TEN-T’:** the Trans-European Network for Transport.

List of key abbreviations

BEV (battery electric vehicle): an electric vehicle powered exclusively by electricity from batteries;
CEPiK: Central Register of Vehicles and Drivers (Centralna Ewidencja Pojazdów i Kierowców);
CNG: compressed natural gas;
EVs: electric vehicles, both PHEVs and BEVs;
IMO: International Maritime Organisation;
LDVs (light-duty vehicles): passenger vehicles, and passenger and goods vehicles;
LNG: liquefied natural gas;
LPG: liquefied petroleum gas;
NGVs: natural gas vehicles;
PAX: air passengers;
PGNiG: Polish Oil and Gas Company (Polskie Górnictwo Naftowe i Gazownictwo);
PHEV (plug-in hybrid electric vehicle): a diesel-electric hybrid which can be recharged at vehicle recharging points;
SECAs: sulphur emission control areas;
TDT: Transport Technical Supervision Authority (Transportowy Dozór Techniczny);
TEU (twenty-foot equivalent unit): a unit of cargo capacity often used with respect to ports and vessels, equivalent to the capacity of a 20-ft long container;
TPA (third-party access): the principle of third-party access to gas or electricity networks.

1. Introduction

Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure ('Directive 2014/94/EU'), the purpose of which is to support the use of alternative fuels in transport, was adopted on 22 October 2014. Within the meaning of the Directive, 'alternative fuels' are fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to reduce the EU Member States' dependence on oil imports, make transport more climate-neutral and enhance the environmental performance of the transport sector. Alternative fuels comprise, but are not limited to, the following: electricity, hydrogen, biofuels, synthetic and paraffinic fuels, natural gas (including biomethane) in the form of compressed natural gas (CNG), liquefied natural gas (LNG) and liquefied petroleum gas (LPG).

Because Poland has scarce oil resources of its own, fuel production in Poland is based mainly on oil imports from third countries. At the same time, fuels alternative to hydrocarbon fuels in transport, except for biofuels, account for a marginal share of the transport fuels market. The only exception is LPG consumption, which has increased significantly: LPG use in transport stands at approx. 1.8 million tonnes a year, which accounts for approx. 12-15% of the transport fuels market. There are over 5,000 LPG refuelling points on the market, which serve approx. 3 million LPG cars.[2] The development of other alternative fuels is at the pilot stage, if not still in the research phase.

It should also be noted that the latest energy forecasts have shown that the demand for fuels in Poland will increase in the nearest future, which means that an increased use of alternative fuels in transport will contribute to reducing both Poland's dependence on oil imports and the adverse environmental impact of the Polish transport sector. For this reason, developing the market for alternative fuels, regardless of the technology applied, should be considered a desirable process. However, there are significant differences between individual technologies with regard to their maturity to enter the fuel market.

Many institutions and organisations are currently conducting research on different types of alternative fuels that can be used in transport. The Ministry of Energy monitors the development of these fuels very closely and is aware of the progress in the research and the technologies linked to, among other things, the use of hydrogen in transport or the production of methanol from CO_2. Nevertheless, the activities carried out in this area to date have focused on the most mature technologies.

Research on different technologies is ongoing, and it cannot be ruled out that, if other alternative fuels are developed and certain technological problems are solved, then strategies will be prepared for developing these technologies in the future. At this stage, however, given the requirements laid down in Directive 2014/94/EU and considering that some technologies are not ready to be deployed commercially, this document sets out specific support instruments for the deployment of infrastructure for electricity and natural gas (CNG and LNG) only, as these instruments have already been put in place on the transport fuels market. This does not mean that the Polish Government does not support other alternative fuels. Nevertheless, a strategy for supporting the deployment of the distribution infrastructure for these fuels will be developed when the technologies for the production of these fuels reach an appropriate stage (at which point the construction of distribution networks will be required).

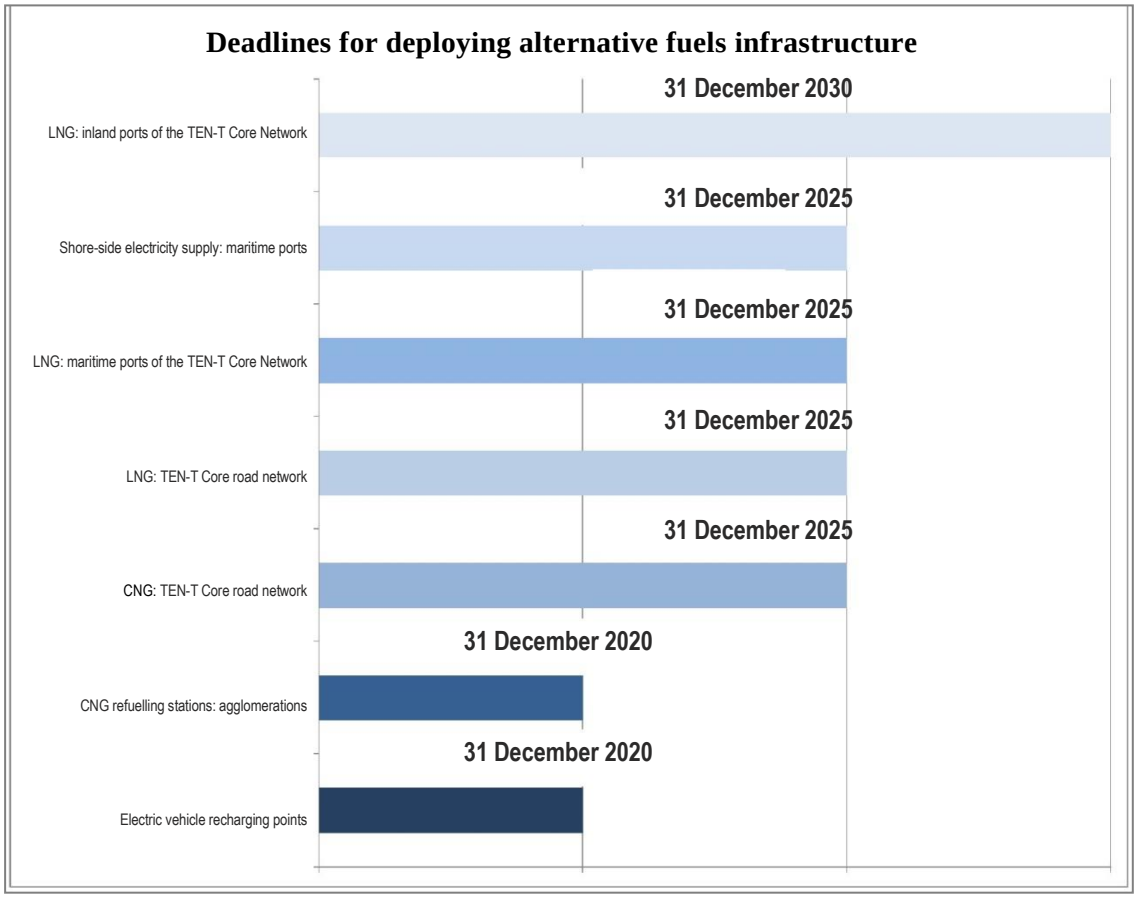
In the European Union, the alternative fuels market has been developing at an ever increasing rate (which is especially true of electric transport). However, it is not the European Union that is at the forefront of the change in the global transport fuels sector: the vanguard is

[2] *The Polish LPG Association's Annual Report for 2015* [Raport roczny 2015 Polskiej Organizacji Gazu Płynnego], Warsaw, 2016, http://pogp.pl/files/Raport_Roczny_POGP_2015.pdf (accessed in June 2016).

led by the USA, China and Japan. Moreover, natural gas has been known and used as a transport fuel for decades, with Italy leading the way in the EU, and Brazil, Iran and Pakistan driving the global trend.

Under Directive 2014/94/EU, the EU Member States are required to deploy alternative fuels infrastructure within the set deadlines. This obligation applies to natural gas refuelling infrastructure, electric vehicle recharging points, as well as infrastructure for supplying electricity to vessels and for refuelling LNG at maritime and inland ports.

Chart 1. Deadlines for the deployment of alternative fuels infrastructure



Prepared by the Ministry of Energy

2. Market for alternative fuels in transport: the status quo

2.1. Natural gas in road transport

2.1.1. Natural gas refuelling infrastructure

There are very few CNG and LNG refuelling stations (points), and they have little impact on the transport market in Poland. In 2011, there were 32 stations in operation, the highest number of such facilities recorded to date. The number of stations has been decreasing since 2013, falling from an estimated 28 refuelling points at the beginning of that year to only 24 stations in March 2014. It can be assumed that there are 26 natural gas refuelling stations in Poland.[3] As regards the number of LNG stations (points), in Poland, there are currently only two LNG stations not accessible to the public and one LCNG station accessible to the public.

The cost of constructing a station ranges from PLN 400,000 to PLN 1 million.[4] These figures only refer to the cost of constructing a station or equipping it with technical equipment necessary for selling CNG and do not cover the cost of leasing (purchasing) an appropriate plot of land, developing the auxiliary infrastructure comprising shops or bars, or supplying the station with electricity, water or other utilities.

CNG stations may operate independently or as part of existing fuel stations that offer other types of fuel.

In addition, Poland has a well-developed distribution system making LNG supplies to refuelling points possible.

2.1.2. Sales volume and prices of natural gas for transport

According experts at the Ministry of Energy, the volume of natural gas sold for propulsion purposes in 2011 was approx. 12 million m^3. This amount is estimated to have increased to approx. 18 million m^3 in 2015.

An analysis of average monthly CNG prices in 2013-2015 shows an increase in the prices of this type of fuel in road transport. Between January and October 2013, CNG prices remained fairly stable (with the monthly average price ranging from PLN 2.80/m^3 to PLN 3/m^3) only to increase to the average level of PLN 3.35/m^3 in November 2013. Subsequently, the prices remained stable (ranging from PLN 3.30 to PLN 3.40/m^3) until July 2014, when they began to gradually decrease, hitting the all-time low of PLN 2.60/m^3 in January 2015. The prices began to go up again in February, reaching their highest average level in the period under study (PLN 3.74/m^3) in April 2015.

The price increase in November 2013 was most likely due to the expiry of the application period of the zero-rate excise duty on natural gas for propulsion purposes. In turn, as the CNG price was linked to the net diesel price, the decrease in diesel prices was accompanied by a drop in CNG prices.

However, PGNiG Obrót Detaliczny Sp. z o.o. changed the pricing rules in January 2015, setting the current gross price at PLN 3.29/m^3. According to the company, this change was driven by the market situation.

2.1.3. Vehicle market

Compressed natural gas (CNG) may be used in all types of vehicles equipped with appropriate installations. However, as the maximum range of CNG vehicles is 300 km, this fuel is recommended mainly for short- and medium-distance transport, for example for vehicle fleets used by transport companies, public transport companies and providers of the

[3] Based on data provided by NGVA Europe and cng.auto.pl.

[4] http://gazeo.pl/cng-lng/technika-cng-lng/infrastruktura-cng-lng/Koszt-budowy-stacji-CNG,artykul,5501.html (accessed on 1.12.2015 r.); industry data.

broadly defined public services (refuse collection, etc.). CNG vehicles are low-emission vehicles, and their use will help reduce emissions of harmful gases, harmful dust and particulate matter from transport.

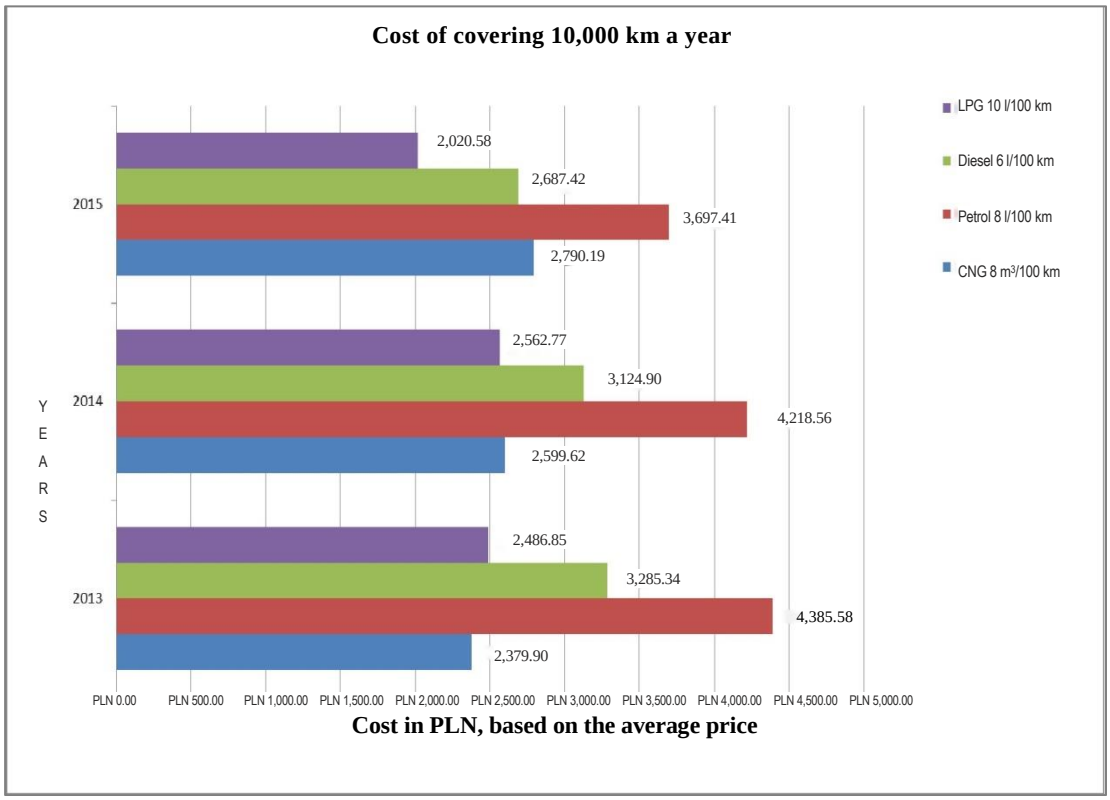
Table 1. Number of natural gas (CNG and LNG) vehicles in Poland

Vehicle type	Number of vehicles: traditional fuels	Number of natural gas vehicles	Share of natural gas vehicles [%]
Passenger vehicles and light-duty vehicles	20,000,400	3,050	0.02
Buses	106,057	400	0.05
Heavy-duty vehicles (heavy-duty vehicles & road tractors)	3,037,427	50	0.00163
Other	—	100	
Total	23,143,884	3,600	0.0155

Prepared by the Ministry of Energy, based on data from the Central Statistical Office (Główny Urząd Statystyczny, GUS) and NGV Europe

Chart 2 below shows that while in 2013-2014 it was more expensive to cover 10,000 km using diesel than to cover the same distance using natural gas, this trend was reversed as a result of the decrease in diesel prices in 2015 and the increase in the CNG price. Given that the cost of purchasing CNG vehicles is higher than that of purchasing diesel vehicles, the resulting correlation between the prices of these two types of fuel makes customers less interested in CNG, which is especially true of economic operators with vehicle fleets.

Chart 2. Comparison of the cost of covering 10,000 km/year (based on fuel consumption) in selected years, by fuel type



Prepared by the Ministry of Energy, based on www.cng.auto.pl and www.ngvaeurope.eu

Table 2. Average fuel price in 2013 - 2015

Year	CNG: average price [PLN/m^3]	Petrol: average price [PLN/l]	Diesel: average price [PLN/l]	LPG: average price [PLN/l]
2013	2.97	5.48	5.48	2.49
2014	3.25	5.27	5.21	2.56
2015	3.49	4.62	4.48	2.02

2.1.4. Public transport

In Poland, CNG buses provide public transport services in 21 cities. LNG is also used as fuel for urban buses. Wałbrzych was one of the first cities to implement this pilot project, and LNG buses are now also used in Warsaw and Olsztyn.

Table 3. Number of CNG and LNG buses providing public transport services in selected cities

City	Number of CNG buses	Number of LNG buses
Gdynia	31	—
Tarnów	20	—
Zamość	33	—
Tychy	75	—
Olsztyn	—	11
Rzeszów	64	—
Warsaw	—	35
Radom	41	—

Prepared by the Ministry of Energy, based on information published at carriers' websites, January 2016

With very few exceptions, municipalities are not interested in purchasing CNG or LNG buses or in supporting undertakings which operate such vehicles, because of the fuel price and the initial cost of purchasing LNG buses, which is higher than the cost of purchasing vehicles powered by traditional fuels. The smaller the difference between the prices of CNG/LNG and traditional fuels, the longer the payback period. Municipalities can certainly afford to pay a higher purchasing price for natural gas vehicles (or electric vehicles) provided that, in the long term, the costs of using these vehicles are lower and there is a relatively quick return on investment. It is worth noting that the difference between the price of a diesel bus and that of a CNG bus is becoming smaller and smaller. It is assumed that in 2016 it will be approx. 5% for 18-metre buses and up to approx. 10% for 12-metre buses. Although the municipal authorities do appreciate the advantages of environmentally friendly natural gas vehicles, especially their low emissions of harmful chemical compounds, their budgets are limited, which is why it is particularly important that the use of alternative fuels is economically viable.

2.2. Electricity in road transport

2.2.1. Electric vehicle recharging infrastructure

The Polish e-mobility market (comprising both the infrastructure and the electric vehicles themselves) is very poorly developed. In principle, it is more accurate to speak about individual companies' promotional activities rather than an organised and functioning market.

Given this technology's current level of development, the electrification of the transport system will mainly affect urban transport.

It is estimated that there are approx. 305 recharging points currently in operation in Poland (these mainly comprise recharging points accessible to the public),[5] most of which are located in Warsaw. There are also recharging points in Kraków, Poznań and Gdańsk. The is no data on the number of private recharging points.

For a regular recharging point, the construction cost ranges from approx. PLN 16,000 to PLN 70,000, depending on the charging power, connection costs and the number of cars that can be recharged at a time. The cost of constructing a fast recharging point is estimated at PLN 100,000-250,000. The cost of setting up a recharging point depends on the cost of connecting such points to an electricity network.

[5] http://samochodyelektryczne.org/, http://www.eafo.eu/electric-vehicle-charging-infrastructure (accessed in July 2016).

Under the Energy Law Act of 10 April 1997, in particular Article 4j, energy consumers have the right to purchase energy from any supplier they choose. This means that electric vehicle users have the right to enter into contracts for the supply of electricity to a recharging point with a supplier other than the entity supplying electricity to the household or premises where such a recharging point is located. The provisions of the Energy Act do not restrict the users in their right to have more than one energy outlet (punkt poboru energii, PPE). PPE is a place (address/point) in the network at which electricity consumption is measured. If there is more than one measuring facility at one address, these facilities are separate PPEs.

2.2.2. Electric vehicles — passenger cars

In Poland, electric passenger vehicles are more expensive than vehicles powered by traditional fuels: their price can be estimated at PLN 80,000-220,000.

The cost of covering 100 km in an electric vehicle depends mainly on the price of electricity (1 kWh). Some analyses and reports also take into account the cost of using car batteries. Based on the data available on a US Government website[6] and expert calculations provided by the Ministry of Energy and the Ministry of Economic Development, it can be estimated that the cost of covering 100 km in an electric vehicle is approx. PLN 10, assuming that the vehicle in question uses up to 20 kWh/100 km. However, this is solely the cost of electricity and the estimated amount does not include any charges or commissions associated with recharging electric vehicles or the increasing battery wear level.

The share of EVs in the total number of new passenger vehicles registered in Poland was 0.29% in 2012 and 1.29% in 2014. The share of EVs in the total number of vehicles in Poland in 2013 was 0.012%. Despite a noticeable upward trend in sales, the market for electric vehicles is still developing at a slower rate in Poland than in the rest of the European Union. A detailed list of electric passenger vehicles in Poland in 2012-2014, broken down into BEVs, PHEVs and self-charging hybrids, is set out in the table below.

Table 4. Registration of new electric passenger vehicles (BEVs, PHEVs and self-charging hybrids) in Poland in 2012-2014[7]

Propulsion system	Number of vehicles			Share of EVs in the total number of new vehicles registered in Poland [%]		
	2012	2013	2014	2012	2013	2014
Hybrid	762	1,869	3,887	0.28	0.64	1.26
Electric (BEVs)	28	31	45	0.01	0.01	0.03
Total EVs	790	1,900	3,968	0.29	0.65	1.29

Prepared by the Ministry of Energy

The development of electro-mobility worldwide is a coordinated process that takes place in synergy with appropriate measures taken by groups of neighbouring countries. For instance, a common urban electro-mobility development scheme has been implemented in the Nordic countries. In addition, these countries participate in the European Green Vehicles Initiative (EGVI), financed from the European research programme Horizon 2020 (H2020).

2.2.3. Public transport

The need to provide efficient public transport is an essential driver of the electric transport market. Today, more and more bus companies in Poland purchase electric buses for their fleets or are planning to do so. The first cities to use electric buses were:

1. Warsaw, which purchased 10 electric buses;

[6] www.fueleconomy.gov (accessed in January 2015).

[7] Based on data provided by the National Energy Conservation Agency (Krajowa Agencja Poszanowania Energii S.A., KAPE), http://samochodyelektryczne.org/wyniki_sprzedazy_aut_elektrycznych_w_polsce_za_rok_2014.htm (accessed on 9 November 2016), http://www.eafo.eu/vehicle-statistics/m1 (accessed on 9 November 2016)

2. Kraków, which is currently testing its electric bus fleet and where a call for tenders has been concluded for the purchase of four electric buses;
3. Jaworzno, which is currently using one electric bus but plans to expand its fleet of electric buses;
4. Lublin, which is currently testing electric buses of different brands;
5. Rzeszów, which is conducting tests and analyses related to transport electrification.

Electric buses still account for only a small part of the urban transport fleet in Poland. The fleet of approx. 12,000 urban buses currently includes several dozen electric buses.[8] However, more and more local governments are considering using such vehicles. Worldwide, public transport is considered to be the branch of transport best suited to testing new technologies and therefore a driver of the e-mobility market. In many countries public transport has a key part to play in the transition to alternative fuels. In addition, fleet replacement projects provide an excellent opportunity for developing new technologies, and, consequently, they foster economic growth.

2.3. Maritime transport: LNG and electricity in maritime transport

There are several alternatives to petroleum products on the marine fuels market. When choosing a specific type of fuel, shipping companies consider the type of activity, the amount of capital expenditure and the operating costs.

In the vast majority of cases, shore-side electricity provided to commercial vessels is used to supply power to the vessels' electric installations while at berth. This is done to avoid using the vessels' own power generators, which generate noise and pollute the air.

In Polish maritime ports, electricity can be provided to vessels, but only at low voltage (400 V/50 Hz) and low power (up to 100 kW).

Supplying electricity to sea ferries and cruise ships, which require connections with a power input of 3-20 MW, is a different matter altogether. There are currently no specialised transformer/converter stations in Polish ports which make it possible to change the parameters of the electric current from 50 Hz to 60 Hz to adjust it to the different high-power electrical systems of such vessels.

Considering that LNG bunkering services are currently widely available and the demand for such services is relatively low, it is not necessary to invest considerable amounts in constructing complex onshore infrastructure. Fuel can be provided both by specialist bunker vessels, which operate on water, and by tank trucks, which operate on land. It is only necessary to develop appropriate procedures ensuring that such services are performed in a safe and efficient manner.

Other alternative fuels, such as methanol, may also be used to power vessel engines. However, as it is a liquid fuel, methanol is supplied to vessels using the traditional method. The Polish fleet does not have any vessels with a capacity to use shore-side electricity or any LNG-powered vessels. Polish ports are used by shipping companies whose vessels can use shore-side electricity supplies.

Nevertheless, measures are under way to rebuild and stimulate the Polish shipbuilding industry. There are plans to build new fully-equipped passenger and car ferries in Polish shipyards, taking into account the latest trends and policies, including the need to reduce

[8] *Transport — 2014 performance results* [Transport – wyniki działalności w 2014 r.], analysis by the Central Statistical Office, Warsaw, 2015:: http://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-wyniki-dzialalnosci-w-2014-r-,9,14.html (accessed in September 2015).

emissions by using dual-fuel technology. The first letter of intent concerning the construction of two vessels of this kind was signed on 9 June 2016 in Szczecin. In addition, constructing new passenger and car ferries for Polish shipping companies is part of the Strategy for Responsible Development (area: Reindustrialisation, project title: 'Batory').

The standards for gas emissions from fuel combustion by vessels (mainly for SO_x and NO_x) are becoming more and more restrictive. These standards are implemented by both the European Union (Directive 2012/33/EU) and the International Maritime Organisation (IMO) (Annex VI to the MARPOL Convention).

The Baltic Sea is a sulphur emissions control area (SECA). As from 1 January 2015, the level of sulphur in marine fuel cannot exceed 0.1%.

Shipping companies may achieve this emission level by using exhaust gas cleaning systems, low-sulphur fuels or LNG. More and more shipping companies can be expected to begin using low-carbon energy sources to propel their vessels.

It is also worth noting that Polish shipbuilding companies manufacture LNG vessels themselves or cooperate with other companies in constructing such vessels. These are mainly passenger and car ferries built for shipping companies from the Nordic countries.

In Poland there are four maritime ports that belong to the TEN-T Core Network, namely Gdańsk, Gdynia, Szczecin and Świnoujście.

2.4. LPG

Poland has one of the largest markets for LPG for vehicle propulsion in the world. This market is stable and undoubtedly well developed. At the end of 2015, there were 5,420 stations selling LPG in Poland. In 2015, the share of LPG-powered vehicles in the total number of passenger vehicles was over 14%. One of the specific features of the LPG market is that there are no vehicles equipped solely with LPG installations on the market. The Polish LPG Association estimates that one in five petrol vehicles is also LPG-equipped.[9]

No government scheme supporting the use of LPG has been developed to date. The only incentive is the lower rate of excise duty on LPG. The popularity of this fuel is due to high consumer demand, which is driven mainly by its lower price compared with traditional fuels. LPG installations started to be used on a mass scale within a short space of time, resulting in a sharp decrease in the costs of purchasing and assembling gas installations, which ensured a quick return on investment. The LPG refuelling infrastructure developed 'naturally', that is, without any special support schemes being created or any appropriate infrastructure being built specifically for that purpose. First, LPG was sold at small independent stations, and it was only later, when this type of fuel became popular, that large fuel companies began to sell it too.

2.5. Hydrogen

Hydrogen is another alternative to traditional fuels. A hydrogen vehicle has a greater range than an electric vehicle powered by batteries. One of the advantages of hydrogen vehicles is that they do not emit harmful substances into the atmosphere. At the same time, storing hydrogen may pose certain problems. Some vehicle manufacturers have been selling hydrogen cars since the end of 2014.

[9] All data are taken from *The Polish LPG Association's Annual Report for 2015* [Raport roczny 2015 Polskiej Organizacji Gazu Płynnego], Warsaw, 2016: http://pogp.pl/files/Raport_Roczny_POGP_2015.pdf (accessed in June 2016).

1 kg of hydrogen is sufficient to cover 100 km, which means that the average range of mass-produced vehicles using fuel cells is between 500 km and 600 km. According to the Motor Transport Institute (Instytut Transportu Samochodowego), 184 hydrogen refuelling stations worldwide were in operation in March 2015 (82 in Europe, 63 in North America and 39 in Asia).

The technology enabling the use of hydrogen in transport is currently the least developed of all alternative fuel technologies. Nevertheless, experts believe that hydrogen propulsion technology will attain its full commercial maturity around 2040-2050.[10]

There is no hydrogen refuelling infrastructure in Poland, and there is no basis for developing hydrogen refuelling points in the near future.

In accordance with Directive 2014/94/EU, the following technical specifications apply to hydrogen fuelling points:

(1) open air hydrogen refuelling points where gaseous hydrogen is dispensed as fuel to be used in motor vehicles are subject to the technical specifications of standard ISO/TS 20100 on gaseous hydrogen fuelling;

(2) hydrogen refuelling points must comply with the algorithms and equipment requirements specified in standard ISO/TS 20100 on gaseous hydrogen fuelling;

(3) connectors for motor vehicles for the refuelling of gaseous hydrogen must comply with standard ISO 17268 on gaseous hydrogen land refuelling connection devices used in motor vehicles ;

(4) hydrogen purity dispensed by hydrogen refuelling points must comply with the technical specifications of standard ISO 14687-2.

2.6. Synthetic fuels

Synthetic fuels are fuels obtained in the process of chemical synthesis, using different methods and raw materials. Depending on the raw material used, synthetic fuels may be divided into:

(1) fuels obtained from natural gas (gas to liquid (GTL));

(2) fuels obtained from coal (coal to liquid (CTL));

(3) fuels obtained from biomass;

(4) fuels obtained from plastics (municipal waste).

Synthetic petrol or synthetic diesel are obtained as a result of chemical processes.

As a rule, the use of synthetic fuels does not require the construction of new refuelling infrastructure for vehicles powered by synthetic fuels, since synthetic fuels may be used in vehicles powered by traditional fuels.

[10] *National programme for the promotion of hydrogen-powered vehicles in Poland* [Przesłanki narodowego planu wodoryzacji transportu samochodowego w Polsce], Motor Transport Institute: Warsaw, November 2015.

3. Legal aspects of the alternative fuels market

As regards provisions laying down the rules for siting and using alternative fuels infrastructure and the technical conditions for this infrastructure, there are regulations governing the functioning of traditional liquid fuel stations. There are, however, no legal provisions pertaining exclusively to alternative fuels infrastructure in transport.

An analysis of the legal aspects should be carried out separately for two types of infrastructure: natural gas and electricity.

3.1. Legislation: natural gas in transport

3.1.1. Natural gas refuelling infrastructure

There is currently no legislation (pertaining either to the technical aspects or to construction law) directly laying down the technical conditions for natural gas refuelling infrastructure and the rules for siting this infrastructure. To date, when designing and constructing CNG or LNG refuelling stations, investors have relied on the applicable legal provisions governing, among other things, the technical conditions for liquid fuel depots and stations, the technical conditions for gas networks or the existing fire protection rules (a list of legal instruments is included in Annex 4), as well as the non-mandatory technical standards prepared by the Chamber of the Natural Gas Industry (Izba Gospodarcza Gazownictwa). The list of regulations used by investors is not exhaustive, in particular as structures that could have an adverse effect on the environment and the safety of property and persons should be built with utmost care. The obligation to comply with the provisions contained in several different regulatory instruments laying down the technical conditions for natural gas refuelling infrastructure is an obstacle for investors. It would be better if the provisions were harmonised and brought together in a single Act. Such an instrument would take into account the specificity of this type of structure.

3.1.2. Trade in natural gas for propulsion purposes

The trade in natural gas is governed by the Energy Law Act of 10 April 1997.[11] Article 47(1) of that Act provides that energy companies which hold appropriate licences determine the tariffs for gaseous fuels and energy, which are approved by the President of the Energy Regulatory Office (Urząd Regulacji Energetyki, URE), and suggest the validity periods for these tariffs. These licence holders submit the tariffs to the President of the URE on their own initiative or at the request of the President. If the annual value of trade in gaseous fuels does not exceed the equivalent of EUR 100 000, then an undertaking is not required to obtain a licence and, therefore, does not have to submit tariffs for approval.

At the same time, the President of the Energy Regulatory Office may exempt licence holders from the obligation to submit tariffs based on individual decisions. Until January 2017, all undertakings trading in CNG which were not required to submit tariffs for approval could conduct their activities under the Communication from the President of the Energy Regulatory Office of 25 March 2009 No 7/2008 on the exemption of all energy companies holding licences to trade in gaseous fuels from the obligation to submit for approval tariffs for compressed natural gas (CNG) used to propel motor vehicles. Undertakings had the right to submit applications for exemption from the obligation to submit tariffs for approval. The President of the Energy Regulatory Office issued decisions granting exemptions after conducting administrative proceedings. Decisions exempting undertakings trading in CNG from the obligation to submit tariffs for approval were issued on the grounds that the

[11] Journal of Laws (Dziennik Ustaw) 2012, item 1059, as amended.

applicable rules governing the gas sector (in particular the TPA principle) provided for non-discriminatory access to gas networks, which allowed all entities to connect their gas compression equipment to distribution networks on equal terms. The President of the Energy Regulatory Office also noted that the development of methane fuels in transport contributed to the diversification of energy sources used in transport, while the development of the CNG market helped to increase competition on the fuel market as the obligation to submit tariffs for CNG trading for approval constituted a market entry barrier.

As a result of amendments made to the Energy Law Act by the Act of 30 November 2016 (Journal of Laws, item 1986), as from 1 January 2017 trade in CNG and LNG is not subject to price regulation by the President of the Energy Regulatory Office.

Although trade in natural gas is minutely regulated in Polish legislation, there are no provisions governing trade in LNG in ports, including transhipment. Any bunkering operations must be individually arranged with the Maritime Office, the port authorities and the shore-side transhipment operator, on the basis of the rules for the transhipment of dangerous goods.

3.1.3. Provisions for users of natural gas vehicles

CNG and LNG containers installed in motor vehicles constitute technical devices within the meaning of the Cabinet Regulation of 7 December 2012 on the types of technical devices subject to technical supervision.[12] As such, they are therefore subject to technical supervision. They may be used only if a decision authorising their use has been issued by the Transport Technical Supervision Authority (Transportowy Dozór Techniczny ,TDT), which is the competent body. For each of these containers, there are different rules for issuing decisions authorising their use.

LPG users are not obliged to hold decisions authorising the use of their containers if the containers are installed in establishments that have been granted authorisation for the assembly of gas installations for motor vehicles, hold an inspection report and have obtained a decision authorising the use of such containers from the TDT which was issued at the manufacturing stage. Such decisions, however, are not issued with regard to CNG or LNG containers, which is why the required technical supervision activities must be carried out in order that a decision authorising the use of such containers may be obtained. Approval should be obtained for natural gas containers installed in vehicles in accordance with UNECE Regulation No 110,[13] which specifies the service life, the conditions and rules of use for CNG cylinders in motor vehicles and LNG tanks. Periodic requalification rules for cylinders are laid down in point 4.1.4 of Annex 3 to this document, which provides that CNG cylinders must be visually inspected every 48 months. Moreover, in accordance with the regulation, the maximum service life of cylinders is 20 years. It should be noted that most cylinder manufacturers provide a 10- year warranty only.

The Polish national provisions are more restrictive in this regard because in accordance with the Annex to the Regulation of the Minister for Transport of 20 October 2006 on the technical conditions for the technical supervision of the design, manufacture, operation, repair and modernisation of specialist pressure equipment,[14] CNG containers should undergo an external inspection, a leak test and an operating test of

[12] Journal of Laws 2012, item 1468.

[13] Regulation No 110 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of:
I. specific components of motor vehicles using compressed natural gas (CNG) and/or liquefied natural gas (LNG) in their propulsion system;
II. vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) and/or liquefied natural gas (LNG) in their propulsion system [2015/999].

[14] Journal of Laws 2014, item 1465.

accessory equipment every three years (36 months). According to the information from the TDT and the Ministry of Infrastructure and Economic Development (currently the Ministry of Infrastructure and Construction), if an approval has been obtained for containers (both in new vehicles and in vehicles adapted for CNG use) in accordance with UNECE Regulation No 110, the validity period of the tests specified in the approval or operating instructions has not expired yet and the technical condition of these containers does not give rise to any concerns, a TDT inspector:
(1) checks whether the documentation is complete and relevant;
(2) identifies the pressure equipment on the basis of the documentation submitted and the manufacturer's nameplate;
(3) checks the equipment for completeness by comparing it with the documentation submitted.

LNG containers intended for the on-board storage of liquid natural gas as a fuel for motor vehicles in which the containers are to be fixed should be of any material containing austenitic stainless steel, and their design or method of manufacture must be suitable for the specified service conditions. Each tank is visually inspected every 120 months after the date of its manufacture (vehicle registration).[15] Naturally, the provisions on CNG containers and LNG tanks apply to those containers and tanks which have been manufactured in accordance with the relevant technical standards guaranteeing safe operation.

The more restrictive checks provided for in the Polish legislation generate costs and discourage potential users from choosing natural gas vehicles.

The increased vehicle mass and the smaller range compared with traditional vehicles are the major technological barriers to CNG use in transport. High-pressure containers for CNG storage can store relatively little energy and are relatively heavy (e.g. a 45-litre container can store up to 10 m^3 of gas weighing 50 kg). Assuming that three to five such containers are often installed in one vehicle to increase its range, the mass of that vehicle can increase significantly. This translates into an increased total mass of the vehicle and lower load capacity. In particular, this problem affects commercial vehicles with a maximum permissible laden weight of less than 3.5 tonnes.

3.1.4. Fiscal rules

The zero rate of excise duty on CNG ceased to apply in November 2013. As from 1 November 2013, CNG for propulsion purposes is subject to excise duty (currently PLN 0.33/m^3). This has resulted in the price of this fuel increasing, and it has prolonged the payback period for the capital invested in new vehicles.

3.2. Legal rules: electricity in transport

There are no legal provisions pertaining specifically to the electric vehicle recharging infrastructure. The laws that apply in this context are the general provisions, especially the Construction Law Act and the Energy Law Act.

The Construction Law Act lays down, among other things, the rules for constructing and designing buildings. It also governs the construction of electric vehicle recharging points. Recharging points may be classified as street furniture, which may be constructed without a building permit. As the definitions of 'structure' and 'street furniture' set out in the Construction Law Act are very broad, they tend to be interpreted differently by various local architectural and construction administration authorities. As a result, recharging points are sometimes treated as structures, which require a building permit. The Construction Law Act is also vague when it comes to electricity connections, as some administration authorities claim

[15] UNECE Regulation No 110

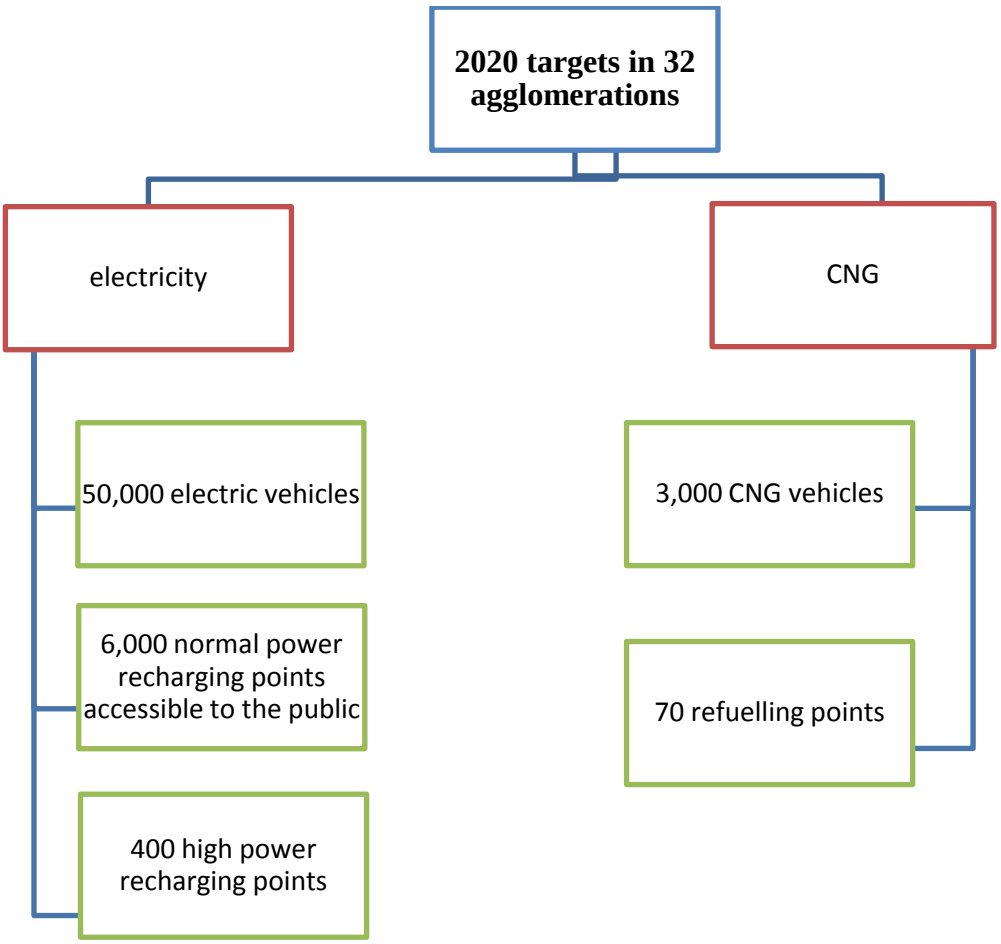
that a building permit is necessary and that it is not sufficient to notify the competent body of the intention to conduct building works.

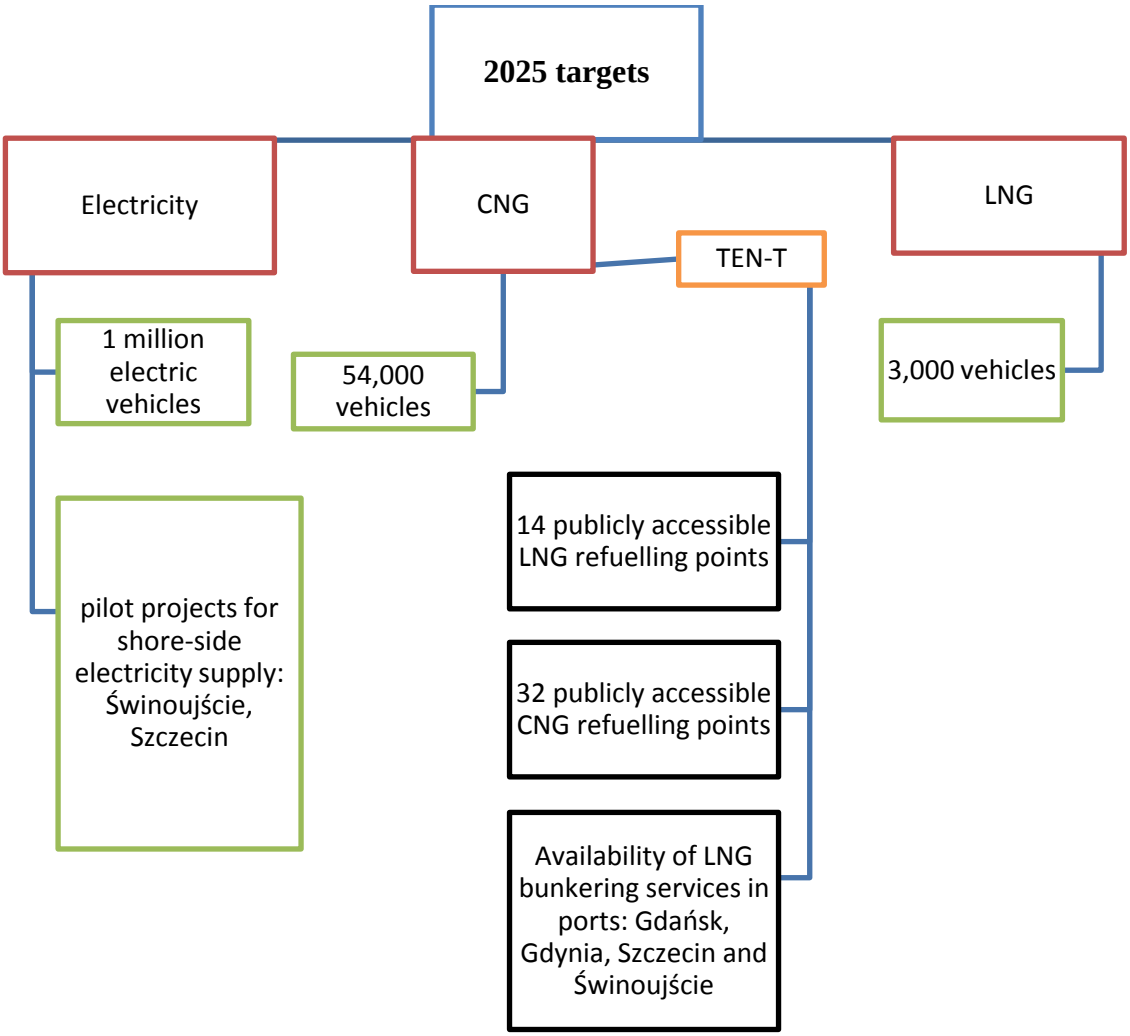
As things currently stand, in accordance with the Energy Law Act, if an undertaking buys electricity and then resells it to its consumers, then, as a rule, it must obtain a licence to trade in electricity for such activities. Trade in electricity by means of consumer-owned installations with a voltage of less than 1 kV is exempt from the obligation to obtain a licence. If the purpose of the activities in question is not 'financial gain', they are not considered to be business activities and, therefore, a licence is not required. In effect, electric vehicle recharging services are sold on the basis of licences for trade in electricity or electricity distribution. Moreover, while no direct reference to vehicle recharging is made in the aforementioned regulation, the Act sets out the rules for trading in electricity. The fundamental issue is whether electric vehicle recharging services are considered as subject to those rules or not. One of the technical barriers indicated by undertakings from that sector[16] is the obligation to install metering devices in front of the recharging points. Recharging facilities have their own pre-installed meters, which make it possible to calculate the amount of electricity provided to individual electric vehicle users. The respondents believe that the provisions should allow the use of those meters instead of obliging operators to install separate devices in the connection boxes. Among the other barriers mentioned were the customers' preference for traditional vehicles, problems with constructing electricity connections (problems in areas with unclear ownership of land, a long implementation period), administrative barriers when building recharging points along public roads and the lack of obligation to build such points.

In Poland there is no sales model for electric vehicle recharging services setting out the rules for selling electricity or the method for financial settlements between vehicle owners and providers of recharging services or between providers of recharging services and electricity sellers or, if the seller and the provider are the same entity, between that entity and the electricity distributor. Most recharging points are available to users free of charge; the users do not pay for the electricity used. Some users enjoy exclusive access to such points. A small number of recharging points operate for commercial purposes, but no accurate data are available. The purpose of offering recharging services free of charge is to promote the use of electric vehicles in Poland.

[16] Data obtained in a survey conducted by the Ministry of the Economy.

4. Development of the market for alternative fuels in transport: targets




2025 targets
Electricity
CNG
LNG
TEN-T
1 million electric vehicles
54,000 vehicles
3,000 vehicles
pilot projects for shore-side electricity supply: Świnoujście, Szczecin
14 publicly accessible LNG refuelling points
32 publicly accessible CNG refuelling points
Availability of LNG bunkering services in ports: Gdańsk, Gdynia, Szczecin and Świnoujście

It is not economically viable to develop an infrastructure for electricity supply for stationary airplanes.

There are no inland ports belonging to the TEN-T network.

The provisions of Directive 2014/94/EU allow for modes of transport other than those indicated in the Directive to be taken into account, such as rail transport, but this is not mandatory. Given that, in Poland, rail transport is not a mode of transport for which there are limited alternatives to fossil fuels, it was not considered necessary to set targets for railway transport in this document.

4.1. Electric vehicles: projected growth

4.1.1. Motor vehicles

Table 5. Projected increase[17] (indicative figures) in the number of electric vehicles in 2016-2025

Year	Number of EVs	Newly registered EVs
2015	1,007	—
2016	2,397	1,389
2017	5,704	3,307
2018	13,576	7,871
2019	32,310	18,734
2020	76,898	44,587
2021	183,017	106,119
2022	366,034	183,016
2023	549,051	183,016
2024	823,576	274,525
2025	1,029,470	205,894

Prepared by the Ministry of Energy

The target of 1 million vehicles only serves to indicate the direction of change. The table above shows a linear and systematic year-on-year increase in the number of electric vehicles. It is important to note that the actual figures for 2016 differ from those adopted in the model, but this difference should be less marked for subsequent years. The figures provided in the table are only indicative as it is difficult at the present stage to predict with absolute certainty when the number of electric vehicles will rapidly increase. This increase is forecast to take place between 2021 and 2024, when, in line with the projected trends, electric vehicle technology should have reached a sufficiently advanced state of development. The target set for 2025 will make it possible to properly develop the recharging infrastructure and reduce air emissions of harmful compounds from the transport sector. The projected gradual

[17] The table shows only indicative numbers of electric vehicles in individual years which may be different from the actual figures.

increase will make it possible to prepare the correct number of recharging points for electric vehicles, modernise or create an appropriate electricity infrastructure (comprising both transmission and distribution networks) and establish an appropriate legal framework for the e-mobility market.

The initially small increase in the number of vehicles will be offset by an ever faster growth in subsequent years. At the same time, the growth rate will make it possible to create instruments to support the development of the e-mobility market.

4.1.2. Number of recharging points for electric vehicles

In line with the target of 1 million electric vehicles to be achieved by 2025, the number of such vehicles in Poland in 2020 should be over 75,000. As the electrification of transport should occur mainly in agglomerations and densely populated areas, in 2020, 70% of the electric vehicles in Poland should be registered and used in the selected agglomerations and densely populated areas. In order for the newly created recharging infrastructure to be as functional as possible, it should be fully accessible to all electric vehicle users, even if a particular user does not have a contract with the seller of recharging services when recharging their vehicle. It is also essential to establish the standard for the newly created infrastructure to ensure its full uniformity and interoperability. Undoubtedly, the development of high-power chargers along the TEN-T Core Network would facilitate the development of the alternative fuels market and infrastructure. The General Directorate for National Roads and Motorways (Generalna Dyrekcja Dróg Krajowych i Autostrad, GDDKiA) should consider implementing a facilitation scheme for entities intending to build elements of the electric vehicle recharging infrastructure in the facilities managed by the GDDKiA.

Map 1 shows the range of electric vehicle recharging points in individual agglomerations and other densely populated areas.[18] It can be seen that it will be possible to travel in electric vehicles between most agglomerations and densely populated areas. Thanks to their driving range, electric vehicles can be used not only by inhabitants of particular towns but also by inhabitants of adjacent municipalities and areas.

Table 6. Selected agglomerations and densely populated areas in Poland (data for 2014)

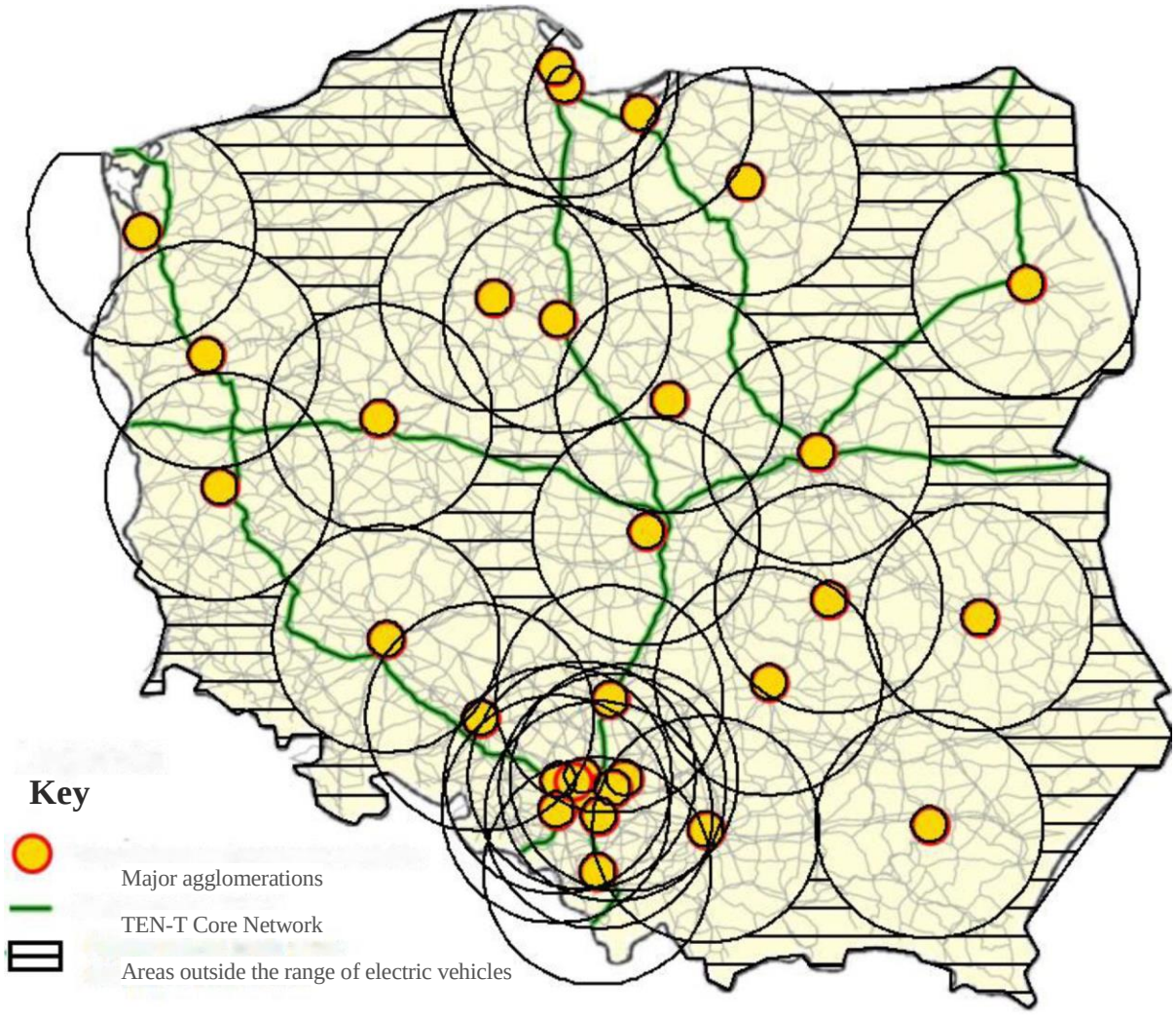
Item	Agglomeration	Province	Population	Surface km^2	Number of registered vehicles	Number of vehicles/1,000 inhabitants	Number of inhabitants/1 km^2	Number of vehicles/1 km^2
Provincial capitals								
1	Warsaw	Mazowieckie	1,735,442	517	1,262,399	727.4	3,334.0	2,441.8
2	Kraków	Małopolskie	761,873	327	482,747	633.6	2,322.0	1,476.3
3	Łódź	Łódzkie	706,004	293	397,452	563.0	2,426.0	1,356.5
4	Wrocław	Dolnośląskie	634,487	293	437,672	689.8	2,159.0	1,493.8
5	Poznań	Wielkopolskie	545,680	262	401,576	735.9	2,092.0	1,532.7
6	Gdańsk	Pomorskie	461,489	262	294,667	638.5	1,762.0	1,124.7
7	Szczecin	Zachodniopomorskie	407,180	301	226,191	555.5	1,358.0	751.5
8	Bydgoszcz	Kujawsko-Pomorskie	357,652	176	224,288	627.1	2,042.0	1,274.4
9	Lublin	Lubelskie	341,722	147	196,850	576.1	2,330.0	1,339.1
10	Katowice	Śląskie	301,834	165	218,852	725.1	1,849.0	1,326.4

[18] The selection criteria are set out in Annex 2, point 3.

Item	Agglomeration	Province	Population	Surface km^2	Number of registered vehicles	Number of vehicles/1,000 inhabitants	Number of inhabitants/1 km^2	Number of vehicles/1 km^2
Provincial capitals								
11	Białystok	Podlaskie	295,459	102	138,271	468.0	2,891.0	1,355.6
12	Toruń(2)	Kujawsko-Pomorskie	203,158	116	114,581	564.0	1,758.0	987.8
13	Kielce	Świętokrzyskie	198,857	110	110,440	555.4	1,823.0	1,004.0
14	Rzeszów	Podkarpackie	185,123	117	107,436	580.4	1,574.0	918.3
15	Olsztyn	Warmińsko-Mazurskie	173,831	88	99,258	571.0	1,540.0	1,127.9
16	Gorzów Wielkopolski(1)	Lubuskie	124,145	86	74,317	598.6	1,451.0	864.2
17	Opole	Opolskie	119,574	97	86,604	724.3	1,244.0	892.8
18	Zielona Góra(2)	Lubuskie	117,738	58	74,210	630.3	2,030.0	1,279.5
Other densely populated areas								
19	Gdynia	Pomorskie	247,820	135	155,449	627.3	1,835.0	1,151.5
20	Częstochowa	Śląskie	230,123	160	136,431	592.9	1,455.0	852.7
21	Radom	Mazowieckie	217,201	112	114,080	525.2	1,954.0	1,018.6
22	Sosnowiec	Śląskie	209,274	91	118,846	567.9	2,320.0	1,306.0
23	Gliwice	Śląskie	184,415	134	123,995	672.4	861.0	925.3
24	Zabrze	Śląskie	177,188	80	90,250	509.4	2,218.0	1,128.1
25	Bielsko-Biała	Śląskie	173,013	125	109,606	633.5	1,395.0	876.9
26	Bytom	Śląskie	172,306	69	81,698	474.1	2,498.0	1,184.0
27	Ruda Śląska	Śląskie	140,669	78	71,249	506.5	1,821.0	913.5
28	Rybnik	Śląskie	140,052	148	81,510	582.0	945.0	550.7
29	Tychy	Śląskie	128,621	82	77,182	600.1	1,575.0	941.2
30	Dąbrowa Górnicza	Śląskie	123,376	189	76,255	618.1	397.0	403.5
31	Elbląg	Warmińsko-Mazurskie	122,368	80	63,072	515.4	1,540.0	788.4
32	Płock	Mazowieckie	122,224	88	84,534	691.6	1,395.0	960.6

(1) seat of the provincial governor, (2) seat of the provincial assembly and marshal's office
Source: KAPE

Map 1 Electric vehicle recharging infrastructure coverage in selected agglomerations and densely populated areas[19]



[19] It was assumed that the driving range of electric cars was 150 km, which is equal to the diameter of the circles shown.

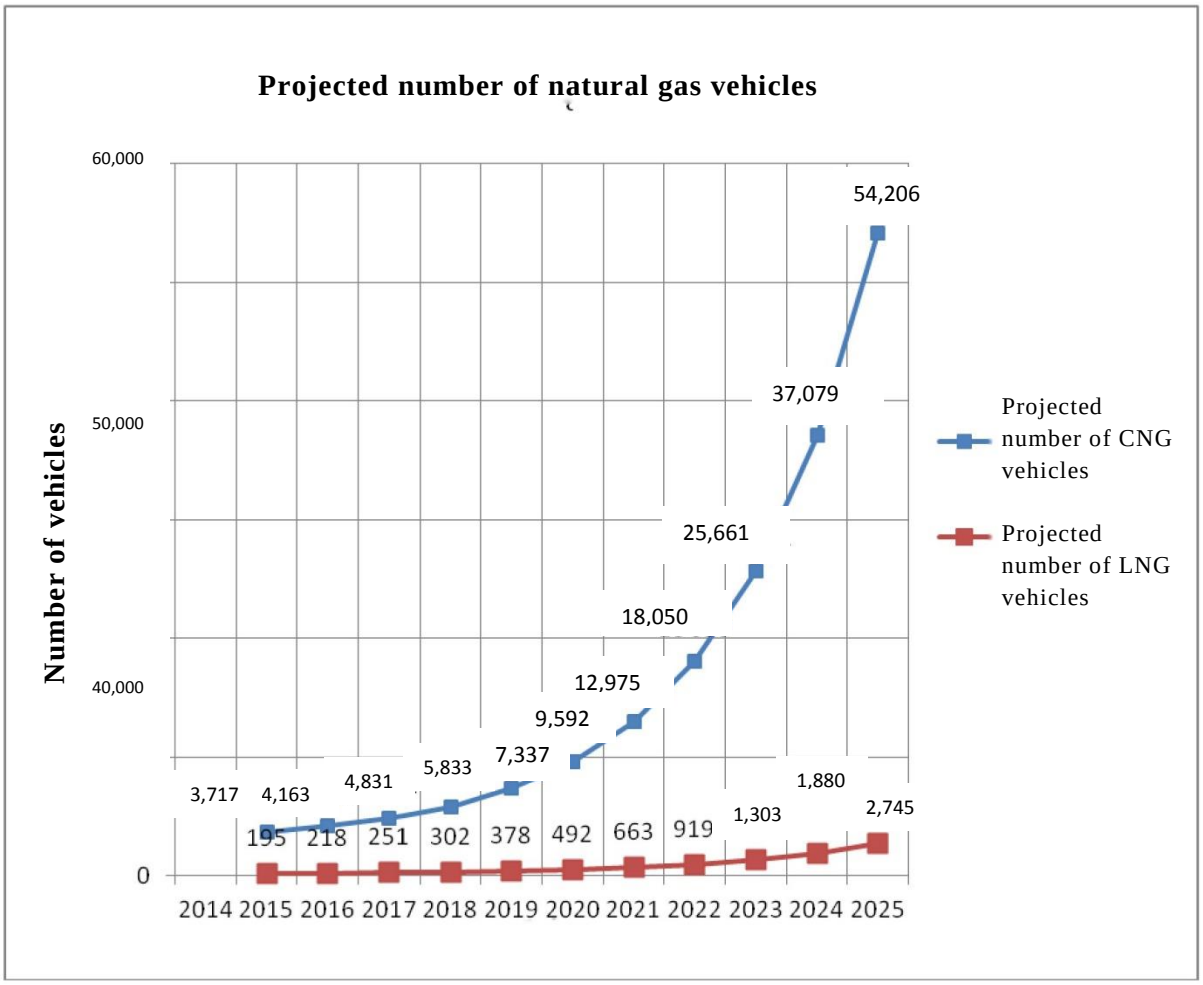
Table 7. Projected number of electric vehicles and recharging points in 32 agglomerations and densely populated areas in 2020 (indicative figures)

City	Number of electric vehicles (excl. buses)	Number of normal power recharging points accessible to the public	Number of high power recharging points accessible to the public	Total number of recharging points
Warsaw	10,463	1,304	63	1,367
Kraków	4,002	499	24	523
Łódź	3,295	411	20	431
Wrocław	3,628	452	22	474
Poznań	3,329	415	20	435
Gdańsk	2,443	305	15	320
Szczecin	1,874	233	11	244
Bydgoszcz	1,859	232	11	243
Lublin	1,632	203	10	213
Katowice	1,814	226	11	237
Białystok	1,146	143	7	150
Toruń	950	118	6	124
Kielce	916	114	6	120
Rzeszów	890	111	5	116
Olsztyn	823	103	5	108
Gorzów Wielkopolski	616	77	4	81
Opole	718	89	4	93
Zielona Góra	615	77	4	81
Gdynia	1,288	160	8	168
Częstochowa	1,131	141	7	148
Radom	946	118	6	124
Sosnowiec	985	123	6	129
Gliwice	1,027	128	6	134
Zabrze	748	93	5	98
Bielsko-Biała	909	113	5	118
Bytom	677	84	4	88
Ruda Śląska	590	73	4	77
Rybnik	676	84	4	88
Tychy	640	80	4	84
Dąbrowa Górnicza	633	79	4	83
Elbląg	523	65	3	68
Płock	701	87	4	91
Total	53,829	6,541	318	6,859

Prepared by the Ministry of Energy

4.2. Natural gas vehicles

Chart 3. Projected number of natural gas vehicles (indicative figures)



Prepared by the Ministry of Energy

4.2.1. CNG in agglomerations

Developing an appropriate CNG vehicle refuelling infrastructure is an essential factor which may help boost the popularity of natural gas in transport. In accordance with Directive 2014/94/EU, refuelling points should be deployed in the first instance in agglomerations and other densely populated areas. The agglomerations and densely populated areas were selected using the same method as that applied for the electric vehicle recharging points.

The number of recharging points in individual agglomerations selected in 2020 was calculated using a special algorithm (Annex 6).[20] In agglomerations in which, based on that algorithm, there was only one refuelling station, the number of stations was increased to two,

[20] Based on *Analysis of possible scenarios for the development of the market for alternative fuels in transport and related infrastructure in Poland, including algorithms and methods for the deployment of alternative fuels infrastructure* [Analiza dotycząca scenariuszy przyszłego rozwoju rynku paliw alternatywnych w transporcie w Polsce i powiązanej z nim infrastruktury, w tym algorytmów rozmieszczenia infrastruktury dla paliw alternatywnych oraz zastosowanej metodologii],, prepared by KAPE.

which significantly improved the flow of traffic in the agglomerations concerned. In addition, it is projected that one CNG refuelling station will consist of two refuelling pumps (points). In Zielona Góra, CNG use requires the construction of LCNG stations since the city is supplied with nitrogen-rich gas, which does not meet the requirements for CNG due to its low octane number.

Table 8. Number of CNG refuelling points in individual agglomerations in 2020 (indicative figures)

Item	Agglomeration	Province	Number of refuelling points required	Number of CNG vehicles in the selected agglomerations
1	Warsaw	Mazowieckie	6	457
2	Kraków	Małopolskie	3	175
3	Łódź	Łódzkie	2	144
4	Wrocław	Dolnośląskie	3	159
5	Poznań	Wielkopolskie	2	146
6	Gdańsk	Pomorskie	2	107
7	Szczecin	Zachodniopomorskie	2	82
8	Bydgoszcz	Kujawsko-Pomorskie	2	81
9	Lublin	Lubelskie	2	71
10	Katowice	Śląskie	2	79
11	Białystok	Podlaskie	2	50
12	Toruń	Kujawsko-Pomorskie	2	42
13	Kielce	Świętokrzyskie	2	40
14	Rzeszów	Podkarpackie	2	39
15	Olsztyn	Warmińsko-Mazurskie	2	36
16	Gorzów Wielkopolski	Lubuskie	2	27
17	Opole	Opolskie	2	31
18	Zielona Góra	Lubuskie	2	27
19	Gdynia	Pomorskie	2	56
20	Częstochowa	Śląskie	2	49
21	Radom	Mazowieckie	2	41
22	Sosnowiec	Śląskie	2	43
23	Gliwice	Śląskie	2	45
24	Zabrze	Śląskie	2	33
25	Bielsko-Biała	Śląskie	2	40
26	Bytom	Śląskie	2	30
27	Ruda Śląska	Śląskie	2	26
28	Rybnik	Śląskie	2	30
29	Tychy	Śląskie	2	28
30	Dąbrowa Górnicza	Śląskie	2	28
31	Elbląg	Warmińsko-Mazurskie	2	23

Item	Agglomeration	Province	Number of refuelling points required	Number of CNG vehicles in the selected agglomerations
32	Płock	Mazowieckie	2	31
	Total		72	2296

Prepared by the Ministry of Energy

4.2.2. Deployment of CNG or LNG refuelling stations along the roads of the TEN-T Core Network

The number of CNG or LNG refuelling stations along the TEN-T Core Network was determined by means of an algorithm designed at the request of the Ministry of the Economy (Annex 6).[21] The following elements must be taken into account when determining the location of CNG or LNG refuelling points:

- distance to CNG and LNG storage points and the gas supply method;
- siting natural gas refuelling points at existing traditional fuel stations (which will reduce construction costs);
- siting refuelling points at existing or planned rest and service areas (RSAs);
- prioritising fast fuel systems.

In line with the calculations, the number of CNG/LNG refuelling points in 2025 should be as follows:

1. along the Polish section of the Baltic-Adriatic base corridor: 16 CNG points, 8 LNG points:

a) section 1: Gdynia – Gdańsk – Katowice/Sławków (585 km) – number of points:

CNG: 4;

LNG: 2;

b) section 2: Gdańsk – Warsaw – Katowice (739 km) – number of points:

CNG: 5;

LNG: 2;

c) section 3: Katowice – Ostrava – Brno – Vienna (length in Poland: 74 km, length in the Czech Republic: 20 km) – number of points:

CNG: 1;

LNG: 1;

d) section 4: Szczecin/Świnoujście – Zielona Góra – Wrocław – Ostrava (length in Poland: 712 km, length in the Czech Republic: 20 km) – number of points:

CNG: 5;

LNG: 2;

e) section 5: Katowice – Žilina – Bratislava – Vienna (length in Poland: 119 km, length in Slovakia: 50 km) – number of points:

[21] Ibid.

CNG: 1;

LNG: 1.

2. the Polish section of the North Sea-Baltic base corridor: 8 CNG points, 3 LNG points:

a) section: Kaunas – Warsaw (length in Poland: 332 km, length in Lithuania: 33 km) – number of points:
CNG: 3;

LNG: 1;

b) section: PL/BY border: Warsaw – Poznań – Frankfurt/Oder – Berlin – Hamburg (length in Poland: 665 km, length in Germany: 35 km) – number of points:
CNG: 5;

LNG: 2.

3. The TEN-T Core road network outside the corridors: 8 CNG points, 3 LNG points.

LCNG refuelling stations should be deployed at existing fuel stations in the RSAs. Regulation (EU) No 1315/2013 of the European Parliament and of the Council on Union guidelines for the development of the trans-European transport network ('Regulation No 1315/2013') lays down the requirements to be met by the infrastructure of the core network. Article 39(2)(c) of Regulation No 1315/2013 provides that an alternative clean fuels infrastructure must be available along the core road network.

Under Directive 2014/94/EU, natural gas, CNG and LNG refuelling stations must be deployed along the TEN-T Core Network to enable the circulation of natural gas vehicles. For this reason, while refuelling stations do not have to be sited in RSAs, they must be located in places where they are accessible to the users of the core network. It seems that RSAs are the most suitable locations for natural gas refuelling stations. However, given the problems relating to the licensed road sections and the difficulty with amending the contracts between the GDDKiA and RSA leaseholders, the natural gas refuelling infrastructure could potentially be deployed along the TEN-T Core Network, rather than directly within that network. This document only specifies the number of refuelling points necessary to enable the circulation of vehicles along the TEN-T network. Specific locations should be determined in cooperation with RSA operators. This task should be carried out by the minister responsible for the development of the TEN-T Core Network and the General Directorate for National Roads and Motorways – with respect to roads managed by that authority. However, individual RSA operators will still have the final say on whether they want to perform such services, as the conditions at different RSAs vary greatly, and it is very difficult to develop a single standard approach. The natural gas distribution system operator should also be consulted in each case, as the current location of gas networks or plans to create new gas networks should also be taken into account (as a factor of the utmost importance) when determining the location of refuelling points.

4.3. Ports

4.3.1. Shore-side electricity supply to vessels

In view of the specificity of Polish ports, shore-side electricity installations should be developed in the first instance in maritime ports of fundamental importance to the national economy, that is, in Gdańsk, Gdynia, Szczecin and Świnoujście. The best way to proceed would be to create a pilot project in one of these ports. A pilot project would make it possible to accurately assess the advantages and costs of such an undertaking.

The analyses conducted to date indicate that the deployment of a recharging infrastructure in all ports of the TEN-T network is not justified on economic grounds given the current costs of this infrastructure and the shipping companies' lack of interest in this technology.

4.3.2. LNG

The forecast number of calls at TEN-T ports prepared by KAPE for the purpose of this document shows that the LNG refuelling infrastructure could become profitable by 2025, depending on the bunkering model selected.

Table 9. Number of calls at Polish ports by LNG vessels in 2025 and 2030

Port	Year	Total	Liquid bulk	Dry bulk	Containers	Mobile self-propelled	Mobile	Other
Gdańsk	2025	768	25	34	703	4	0	1
	2030	1,621	29	50	1,533	6	0	2
Gdynia	2025	604	1	27	527	43	3	3
	2030	1,264	1	41	1150	65	4	4
Szczecin	2025	75	2	18	47	0	0	7
	2030	144	3	27	103	0	0	11
Świnoujście	2025	166	3	23	0	135	3	1
	2030	250	4	34	1	205	4	2

Prepared by KAPE

Each of the bunkering systems has its advantages and disadvantages. System selection should be based on the results of assessments conducted for each of the ports. Fixed bunkering installations are a very expensive system to set up. As these installations are mainly dedicated to specific maritime units (e.g. ferries travelling regularly along a fixed route frequently calling at ports) due to their parameters (e.g. length) and design (e.g. vessels in which the points of connection between the LNG containers and cables supplying the fuel from a fixed shore-side installation are placed on one side of the vessel), it can be assumed that LNG can be efficiently supplied by means of tank trucks, bunker vessels or containers. However, it is mainly for the shipping companies and/or operators of specific vessels to decide what LNG is to be used for in these vessels, considering the bunkering installations fixed on the vessels in question and LNG availability, including alternative supply methods available in a given port and the cost of such supply (the options available on the market include tank trucks, bunker vessels and containers). In many cases, it may turn out that tank trucks, bunker vessels or containers are the best solution for bunkering in ports, and that building an expensive (fixed) infrastructure is not necessary. At the same time, maritime ports should put in place LNG supply procedures taking into account each of the three methods mentioned above.

Due to insufficient demand, there is currently no need to build fixed LNG bunkering installations in Polish ports. It is enough to use tank trucks or bunker vessels. In order to make

such services available, each port should put in place refuelling safety procedures and designate places where such operations may be carried out. While LNG terminals can be used for bunkering vessels, this will be done by means of bunker vessels anyway. It would be too expensive and time-consuming to tow a vessel to a terminal for bunkering.

Another essential parameter is the availability of LNG. While it is best to have an LNG terminal close to the port, it is not economically viable to build a terminal for the sole purpose of bunkering vessels. In Poland, appropriate volumes of LNG should be supplied to the ports of Gdańsk, Gdynia, Szczecin and Świnoujście. One of the advantages of the Świnoujście port is its location next to an LNG terminal.

The following barriers to the development of LNG refuelling infrastructure have been identified in Poland:

(1) lack of experience in implementing and operating bunkering installations for LNG vessels;

(2) high costs of investing in shore-side installations and installations on board vessels;

(3) no measures taken to force shipping companies to use LNG – preference for vessels that have less impact on the environment or high charges for water pollution in ports and harmful emissions from vessels.

The development of LNG infrastructure in ports depends directly on the cost of investing in LNG refuelling infrastructure going down, especially as LNG prices may initially be less attractive than the prices of traditional marine fuel. Nevertheless, these proportions may change if the services are provided on a wider scale. It would be best to launch pilot programmes in selected ports and to encourage the port authorities to develop this infrastructure by working together.

Except for the TEN-T network ports, there is no commercial need for LNG installations in other Polish ports. However, it will always be possible to use the existing LNG terminal in Świnoujście and to supply LNG by tank trucks or bunker vessels.

4.4. Airport electricity supply for stationary airplanes

At the current stage of technological development, there are no economic grounds for developing an electricity supply infrastructure for stationary airplanes. At present, such installations cannot be developed without financial support, and their advantages would be vastly outweighed by the costs. Nevertheless, the provision of electric power at airports has become a standard service which the users, that is, carriers, have come to take for granted. It seems worthwhile to consider a separate scheme for optimising the electricity supply for stationary aircraft using different methods, covering, among other things, fixed supply points. Such a scheme would make it possible to generate savings and adopt a sustainable approach to environmental protection at airports.

It is already possible to connect separate fixed energy facilities to the electricity network of airports powered, for instance, by solar panels.

The use of diffuse sources, such as mobile power generators powered by alternative fuels LNG/CNG, or pure biofuels or their blends with standard fuels may in the long term help to increase the share of alternative fuels in the entire aviation sector.

However, any of the measures mentioned above should be justified on economic grounds and left to the discretion of individual airports, especially if there is no single support system for such costly investments.

At the same time, recharging points for electric passenger vehicles and buses will be installed in the car parks and in other places at Polish airports.

5. Support for the development of infrastructure and the vehicle market

5.1. Financial support for infrastructure and the vehicle market

The experience of European Union countries shows that developing both the infrastructure and the market for alternative fuel vehicles must be supported through an appropriate system of subsidies.

The system of subsidies, along with appropriate tax instruments and soft support instruments, may have the desired effect: an increase in the number of vehicles and the deployment of appropriate infrastructure.

Therefore, there are plans to create an appropriate financial instrument designated for:

(1) supporting the purchase of electric vehicles, compressed natural gas (CNG) vehicles and liquefied natural gas (LNG) vehicles;

(2) supporting the construction and development of appropriate alternative fuels infrastructure, in particular recharging points for electric vehicles and natural gas refuelling points in agglomerations and densely populated areas, also for local government units;

(3) supporting local government policies with regard to charging parking fees for low-emission vehicles;

(4) supporting the construction and deployment of alternative fuels infrastructure in maritime ports of fundamental importance to the national economy;

(5) supporting the construction of bunker vessels supplying LNG to vessels;

(6) supporting the purchase of tank trucks used for shore-side LNG supply to vessels.

Detailed rules for the functioning of such a legal instrument will be laid down in an act. Funds would be allocated to local government bodies, undertakings and natural persons. Proper distribution of those funds will make it possible to achieve the targets under that scheme.

Another area to be taken into account is support for the development and implementation of innovation. Such expenditure at national level brings tangible benefits only if it is incurred in synergy with innovation activities carried out in Poland and abroad to foster the development of low-carbon transport (e.g. InnoMOTO, Era-Net Cofund on Electromobility, European Green Vehicle Initiative, etc.).

5.2. Incentives for investors to manufacture electric vehicles in Poland

Achieving the target of 1 million electric vehicles by 2025 is a very ambitious plan. This document outlines the support instruments for the construction of infrastructure and the development of the vehicle market. However, in the light of the targets set in this document, it is essential that the scheme helps boost economic growth and increase the number of innovative projects in Poland.

The National Policy Framework forms part of a wider strategy — the Clean Transport Package. Apart from the National Policy Framework, this package comprises the ‘Electro-mobility Development Plan for Poland – Energy for the Future’ and the Low-Carbon Transport Fund.

6. Proposed amendments

In order to support the deployment of alternative fuels infrastructure, the existing legal barriers must be eliminated and instruments driving the demand for vehicles using alternative fuels must be introduced. The table below sets out the proposed amendments to current legislation designed to achieve this goal, as well as legal instruments for implementing the proposed changes. The third column shows which of the proposed amendments serve to transpose Directive 2014/94/EU and which help to achieve the National Policy Framework targets. The Directive will be transposed into Polish law by means of a new act (title of the bill: Electro-mobility and Alternative Fuels Act), which will introduce new standards into Polish legislation and amend the existing provisions to the extent necessary to transpose the Directive. In Table 10, the term 'new Act' refers to the Electro-mobility and Alternative Fuels Act.

Table 10. List of proposed amendments and implementation methods

Item	**Proposed amendment**	**Implementation method**	**Transposition of Directive 2014/94/EU/ and/or achievement of the National Policy Framework targets**
	Rules governing the market for alternative fuels in transport		
1	Establishing the rules governing the market for electric vehicle recharging services	New Act	Transposition
2	Determining the principles of providing consumers with information on the fuels which may be used to refuel particular vehicles, and the obligation to make this information available in motor vehicle manuals, at refuelling/recharging points and car dealerships	New Act	Transposition
3	Setting up of a system for accessing data on the geographic location/accessibility of recharging points and natural gas refuelling stations which are accessible to the public	New Act	Transposition

4	Exempting sellers of electric vehicle recharging services from the obligation to hold licences to trade in electricity	Amending the Energy Law Act of 10 April 1997 (amendments set out in the new act)	Transposition
5	Adopting provisions on alternative fuels infrastructure taking into account the specificity of selling these fuels in maritime and inland ports	New Act	Transposition
	Support instruments		
1	Obliging public transport companies to use low-emission vehicles	New Act	Achievement of targets
2	Introducing an obligation to ensure appropriate connection power for car parks located next to newly erected public buildings and multi-family residential buildings	New act or amendments to existing legislation	Transposition
3	Permitting low-emission vehicles to use lanes specially designated for public transport (bus lanes)	New Act	Achievement of targets
4	Adopting measures facilitating the construction of electric vehicle recharging stations	Amending the Construction Law Act of 7 July 1994[22]	Achievement of targets
5	Adopting measures facilitating the construction and reconstruction of distribution networks and connections	Amending the Construction Law Act of 7 July 1994	Achievement of targets
6	Introducing low-emission (zero-emission) zones accessible to electric vehicles in towns/cities	Amending the Environmental Protection Law Act of 27 April 2001 or the new Act	Achievement of targets

[22] Work on a new Act, the Urban Development and Construction Code, is currently under way. Any proposals for amendments to the Construction Law Act will therefore be examined from the point of view of amendments to the new Code.

7	Introducing free parking for electric vehicles in paid public car parks	Amending the Public Roads Act of 21 March 1985 (Journal of Laws 2013, item 260)	Achievement of targets
8	Obliging public institutions to ensure at least a 50% share of low-emission vehicles in their fleets by 2025	New Act	Achievement of targets
9	Developing a support scheme for local governments involved in the construction of public infrastructure for recharging electric vehicles and refuelling CNG vehicles	Support scheme developed by the minister responsible for energy and the minister responsible for regional development.	Achievement of targets
10	Green public procurement	Information and promotional activities to boost the share of low-emission vehicles in public contracts	Achievement of targets
11	Supporting the development of low-carbon public transport	Supporting the construction of fast chargers for electric buses and urban electric vehicle rental companies	Achievement of targets
12	If no changes to the VAT tax are made at EU level (see point 3: Tax instruments below), a subsidy scheme for purchasing electric vehicles will be developed	Developing a subsidy scheme	Achievement of targets
	Tax instruments		
1	Zero-rate excise duty on electric vehicles and a lower rate of excise duty on low-emission vehicles	Amending the Excise Duty Act of 6 December 2008	Achievement of targets
2	More favourable tax depreciation rates for electric vehicles purchased for business purposes: the cost limit will be laid down in an Act	Amending the Personal Income Tax Act of 26 July 1991 Amending the Corporate Income Tax Act of 15 February 1992	Achievement of targets

3	Seeking to create a legal framework for the application of the reduced VAT rate to electric vehicles.	Work on amending Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax	Achievement of targets
4	Exempting electric vehicle recharging points (posts) from real estate tax	Amending the Act of 12 January 1991 on local taxes and charges	Achievement of targets
5	Introducing a registration fee based on the volume of harmful compound emissions, vehicle age and price	The minister responsible for public finance and the minister responsible for energy will prepare a proposal for a new system of vehicle registration fees	Achievement of targets
6	Including electric vehicle recharging services in Section D(35) of the Polish Classification of Goods and Services (Polska Klasyfikacja Wyrobów i Usug, PKWiU)	Amending the Cabinet Regulation of 4 September 2015 on the Polish Classification of Goods and Services	Achievement of targets
7	Reducing the tonnage tax for 'green vessels'	Amending the Tonnage Tax Act of 24 August 2006	Achievement of targets
8	Adopting more favourable rates of registration fees for vessels powered by alternative fuels	Amending the Regulation of the Minister for Infrastructure of 23 January 2003 on the register of vessels and registration procedure	Achievement of targets
	Technical provisions		
1	Drafting technical and construction provisions for CNG and LNG refuelling stations	A new regulation on the basis of the statutory authorisation provided for in the Construction Law Act of 7 July 1994	Achievement of targets

2	Amending the technical provisions concerning CNG and LNG containers	Amending the Regulation of the Minister for Transport of 20 October 2006 on the technical conditions of technical supervision of the design, manufacture, operation, repair and modernisation of specialised pressure equipment	Achievement of targets
3	Repealing provisions preventing untrained persons from refuelling CNG	Amending the Regulation of the Minister for Transport of 20 October 2006 on the technical conditions of technical supervision of the design, manufacture, operation, repair and modernisation of specialised pressure equipment	Achievement of targets
4	Laying down technical standards for recharging/refuelling points for alternative fuels, consistent with the standards laid down in Directive 2014/94/EU	Implementing provisions issued on the basis of the new Act	Transposition
5	Laying down the quality requirements, testing methods, quality standards and the sampling method for LNG	Drafting a regulation on the basis of the statutory authorisation provided for in the Fuel Quality Monitoring and Control System Act	Achievement of targets
6	Supplementing and updating the tables indicating the energy value of motor fuels	Regulation of the Prime Minister of 10 May 2011 on the mandatory tender evaluation criteria other than price for certain types of public contracts	Achievement of targets
7	Harmonising the sell price unit of measure for CNG and LNG (natural gas would be sold by kg)	Adopting provisions establishing CNG sale in kg	Achievement of targets

7. Review of the scheme

The scheme should be subject to annual reviews. The first review should take place one year after the adoption of the National Policy Framework by the Cabinet. Subsequent reviews should be performed every 12 months. The review should involve an assessment of the following aspects:

1. Achievement of the targets adopted;
2. Instruments used to achieve the targets;
3. Opportunities for the deployment of infrastructure for alternative fuels other than those specified in this scheme;
4. Cost-effectiveness of the construction of shore-side electricity installations;
5. Achievement of the targets set out in Directive 2014/94/EU;
6. Development of bunkering installations for LNG vessels in inland ports and outside the TEN-T network;
7. Analyses of the use of alternative fuels in air transport.

Annex 1: Requirements of Directive 2014/94/EU

Directive 2014/94/EU sets out the requirements for expanding the alternative fuels infrastructure, mainly with regard to recharging points for electric vehicles and natural gas and hydrogen refuelling stations. The Directive allows the Member States to include in their national policy frameworks also those transport modes in which alternative fuels may be used to a limited extent. Thus, railway transport may also be included in infrastructure deployment schemes. Development measures are to be implemented by means of national policy frameworks prepared by individual Member States.

In accordance with the Directive, a national policy framework must contain the following elements at the minimum:

– an assessment of the current state and future development of the market as regards alternative fuels in the transport sector, including in light of their possible simultaneous and combined use, and of the development of alternative fuels infrastructure, considering, where relevant, cross-border continuity;

– national targets and objectives, pursuant to Articles 4(1), 4(3), 4(5), 6(1)-(8) and, where applicable, Article 5(1), for the deployment of alternative fuels infrastructure. Those national targets and objectives shall be established and may be revised on the basis of an assessment of national, regional or Union-wide demand;

– measures necessary to ensure that the national targets and the objectives contained in the national policy framework are reached;

– measures that can promote the deployment of alternative fuels infrastructure in public transport services;

– designation of the urban/suburban agglomerations, of other densely populated areas and networks which, subject to market needs, are to be equipped with recharging points for electric vehicles accessible to the public;

– designation of the urban/suburban agglomerations, of other densely populated areas and networks which, subject to market needs, are to be equipped with CNG refuelling points;

– an assessment of the need to install refuelling points for LNG in ports outside the TEN-T Core Network;

– consideration of the need to install electricity supply at airports for use by stationary airplanes.

As regards infrastructure for individual types of alternative fuels, the Directive imposes the following obligations on the Member States:

1. Electricity supply for transport

– an appropriate number of recharging points accessible to the public must be put in place by 31 December 2020, in order to ensure that electric vehicles can circulate at least in urban (suburban) agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States. The number of points should ensure that vehicles can circulate within agglomerations or networks designed;

– normal power or high power recharging points, deployed or renewed as from 18 November 2017, should comply with the technical standards laid down in the Directive;

– shore-side electricity supply to maritime and inland vessels should be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand for such services and the costs are disproportionate to the benefits, including environmental benefits;

– shore-side electricity supply installations for maritime transport, deployed or renewed as from 18 November 2017, should comply with the technical specifications and standards laid down in the Directive;

– operators of recharging points accessible to the public should be free to purchase electricity from any Union electricity supplier;

– electric vehicle recharging points accessible to the public should provide for the possibility for users to recharge on an ad hoc basis without entering into a contract with the electricity supplier or operator concerned;

– prices charged by the operators of recharging points accessible to the public should be reasonable, easily and clearly comparable, transparent and non-discriminatory;

– distribution system operators are required to cooperate on a non-discriminatory basis with any person establishing or operating recharging points accessible to the public;

– Member States must ensure that the legal framework permits the electricity supply for a recharging point to be the subject of a contract with a supplier other than the entity supplying electricity to the household or premises where such a recharging point is located.

2. Hydrogen supply for road transport

– the decision about whether to develop hydrogen refuelling points has been left to the discretion of the Member States; if, however, a Member State decides to develop hydrogen refuelling points accessible to the public, then an appropriate number of such points should be put in place by 31 December 2025.

3. Natural gas supply for transport

a) maritime and inland ports:

– an appropriate number of LNG refuelling points must be put in place at maritime ports, to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2025;

– an appropriate number of LNG refuelling points must be put in place at inland ports, to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2030;

– Member States must cooperate with neighbouring Member States where necessary to ensure adequate coverage of the TEN-T Core Network;

– Member States must designate in their national policy frameworks the maritime and inland ports that are to provide access to LNG refuelling points, also taking into consideration the real market demand;

b) road transport:

– an appropriate number of LNG refuelling points accessible to the public must be put in place by 31 December 2025, at least along the existing TEN-T Core Network, in order to ensure that LNG heavy-duty motor vehicles can circulate throughout the European Union, where there is demand, unless the costs are disproportionate to the benefits, including environmental benefits;

– an appropriate number of CNG refuelling points accessible to the public must be put in place by 31 December 2020, in order to ensure that CNG motor-powered vehicles can circulate in urban (suburban) agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States;

– an appropriate number of CNG refuelling points accessible to the public must be put in place by 31 December 2025, at least along the existing TEN-T Core Network, to ensure that CNG motor-powered vehicles can circulate throughout the European Union.

c) Member States must ensure that an appropriate LNG distribution system is available in their territory, including loading facilities for LNG tank vehicles, in order to supply LNG refuelling points in maritime and inland ports, and within the TEN-T Core Network.

Directive 2014/94/EU also provides for an obligation to provide appropriate information to users of alternative fuel vehicles:

– relevant, consistent and clear information must be made available as regards those motor vehicles which can be regularly fuelled with individual fuels placed on the market, or recharged by recharging points;

– the above information must be made available in motor vehicle manuals, at refuelling and recharging points, on motor-powered vehicles and in motor vehicle dealerships in their territory; the requirement applies to all motor vehicles, and their motor vehicle manuals, placed on the market after 18 November 2016;

– the supply of information must be based on the labelling provisions regarding fuel compliance under standards of the ESOs setting the technical specifications of fuels.

The visual presentation of the information should be such as to ensure that the information is placed in a clearly visible manner:

– on corresponding pumps and their nozzles at all refuelling points, as from the date on which fuels are placed on the market, and on all fuel tanks' filling caps of motor vehicles;

– where appropriate, and in particular for natural gas and hydrogen, when fuel prices are displayed at a fuel station, a comparison between the relevant unit prices must be displayed for information purposes; the display of this information must not mislead or confuse the user;

– Member States should also provide access to data on the geographic location of recharging and refuelling points for alternative fuels accessible to the public. In the case of recharging points, such data may include information on accessibility, real-time charging, etc.

Annex 2: Detailed data on the market for alternative fuels in transport

1. Location and ownership structure of natural gas stations

The vast majority of stations (20) belong to the Polish Oil and Gas Company (Polskie Górnictwo Naftowe i Gazownictwo S.A., PGNiG). Some of these stations are located on land belonging to public transport companies and are run on the basis of an agreement between PGNiG and these companies. The ownership structure of the stations is as follows:[23]

1. PGNiG Capital Group (20 stations),
2. MPK Inowrocław (one station),
3. OrfaMet – Kraków (one station),
4. Vitkovice-Milmet – Sosnowiec (one station),
5. GZOG Zabrze (one station),
6. CNG Kalisz-Eljon (one station),
7. Inter-Municipal Municipal Waste Landfill – Śrem (one station),
8. Niepołomice – compressed biomethane station.

Most CNG refuelling stations are located in urban areas. Their location depends on access to natural gas networks, which is limited in some regions. The problem of access to natural gas networks can be solved by building LNG/CNG (LCNG) stations. Stored LNG may be converted to CNG. The costs of operating such stations are lower compared with CNG refuelling stations due to lower demand for energy. However, the capital expenditures associated with the construction of these stations are higher.

CNG stations may operate independently or as part of existing fuel stations that sell other types of fuel.

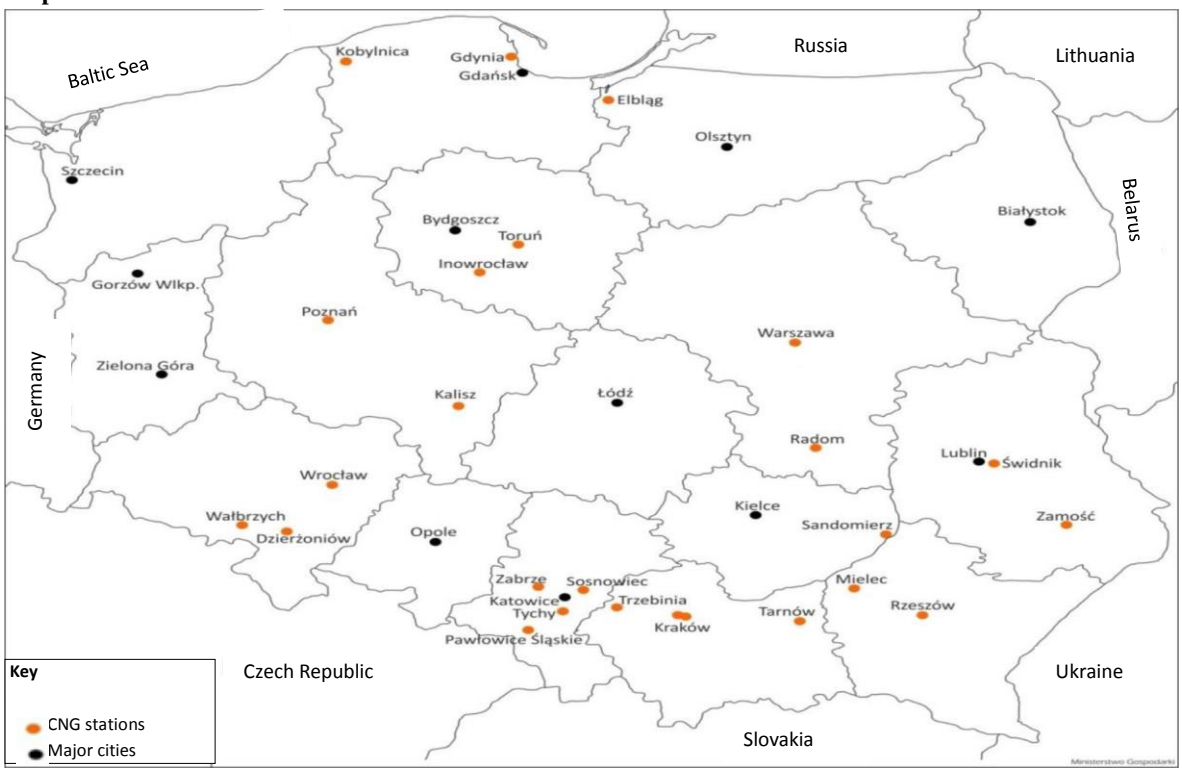
The number of existing refuelling stations for traditional fuels (petrol, diesel, LPG) at the end of 2014 was approx. 6,500,[24] which gives an average of approx. 4,000 motor vehicles for every traditional fuel station considering that the total number of motor vehicles is nearly 26.5 million.[25] Naturally, the exact number and the profitability of such stations may be different depending on the location of fuel stations. Given the specificity of natural gas-powered transport, CNG/LNG stations need not be as numerous as stations selling traditional fuels – at least at the initial stage of development.

[23] https://cng.auto.pl/stacje-cng-w-polsce/ (accessed on 12 December 2015).

[24] *Annual report. Oil Industry and Trade in 2014* [Raport roczny. Przemysł i Handel Naftowy 2014 r.], Polish Organisation of Oil Industry and Trade, p. 21.

[25] *Transport — 2014 performance results* [Transport – wyniki działalności w 2014 r.], analysis by the Central Statistical Office, Warsaw, 2015: http://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-wyniki-dzialalnosci-w-2014-r-,9,14.html (accessed in September 2015).

Map 2. Locations of CNG stations in Poland



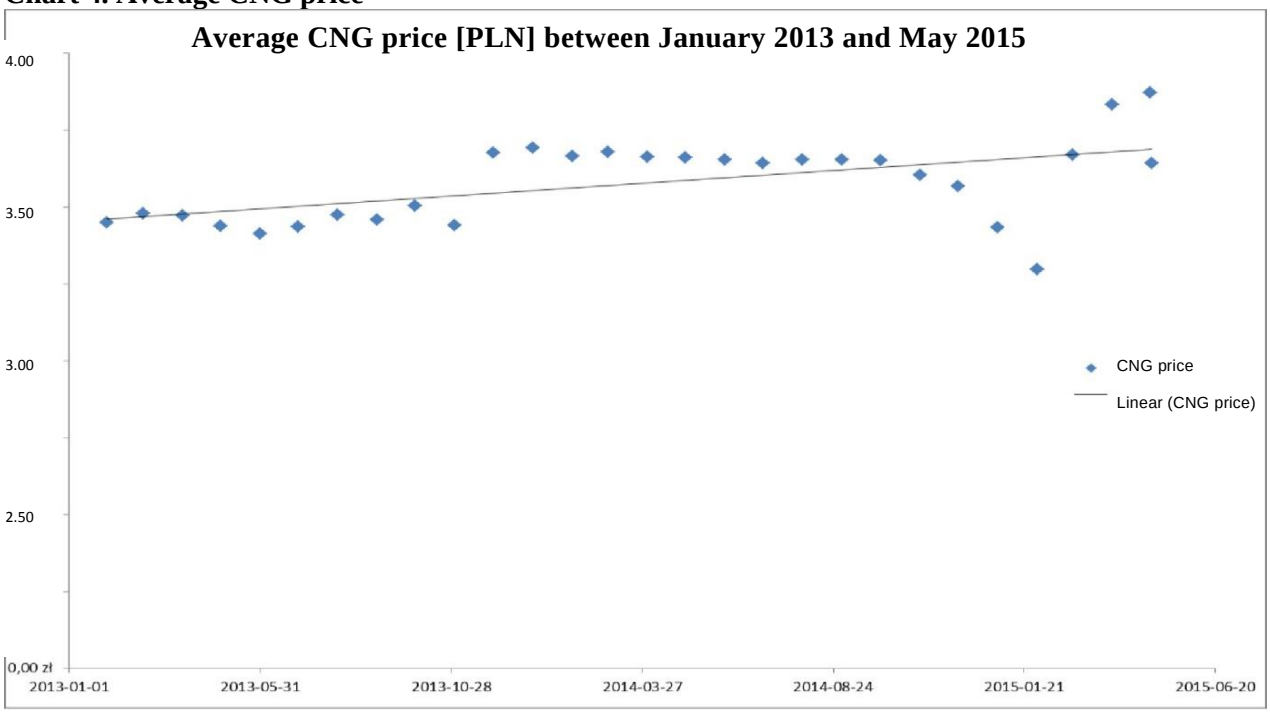
2. Economic viability of CNG installations in motor vehicles

If we assume that under normal conditions the energy value of 1 m^3 of CNG corresponds to 1 litre of petrol, then a comparison of the average prices of other fuels shows that CNG costs less than both petrol and diesel. At the same time, LPG remains the cheapest fuel in Poland.

The cost of fixing CNG installations in vehicles or the cost of purchasing a new vehicle with a CNG/LNG installation, as well as the actual costs of covering a certain distance, compared with the price of traditional fuel, are also important factors which should be considered when determining the economic viability of using natural gas in transport. CNG or LNG vehicles are usually 10-15% more expensive than vehicles powered by traditional fuels. The cost of fixing a specialised CNG installation is approx. PLN 6,000.

Another important criterion in assessing the viability of CNG is the cost of vehicle use and maintenance, which includes the cost of fuel, servicing, replacement parts, etc. The most important cost is the price of fuel. The viability of using natural gas in transport depends on the price of traditional fuels: the lower those prices, the longer the payback period for investments in the more expensive CNG or LNG vehicles. Crucial in this context is the diesel/CNG price ratio. These fuels are used to power the same types of vehicles. Moreover, the level of emissions from the latest generation diesel engines is comparable to that from CNG vehicles. As a result, a decrease in the diesel price hinders the growth of natural gas use in transport.

Chart 4. Average CNG price



Prepared by the Ministry of Energy, based on data at www.cng.auto.pl and www.ngvaeurope.eu

3. Agglomeration selection criteria

Accessibility of recharging/refuelling points is an important factor influencing the popularity of electric vehicles among consumers. In accordance with Directive 2014/94/EU, vehicle recharging points should be deployed in the first instance in urban/suburban agglomerations and other densely populated areas.

There are two main types of agglomerations: monocentric and polycentric agglomerations. Monocentric agglomerations, that is, agglomerations with a single large city at their centre, are the more common type of Polish agglomerations. In a monocentric agglomeration, the city must stand out against the other settlement units, for example in terms of size, location at the heart of the agglomeration or functional mix. Polycentric agglomerations, on the other hand, are agglomerations in which the urbanised area is surrounded by several functionally diversified, self-contained urban centres. Examples of such agglomerations include the Upper Silesia conurbation and the Tri-City Agglomeration.

After analysing the following parameters:

– the number of inhabitants;

– the types of administration authorities in agglomerations (provincial authorities or seats of the provincial governor, provincial assembly or marshal's office);

– the types of business undertakings operating in those agglomerations (manufacturing goods to satisfy the domestic demand and for export);

– the number of motor vehicles registered in agglomerations and their concentration (i.e. the number of vehicles per 1,000 inhabitants or the number of vehicles per 1 km^2);

– public transport services,

it was concluded that the following conditions must be met for a given area to be recognised as an agglomeration or a densely populated area:

– it has more than 100,000 inhabitants;

– it is the seat of an administrative body: provincial authorities or bodies of a provincial governor's office, provincial assembly or marshal's office;

– it is an area where more than 60,000 vehicles have been registered and where there are over 400 vehicles per 1,000 inhabitants or 1 km^2.

4. Electric transport

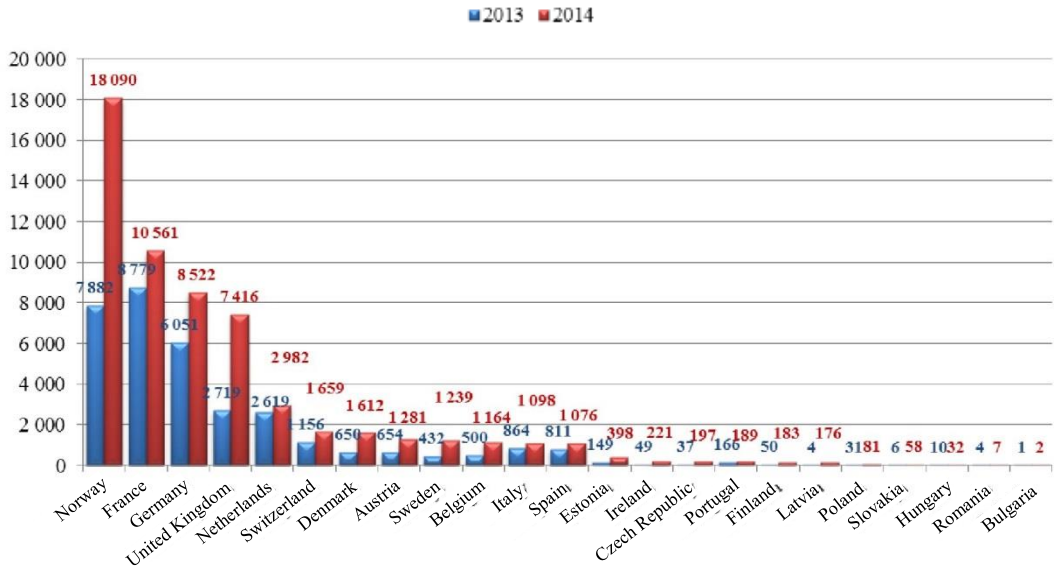
4.1. Electric transport in Europe

In the EU, electric transport has been growing at a considerable pace. This growth has been observed with regard to passenger vehicles, public transport and public services. The leaders in developing transport based on electric vehicles are France, Norway and the Netherlands.

In line with the statistics presented by the European Automobile Manufacturers Association, 60,258 passenger vehicles were registered in 2014, up by 60.1% compared with 2013.

Most electric vehicles are sold in the wealthiest countries. The dynamics of sales growth varies greatly: the figures increased by 129.5% in Norway, 172.6% in the United Kingdom, 148.0% in Denmark and 186.8% in Sweden. An increase in electric vehicle sales was also observed in the 'youngest' EU Member States, namely Estonia, the Czech Republic, Latvia and Slovakia. In these countries, the dynamics of sales growth is very high, but the absolute sales figures remain low compared with countries where much progress has been achieved in implementing e-mobility.

Chart 5. Number of electric passenger vehicles (BEV) registered in Europe in 2013-2014



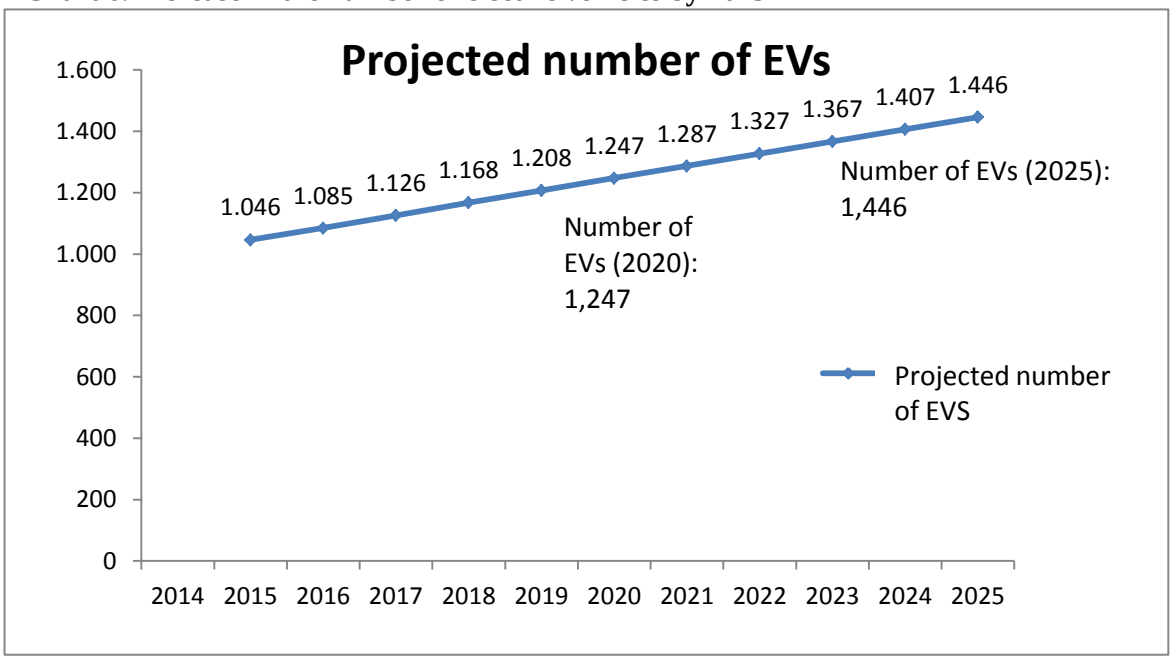
Prepared on the basis of data from the European Automobile Manufacturers Association (ACEA)

4.2. Development of the market for electric vehicles in Poland — the no-support scenario

The market for electric vehicles in Poland is at an early stage of development. In order to meet the requirements of Directive 2014/94/EU, which obliges the Member States to set targets to be achieved for alternative fuels infrastructure, a forecast of the rate and scale of development of the Polish electric vehicle market was prepared at the request of the Ministry of Energy.[26]

The basic scenario analysed in the model was a no-support scenario in which there were no support measures implemented by the state for the development of the market for electric vehicles. This scenario was based on the growth rate of the electric vehicles market and related infrastructure to date.

Chart 6. Increase in the number of electric vehicles by 2025



The above chart shows that without support instruments, the number of electric vehicles will be small and will have very little impact on the transport market in Poland both in 2020 and in 2025. The analysis shows that the electro-mobility market will not develop without active intervention from the state.

4.3. Demand for electricity

In addition to helping to reduce harmful emissions in the transport sector, electric vehicles may also be used as an element stabilising the operation of electricity networks. Electric vehicles may be used as energy storage devices to be connected to a network at the time of the highest capacity utilisation. Electric vehicle users will be able to return the energy to the network and earn money by doing so. Although this would require a major legal and technical overhaul, as well as designing and developing an entire system down to the last detail, this goal is certainly worth pursuing.

[26] *Analysis of possible scenarios for the development of the market for alternative fuels in transport and related infrastructure in Poland, including algorithms and methods for the deployment of alternative fuels infrastructure* [Analiza dotycząca scenariuszy przyszłego rozwoju rynku paliw alternatywnych w transporcie w Polsce i powiązanej z nim infrastruktury, w tym algorytmów rozmieszczenia infrastruktury dla paliw alternatywnych oraz zastosowanej metodologii], KAPE for the Ministry of the Economy, 2016.

On the other hand, the development of electric transport will lead to increased electricity use. Two aspects must be considered in this context: increased energy consumption and increased demand for power. The Polish power sector will be able to produce the amount of electricity required to recharge a specific number of vehicles. What is potentially problematic is the increased demand for power, especially at peak capacity utilisation times in agglomerations or densely populated areas. Moreover, appropriate connection capacities will need to be ensured and distribution networks will need to be deployed in cities in order to enable the use of high power chargers. While this problem may not occur at the initial stage of electric transport development, with an increase in the number of electric vehicles, it will be necessary to modernise the electricity networks system.

The target of 1 million vehicles in Poland will generate an additional demand for energy at the level of 2.3 TWh a year.

The indicative demand for electricity is the maximum value: the actual demand is likely to be lower.

Table 11. Electricity demand for the projected number of vehicles

Year	Projected number of EVs	Daily electricity consumption (MWh)	Annual (MWh)	Annual (TWh)
2015	1,007	6	2,228	0.0
2016	2,397	15	5,303	0.0
2017	5,704	35	12,621	0.0
2018	13,576	82	30,039	0.0
2019	32,310	196	71,492	0.1
2020	76,898	466	170,150	0.2
2021	183,017	1,109	404,958	0.4
2022	366,034	2,219	809,915	0.8
2023	549,051	3,328	1,214,873	1.2
2024	823,576	4,993	1,822,309	1.8
2025	1,029,470	6,241	2,277,886	2.3

Prepared by the Ministry of Energy

Table 12. Projected electricity production by fuel type (TWh)

	2010	2015	2020	2025	2030	2035	2040	2045	2050
hard coal	87.9	72.5	76.9	75.9	79.0	84.4	88.8	82.3	74.5
lignite	48.6	58.4	53.8	49.6	38.1	11.1	11.3	10.7	10.3
natural gas	6.8	5.8	11.8	11.9	13.0	18.4	17.5	23.3	20.4
RES	11.6	20.6	34.0	36.9	51.9	61.1	65.1	67.5	73.2
nuclear energy	0.0	0.0	0.0	11.8	23.3	45.1	45.4	44.2	43.2
other	2.6	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
total	157.7	158.8	177.9	187.5	206.8	221.4	229.7	229.5	222.9

4.4. Electric vehicle recharging points in agglomerations

The number of recharging points accessible to the public to be put in place should be proportional to the projected number of vehicles. It should be determined based on the daily capacity of a recharging point, i.e. the number of electric vehicles per day which can actually be recharged at that point. The daily capacity of recharging points, in turn, is determined by vehicle design, recharging power, the amount of energy taken, authorisation time, servicing technology at these points and the design of the recharging points themselves. The efficiency of high power recharging points (fast recharging points) ranges from 49 to 80 vehicles. For normal power recharging points (slow recharging points), the efficiency ranges from 2 to 5 vehicles recharged a day. For the purpose of this document it was assumed that 3 vehicles a day may be recharged at a normal power recharging point, while 62 vehicles a day may be recharged at a fast recharging point. The number of recharging points required to handle the projected number of electric vehicles may be calculated by applying an algorithm developed by KAPE and experts from the Ministry of Energy.

Given the size of towns and cities, the number of recharging points must be sufficient to handle the number of vehicles and, at the same time, allow electric car users to travel freely and without restriction. The number of recharging points should be such that electric vehicle users are confident that they are able to recharge their vehicles. The fear of not being able to do so is one of the most important factors limiting the popularity of electric vehicles.

The experience of other countries (the United Kingdom, Japan) and expert opinions suggest that normal power recharging points accessible to the public are less frequently and less efficiently used by electric vehicle drivers than the publicly accessible high power recharging points (fast recharging points). Lessons learnt from the United Kingdom[27] show that vehicle users most frequently recharge the batteries at night and sometimes during working hours at the workplace. Fast recharging points, where vehicles can be recharged quickly, are by far the users' first choice. Those points, however, rely on access to a substantial amount of power, which may necessitate an expansion of the distribution network. Moreover, high power recharging points are more expensive to set up and maintain than normal power recharging points. For these reasons, the two recharging technologies should be developed simultaneously with the high power recharging points supplementing the normal power recharging points.

Another issue is the profitability of recharging points. For the purpose of this scheme it was assumed that:

1. Annual energy sales at normal power recharging points at a level ensuring the profitability of a station consisting of four recharging points amount to 131.4 MWh (32.85 MWh per point);

[27] *Driving the Future Today. A strategy for ultra-low emission vehicles in the UK*, September 2013.

2. Annual energy sales at high power recharging points at a level ensuring the profitability of a station amount to 452.6 MWh.

The price of electric vehicle recharging services will have to be higher than the price of electricity, as the operator of a recharging point has to take account of the construction costs, the connection cost, and the costs of maintaining and servicing that point. The profitability of investments will depend on the price of electric vehicle recharging services. As vehicle recharging services are not currently sold commercially in Poland, the assumptions concerning the profitability of recharging points are only projections.

Table 13. Projected energy sales at a single recharging point (MWh)

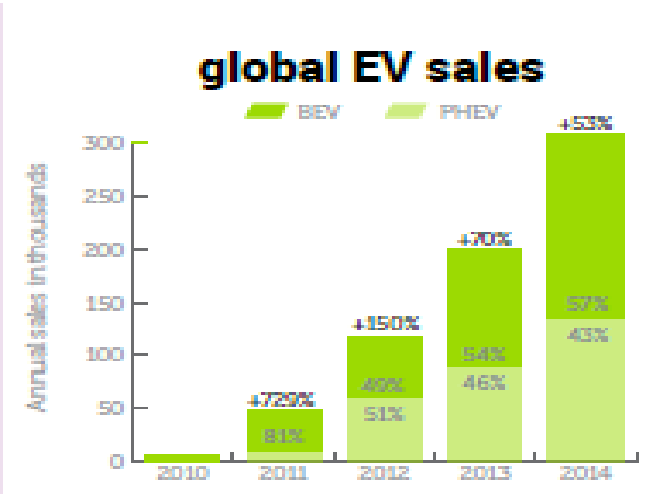
City	Power used by the projected number of vehicles in a year (excl. buses)	Annual energy sales ensuring the profitability of a normal power recharging point	Annual energy sales ensuring the profitability of a fast recharging station	Total power	Power surplus (+)/power deficit (-)
Warsaw	58,753.01	42,836.40	28,513.80	71,350.20	12,597.19
Kraków	22,481.89	16,392.15	10,862.40	27,254.55	4,772.66
Łódź	18,513.90	13,501.35	9,052.00	22,553.35	4,039.45
Wrocław	20,372.18	14,848.20	9,957.20	24,805.40	4,433.23
Poznań	18,697.50	13,632.75	9,052.00	22,684.75	3,987.25
Gdańsk	13,732.88	10,019.25	6,789.00	16,808.25	3,075.38
Szczecin	10,510.09	7,654.05	4,978.60	12,632.65	2,122.56
Bydgoszcz	10,429.09	7,621.20	4,978.60	12,599.80	2,170.71
Lublin	9,173.25	6,668.55	4,526.00	11,194.55	2,021.30
Katowice	10,186.09	7,424.10	4,978.60	12,402.70	2,216.61
Białystok	6,428.70	4,697.55	3,168.20	7,865.75	1,437.05
Toruń	5,340.26	3,876.30	2,715.60	6,591.90	1,251.64
Kielce	5,156.66	3,744.90	2,715.60	6,460.50	1,303.84
Rzeszów	4,986.23	3,646.35	2,263.00	5,909.35	923.12
Olsztyn	4,624.43	3,383.55	2,263.00	5,646.55	1,022.13
Gorzów Wielkopolski	3,446.55	2,529.45	1,810.40	4,339.85	893.30
Opole	4,027.39	2,923.65	1,810.40	4,734.05	706.66
Zielona Góra	3,441.15	2,529.45	1,810.40	4,339.85	898.70
Gdynia	7,225.54	5,256.00	3,620.80	8,876.80	1,651.26
Częstochowa	6,347.70	4,631.85	3,168.20	7,800.05	1,452.35
Radom	5,318.66	3,876.30	2,715.60	6,591.90	1,273.24
Sosnowiec	5,529.26	4,040.55	2,715.60	6,756.15	1,226.89
Gliwice	5,756.06	4,204.80	2,715.60	6,920.40	1,164.34
Zabrze	4,189.39	3,055.05	2,263.00	5,318.05	1,128.66
Bielsko-Biała	5,118.86	3,712.05	2,263.00	5,975.05	856.19
Bytom	3,805.99	2,759.40	1,810.40	4,569.80	763.81

City	Power used by the projected number of vehicles in a year (excl. buses)	Annual energy sales ensuring the profitability of a normal power recharging point	Annual energy sales ensuring the profitability of a fast recharging station	Total power	Power surplus (+)/power deficit (-)
Ruda Śląska	3,306.15	2,398.05	1,810.40	4,208.45	902.30
Rybnik	3,800.59	2,759.40	1,810.40	4,569.80	769.21
Tychy	3,606.19	2,628.00	1,810.40	4,438.40	832.21
Dąbrowa Górnicza	3,568.39	2,595.15	1,810.40	4,405.55	837.16
Elbląg	2,944.35	2,135.25	1,357.80	3,493.05	548.70
Płock	3,935.59	2,857.95	1,810.40	4,668.35	732.76
Total	294,753.94	214,839.00	143,926.80	358,765.80	64,011.86

It is estimated that vehicles in agglomerations will use up to 294,753.94 MWh of electricity a year. In turn, the amount for power exceeding the amount of power required to ensure the profitability of recharging points will be 64,011.86 MWh. Thus, the recharging volume will increase by 20% on average to ensure the profitability of the recharging stations.

Data on the sales of electric vehicles worldwide show that users are more and more interested in BEVs, as compared with hybrid vehicles.[28]

Chart 7. Annual BEV and PHEV sales



[28] http://www.iea.org/evi/Global-EV-Outlook-2015-Update_1page.pdf

In view of the trend outlined above, the projections about energy consumption were based on the following assumptions:

– PHEV users prefer to use electrically-propelled vehicles and use public recharging points;

– both types of vehicles consume similar amounts of electricity;

– BEVs will become more popular in the years to come.

For this reason, vehicles were not divided into hybrid and fully electric vehicles for the purpose of determining the power required for recharging.

5. Natural gas in transport in the no-support scenario

For the purpose of this scheme, we have determined the level of development of the market for CNG vehicles in Poland in 2020 and 2025. The development scenario has been outlined in the main text. In the no-support scenario, no measures are taken by the state. Market development projections were based on the rate of development of the market for alternative fuels and related infrastructure to date. It is estimated that the number of CNG vehicles will exceed 4,000 in 2020 and 5,000 in 2025.

Table 14. Projected number of vehicles, adjusted for GDP (no-support scenario)

Year	Projected GDP in 2015-2025	Number of vehicles	Projected number of vehicles, adjusted for GDP	Number of CNG vehicles	Projected number of CNG vehicles, adjusted for GDP
2014		26,472,274		3,600	
2015	3.90%		27,504,693		3,740
2016	3.70%		28,522,366		3,879
2017	3.80%		29,606,216		4,026
2018	3.70%		30,701,646		4,175
2019	3.40%		31,745,502		4,317
2020	3.30%		32,793,104		4,460
2021	3.20%		33,842,483		4,602
2022	3.10%		34,891,600		4,745
2023	3.00%		35,938,348		4,887
2024	2.90%		36,980,560		5,029
2025	2.80%		38,016,016		5,170

Prepared by KAPE

6. Natural gas in transport: the development scenario

In the development scenario, the number of CNG vehicles was estimated based on the average annual growth rate of vehicle sales, with the following assumptions:

– CNG vehicles constitute 95% of all natural gas vehicles;

– LNG vehicles constitute 5% of all natural gas vehicles;

– the average annual growth rate of CNG vehicle sales is approx. 50%.

Due to the specific technical requirements, the costs of constructing CNG refuelling stations are much higher than the costs of constructing stations for traditional fuels. In particular, such stations must be equipped with such components as a high-pressure fuel container, compressors and a dryer.

For the purpose of this scheme, we have adopted the following average capacity parameters:

– capacity of 600 m^3/h with two station pumps;

– refuelling speed of 10 m^3 per minute.

In practice, the capacity of a CNG station is 80 vehicles refuelled per day, with an average single refuelling volume of 35 m^3. Assuming that vehicles are refuelled every 36 minutes on average (two pumps), a station can refuel a total of 1,022,000 m^3 of CNG per year. With a price of PLN 2.84/m^3, it should be possible to achieve a return on investment in 10 years. It should be borne in mind that the costs of building a station and the operating costs may vary greatly from one agglomeration to another.

In view of the projected number of vehicles, the CNG refuelling infrastructure will not be profitable in 2020 and will require state support to operate. Alternatively, a system may be put in place which will help increase the number of CNG vehicles, thus enabling the refuelling stations to operate on market terms.

LCNG refuelling stations should be deployed at existing fuel stations in rest and service areas (RSAs). Regulation (EU) No 1315/2013 of the European Parliament and of the Council on Union guidelines for the development of the trans-European transport network ('Regulation No 1315/2013') lays down the requirements to be met by the infrastructure of the core network. Article 39(2)(c) of Regulation No 1315/2013 provides that an alternative clean fuels infrastructure must be available along the core road network.

There is a major difference between the investment costs associated with the construction of an entirely new refuelling station accessible to the public for LNG alone[29] and the cost of expanding an existing CNG refuelling station with the same technical parameters to provide LNG refuelling services. Further analysis will therefore focus only on the expansion of CNG stations to provide LNG refuelling services, that is, on deploying LCNG stations. In this case, CNG will be refuelled from LNG containers.

When expanding a station, an LNG container with a capacity of 60 m^3 must be put in operation to supply fuel to both the CNG station and the LNG refuelling pump in order to achieve the projected capacity value. We assume that the expansion of the stations will start from scratch and that CNG will be obtained from LNG. The average refuelling parameters for a CLNG station in this scenario are as follows:

– the refuelling parameters are the same as those for a CNG station;

– a CLNG station has one LNG pump with a capacity of not less than 20 l/minute.

In practice, the capacity of a station is 80 CNG refuellings (35 m^3) and 40 LNG refuellings per day (150 l). Given that the average volume of a single refuelling is 35 m^3, the daily refuelling capacity is 80 refuellings, or 2,800 m^3 of CNG and 6,000 l of LNG. Both CNG and LNG vehicles are refuelled every 36 minutes on average (two CNG pumps and one LNG pump). In this scenario, CLNG stations may become profitable before 2025 if the electric vehicle market grows as expected.

However, the locations and the technical parameters of the stations, as well as their distribution along the TEN-T network, should be specified in detail in cooperation with RSA operators. This task should be carried out by the minister responsible for the development of the TEN-T Core Network and the General Directorate for National Roads and Motorways. This is due to the fact that RSA locations vary greatly and it is very difficult to develop a single standard approach.

[29] The cost of the refuelling station in Olsztyn is PLN 500 000, while the capacity is 60 m^3 (one pump).

7. Ports

7.1. Gdańsk

The authorities of the port of Gdańsk have developed a temporary solution for supplying LNG to vessels. However, as there is currently no demand for LNG as a fuel for vessels calling at Polish ports, and most probably only occasional instances of demand are to be expected in the coming years, the port authorities deemed it sufficient to enable the shore-side supply of gas to vessels by means of tank trucks.

Ferry (ro-pax vessel) and ro-ro vessel traffic

This type of traffic is relatively limited in the port of Gdańsk. Gdańsk has only one ferry connection to the Swedish port of Nynäshamn. This line is operated by Polferries. A single ferry runs between Gdańsk and Nynäshamn, making approx. 165 calls at Gdańsk per year. The frequency of calls ranges from two to three times a week, depending on the season. The ferry stays in the port for approx. five hours at a time. The ferry traffic is operated from the Westerplatte ferry terminal.

Cruise ship traffic

The port of Gdańsk is the second largest port in Poland (after Gdynia) in terms of the number of calls by cruise ships. Cruise ships called at Gdańsk 38 times in 2014. Such vessels are served at the Westerplatte ferry terminal. Naturally, both the duration of stay and the demand for electricity vary greatly from vessel to vessel. Nevertheless, a rough estimate of the total demand of such vessels may be given.

Container ship traffic

The port of Gdańsk is the largest container port in Poland and the second largest container port on the Baltic. Over 1.2 million TEUs were transhipped at this port in 2014. Container ships are served at two locations: at the DCT terminal, which, in addition to feeder vessels, also serves some of the largest ocean-going vessels in the world, and at the Gdańsk Container Terminal. The total number of calls by such vessels in 2014 was over 500.

7.2. Gdynia

Shore-side electricity supply solutions have been developed for the entire port. However, as capital expenditures were very high and the level of demand was uncertain, large-scale investments have been postponed. There are plans to build an installation for supplying electricity to ferries at the new Ferry Terminal by the Polish Quay in the port of Gdynia. A construction plan has already been prepared and a building permit has been obtained. The entire project is to be carried out in 2017-2019. It is estimated that the shore-side supply installation will cost approx. EUR 2.2 million.

Ferry (ro-pax vessel) and ro-ro vessel traffic

Only one ferry connection to Karlskrona is operated from Gdynia (Stena Line). Three ferries currently operate on that route with a frequency of 18 calls per week. The total number of calls by these vessels in 2014 was 744 (it is estimated that approx. 880 calls will take place in 2016). Most of these vessels do not stay in the port for more than three hours. Two ferries which call at Gdynia are equipped with the installation required for shore-side electricity supply (Stena Spirit and Stena Vision). Both use shore-side electricity when in Karlskrona. It is impossible to supply shore-side electricity to those two ferries in the port of Gdynia as the ferries are connected from the starboard side in Karlskrona and are berthed port side to the

quay in Gdynia. Four ro-ro lines are operated between Finland (by Finnlines and Transfennica) and Gdynia. Ro-ro vessels are served mainly at the OT Port Gdynia.

Cruise ship traffic

Gdynia is the only Polish port capable of receiving the largest cruise ships operating in the Baltic. 50 vessels of this type called at Gdynia both in 2014 and in 2016.

Container ship traffic

Gdynia is the second largest container port in Poland in terms of transhipment volume (0.85 million TEUs were transhipped in 2014). Container ships are served at two terminals: the Baltic Container Terminal (BCT) and the Gdynia Container Terminal (GCT). The number of calls by container ships in 2014 was 934.

7.3. Szczecin

At present, there are no plans to construct shore-side electricity infrastructure at the port of Szczecin. The main types of vessels calling at this port are general cargo vessels, bulk carriers and tankers. These vessels are not best suited for cold ironing.

Ferry (ro-pax vessel) and ro-ro vessel traffic

No ferry or ro-ro line is operated in the port of Szczecin.

Cruise ship traffic

Cruise ship traffic in the port of Szczecin is very limited: only three vessels of this type were served in 2014.

Container ship traffic

Container ship traffic is also limited compared with the ports of Gdynia and Gdańsk. Container ships are served at the DB Port Szczecin terminal. A total of 78,000 TEUs were transhipped in Szczecin in 2014, and a total of 192 container ships were served. With this traffic volume, the demand for shore-side electricity may amount to 960 MWh/year.

7.4. Świnoujście

Constructing a quay (facility) enabling LNG supply in the external Świnoujście port is potentially one of the tasks to be carried out as part of the expansion of the existing LNG terminal. The estimated investment cost is PLN 70 million (2018-2020). The investment task was included in the Implementation Document for the Transport Development Strategy until 2020 (with an outlook to 2030). It is to be financed with EU funds in the 2014-2020 perspective.

As part of the project consisting in the creation of the Świnoujście-Trelleborg Motorway of the Sea, for which TEN-T funding was granted, the Szczecin and Świnoujście Seaports Authority (Zarząd Morskich Portów Szczecin i Świnoujście S.A.) commissioned the development of the logistical processes and procedures for LNG supply to vessels at the Świnoujście Ferry Terminal. The Szczecin and Świnoujście Seaports Authority is considering the possibility of building a shore-side electricity infrastructure only for the ferry terminal in Świnoujście. These facilitates are to be available at six vessel berths (the sixth berth is under construction). Although a general infrastructure construction plan has been prepared, the construction date has not yet been fixed due to the high investment costs. For the same reason, the final decision on the construction of the installation will depend on whether EU funding is granted for the project.

Ferry (ro-pax vessel) and ro-ro vessel traffic

Świnoujście is the largest ferry port in Poland, both in terms of the number of passengers served and the number of calls. The Świnoujście port provides services to and from two Swedish ports: Ystad and Trelleborg. The service to Trelleborg is operated by two companies: Unity Line and TT-Line. A total of four ro-pax vessels operate on this route. The connection to Ystad is served by Polferries and Unity Line with six ro-pax vessels operating on that route. In 2014, ferries called at Świnoujście 3,289 times. Given the number of calls and the length of stay in the port, the electricity demand of ferries berthed in Świnoujście can be estimated at 18,900 MWh/year. Two of the ferries calling at Świnoujście have the necessary shore-side electricity installations. These are Skania and Jan Śniadecki (Unity Line). Both ferries use the shore-side electricity infrastructure when berthed in Ystad.

Cruise ship traffic

Next to no cruise ships are served by the Świnoujście port.

Container ship traffic

There is very little container ship traffic in the Świnoujście port. Vessels of this type called at the port only 10 times in 2014.

7.5. Shore-side electricity supply to vessels

In accordance with Article 4(5) of Directive 2014/94/EU, Member States must ensure that the need for shore-side electricity supply is assessed in their national policy frameworks.

In view of the specificity of maritime transport, the manner in which shore-side recharging points are used, the preliminary stage of technological development, as well as the costs of the installations, this technology must be approached with great caution.

When assessing the economic profitability of this infrastructure, shipping companies consider the following factors:

1. The length of a vessel's stay in a port compared with the time spent at sea: in general, the longer the time spent in port, the more profitable the investment is likely to be. For this reason, shore-side supply may be better suited for short-sea liner shipping, especially ferry shipping, than for ocean shipping.

2. The number of ports providing shore-side electricity supply services: the larger the number of ports equipped with such installations, the more profitable the investment is likely to be. If a vessel must rely on its own engines to generate electricity because there are no shore-side supply installations in certain ports along that vessel's route, the investment might not bring sufficient economic benefits.

3. The cost of fuel necessary for generating electricity on board a vessel compared with the costs of shore-side electricity: the costs of shore-side electricity should be lower than the costs of generating electricity on a vessel for shipping companies to use shore-side electricity installations.

The experience of other countries shows that electricity generation on board a vessel is usually more expensive than shore-side supply.[30] However, the difference in the costs of both solutions may vary depending on the prices of the fuel necessary for generating electricity by vessel engines. Vessels in EU ports are currently required to use fuels with a sulphur content of 0.1%. LSMGO prices may vary greatly – the largest price difference per tonne over one year recorded to date is USD 439. The highest price was recorded in August 2014 (USD 844/tonne), and the lowest in August 2015 (USD 405/tonne).

The table below shows the estimated annual electricity consumption in Polish ports by vessel categories referred to above. The data were estimated taking into account the volume of

[30] *Analysis* (...), KAPE

traffic in individual ports. However, certain parameters, such as the length of stay in a port or the demand for energy of a typical vessel from each category, are only indicative. The actual figures may differ.

Table 15. Estimated annual electricity consumption by ferries, ro-ro vessels, cruise ships and container ships berthed in Polish ports

	Ro-pax ferries and ro-ro vessels [MWh]	Cruise ships [MWh]	Container ships [MWh]
Gdańsk	1,240	3,420	5,870
Gdynia	3,310	4,500	6,270
Świnoujście	18,900	0	50
Szczecin	0	270	960

Prepared by KAPE

The infrastructure for shore-side electricity supply is very expensive, while the payback period is long. An analysis conducted at the request of the Ministry of the Economy showed that over 90% of the costs of installing appropriate shore-side infrastructure should be covered by subsidies.

The experience of other countries shows that the instruments which are most often applied are:

– government subsidies;

– tax reductions;

– strict provisions and very high charges for emissions causing environmental pollution.

The costs of installing the facilities in ports vary from port to port and depend on many factors, such as the cost of supplying high voltage current to the port and to the quays, the required power, the parameters and technical state of the existing electricity network (the extent to which it must be adapted to shore-side electricity installations), etc. Generally, the costs of the infrastructure required for one facility may range from several thousand to several million euros.

Another category of essential costs associated with shore-side electricity infrastructure are the operating costs. As with construction costs, operating costs may vary greatly. The two types of costs are also shaped by similar factors. In addition, the intensity of infrastructure use plays a key part in calculating the operating costs. The operating costs of an installation may range from several hundred to tens of thousands of euros per facility.

Given the characteristics of Polish ports (Chapter 3.3), shore-side electricity installations should be set up in Gdańsk, Gdynia, Szczecin and Świnoujście. The best way to proceed would be to create a pilot project in one of these ports, which would make it possible to accurately assess the advantages and costs of such an undertaking.

The analyses conducted to date indicate that the deployment of recharging infrastructure in all the ports of the TEN-T network is not justified on economic grounds given the current costs of this infrastructure and the shipping companies' insufficient interest in this technology.

7.6. LNG in ports of the TEN-T network

In accordance with the requirements of Directive 2014/94/EU, Member States must ensure, by means of their national policy frameworks, that an appropriate number of refuelling points for LNG are put in place at maritime ports, to enable LNG vessels to

circulate throughout the TEN-T Core Network by 31 December 2025. Four Polish ports form part of the Core Network: Gdańsk, Gdynia, Szczecin and Świnoujście.

Investing in bunkering installations is costly. Vessel bunkering facilities must be developed in order to promote LNG as vessel fuel. Five options may be explored:

– connecting an LNG pipeline to a vessel (bunkering operations are conducted on the quay);

– connecting a tank truck to a vessel (bunkering operations are conducted using tanks – the fuel is pumped using a flexible connection);

– conducting bunkering operations from a shore-side installation (LNG container);

– conducting bunkering operations from a special bunker vessel;

– using a tank or tanks (in a container) as a fuel container on a vessel or using a large LNG container (empty containers are replaced with full ones, thanks to which the bunkering operations take less time).

The costs of individual bunkering operations will be determined on the basis of research results obtained by the Danish Maritime Authority.[31] Three different types of terminals are used for LNG bunkering:

1. A large terminal with an annual capacity of 204,000 m^3, with a container of a capacity exceeding 200,000 m^3, one shore-side refuelling facility, one small bunker vessel (4,000 m^3), two tank trucks (50 m^3 each) and one refuelling point. The investment payback period of 10 years gives a mark-up of EUR 118 for every tonne of LNG sold. The investment cost is approx. EUR 170 million. The critical mass of vessels ensuring a return on investment in 10 years is four vessels per day on average.

2. A medium terminal with an annual capacity of 343,000 m^3, with a container of a capacity of 20,000 m^3, refilled 20 times per year, one shore-side refuelling facility, one small bunker vessel (4,000 m^3), two tank trucks (50 m^3 each) and one refuelling point. The investment payback period of 10 years gives a mark-up of EUR 137 for every tonne of LNG sold. The investment cost is approx. EUR 300 million. The critical mass of vessels ensuring a return on investment in 10 years is eight vessels per day on average.

3. A small terminal with an annual capacity of 52,000 m^3, with two containers of a capacity of 700 m^3 each, refilled 40 times per year, one shore-side refuelling facility, one tank truck (50 m^3) and one refuelling point. The investment payback period of 10 years gives a mark-up of EUR 194 for every tonne of LNG sold. The investment cost is approx. EUR 70 million. The critical mass of vessels ensuring a return on investment in 10 years is one vessel per day on average.

The forecast number of calls, as specified in KAPE analysis, shows that LNG refuelling infrastructure may become profitable by 2025, depending on the bunkering model selected.

Table 16. Number of calls at Polish ports by LNG vessels in 2025 and 2030

Port	Year	Total	Liquid bulk	Dry bulk	Containers	Mobile self-propelled	Mobile	Other
Gdańsk	2025	768	25	34	703	4	0	1
	2030	1,621	29	50	1,533	6	0	2
Gdynia	2025	604	1	27	527	43	3	3

[31] Ibid.

Port	Year	Total	Liquid bulk	Dry bulk	Containers	Mobile self-propelled	Mobile	Other
	2030	1,264	1	41	1,150	65	4	4
Szczecin	2025	75	2	18	47	0	0	7
	2030	144	3	27	103	0	0	11
Świno-ujście	2025	166	3	23	0	135	3	1
	2030	250	4	34	1	205	4	2

Prepared by KAPE

Each of the bunkering systems has its advantages and disadvantages. System selection should be based on the results of assessments conducted for each of the ports.

Another essential parameter is the availability of LNG. While it is best to have an LNG terminal close to the port, it is not economically viable to build a terminal for the sole purpose of bunkering vessels. In Poland, appropriate volumes of LNG should be supplied to the ports of Gdańsk, Gdynia, Szczecin and Świnoujście. One of the advantages of the Świnoujście port is its location next to an LNG terminal.

The following barriers to the development of LNG refuelling infrastructure have been identified in Poland:

(1) lack of experience in implementing and operating bunkering installations for LNG vessels;

(2) high costs of investing in shore-side installations and installations on board vessels;

(3) no measures taken to force shipping companies to use LNG – preference for vessels that have less impact on the environment or high charges for water pollution in ports and harmful emissions from vessels.

The development of LNG infrastructure in ports depends directly on the cost of investing in LNG refuelling infrastructure going down, especially as LNG prices may initially be less attractive than the prices of traditional marine fuel. Nevertheless, these proportions may change if the services are provided on a wider scale. It would be best to launch pilot programmes in selected ports and to encourage the port authorities to develop this infrastructure by working together.

Except for the TEN-T network ports, there is no commercial need for LNG installations in other Polish ports.

8. Airport electricity supply for stationary airplanes

Work on developing the infrastructure for electricity supply for stationary airplanes has only recently begun, and its growth depends largely on individual airport parameters, which include size, air traffic volume, etc. The table below sets out a general overview of the Polish airports of substantial size in terms of the number of passengers served per year.

Table 17. Number of passengers served at Polish airports

Item	City	Airport name	Percentage share of the number of passengers served in 2014
1	Warsaw	Warsaw Chopin Airport	39%
2	Kraków	John Paul II International Airport Kraków-Balice	14%
3	Gdańsk	Gdańsk Lech Wałęsa Airport	12%
4	Katowice	International Airport in Pyrzowice	10%
5	Wrocław	Copernicus Airport Wrocław	8%
6	Poznań	Poznań-Ławica Henryk Wieniawski Airport	5%
7	Rzeszów	Rzeszów — Jasionka Airport	2%
8	Szczecin	'Solidarity' Szczecin-Goleniów Airport	1%
9	Bydgoszcz	Bydgoszcz Ignacy Jan Paderewski Airport	1%
10	Łódź	Łódź Władysław Reymont Airport	1%
11	Warsaw	Warsaw Modlin Airport	6%
12	Lublin	Lublin Airport	1%
13	Zielona Góra	Zielona Góra — Babimost Airport	0%
TOTAL			100%

Prepared by KAPE, based on data at www.ulc.gov.pl

Nearly 40% of all air passengers served at Polish airports in 2014 travelled to/from Warsaw Chopin Airport. Another 40% were served jointly by the airports of Kraków, Gdańsk and Katowice. Developing these airports is therefore a prerequisite for the deployment of electricity supply infrastructure for stationary airplanes.

In addition, the dynamics of passenger traffic growth has also been analysed based on the estimates by the Civil Aviation Office (Urząd Lotnictwa Cywilnego). The estimated values are set out in the table below.

Table 18. Projected demand for air passenger traffic at Polish airports until 2030

Year	PAX ('000)	Dynamics	PAX operations ('000)	Dynamics	Mobility
2008	20,653	8.10%	258.8	4.10%	0.54
2009	18,925	-8.40%	237.8	-8.10%	0.5
2010	20,467	8.10	240.7	1.20%	0.54
2011	21,713	6.10%	246.7	2.50%	0.57
2012	23,614	8.80%	261.5	6.00%	0.62

Year	PAX ('000)	Dynamics	PAX operations ('000)	Dynamics	Mobility
2013	24,880	5.40%	272.6	4.20%	0.65
2014	26,628	7.00%	282	3.50%	0.7
2015	28,492	7.00%	292.6	3.80%	0.75
2016	30,452	6.90%	304.2	3.90%	0.8
2017	32,340	6.20%	312.2	2.60%	0.85
2018	34,345	6.20%	320.9	2.80%	0.91
2019	36,234	5.50%	330.2	2.90%	0.96
2020	38,226	5.50%	339.7	2.90%	1.01
2021	40,329	5.50%	349.6	2.90%	1.07
2022	42,547	5.50%	359.7	2.90%	1.13
2023	44,504	4.60%	368.7	2.50%	1.18
2024	46,551	4.60%	377.9	2.50%	1.24
2025	48,693	4.60%	387.4	2.50%	1.3
2026	50,933	4.60%	397.1	2.50%	1.36
2027	52,868	3.80%	405.4	2.10%	1.42
2028	54,877	3.80%	413.9	2.10%	1.48
2029	56,962	3.80%	422.6	2.10%	1.54
2030	59,127	3.80%	431.5	2.10%	1.61

Based on data at www.ulc.gov.pl

The data show a steady increase in the number of passengers served by Polish airports and a growth in the number of PAX operations in Poland. As no rapid increase in air traffic is expected until 2030, the demand for electricity supply for stationary airplanes is not likely to increase rapidly over the same period.

The current demand for such services should be determined by analysing other aspects of developing the electricity supply market for stationary airplanes.

The calculations are based on the following assumptions:

– airplanes at jet bridges are powered from the network (70%), a power generating unit (5%) or an auxiliary power unit (APU) (25%);

– 70% of airplanes on the airport apron use power generating units, and 30% use APUs;

– a single recharging of an airplane lasts approx. 2 hours, and there is an approx. 30-minute break between rechargings;

– power input from the network is 200 kW, from mobile power generating units – 115 kW and from APUs – 90 kW.

The projected dynamics of operations was also taken into account when estimating the number of air operations and the electricity demand of stationary airplanes.

The forecasts presented in the two tables above are based on data obtained from the Civil Aviation Office. The projected values are therefore closely linked.

Between 2014 and 2030, the demand for electricity supply for stationary airplanes will have increased by over 50%.

In view of the current stage of technological development, it is not economically viable to deploy this type of infrastructure, the development of which requires purely financial support. At present, such installations cannot be developed without financial support, and their advantages would be vastly outweighed by the costs.

Annex 3: Measures to support the development of the market for alternative fuels in transport

As the Polish market for alternative fuels is still poorly developed, the targets set can be achieved only with state support. This support may involve implementing solutions to encourage investors or vehicle users to start using alternative fuels in transport or invest in appropriate infrastructure. The state may also impose certain obligations on specific entities. Other important tasks of the state in respect of alternative fuels infrastructure include introducing legal frameworks for the functioning of this infrastructure and eliminating inconsistent laws which could hinder the operation of the infrastructure.

The experience of other European countries shows that the best incentives to develop the market for alternative fuel vehicles are the broadly understood financial incentives, in the form of either reduced taxes on, or subsidies for, purchasing such vehicles. These instruments make it possible to eliminate the initial price difference between vehicles using traditional fuels and alternative fuels.

1. Rules governing the market for alternative fuels in transport

1.1 Establishing the rules governing the market for electric vehicle recharging services

Directive 2014/94/EU requires Member States to create an appropriate number of recharging points accessible to the public. A recharging point accessible to the public means a point which provides non-discriminatory access to users. Non-discriminatory access may involve different methods of authentication, use and payment.

First and foremost, it must be acknowledged that electric vehicle recharging services are a broader concept than the sale of electricity per se. On the basis of available studies and industry information, entities involved in electric vehicle recharging services may be divided up as follows:

1. Distribution network operators (DNOs): electricity distribution;

2. Electricity sellers: the sale of energy within the meaning of the Energy Law Act of 10 April 1997;

3. Operators of stations (recharging points) accessible to the public: entities which own electricity recharging stations (points) accessible to the public and make these points available to the sellers of electric vehicle recharging services;

4. Sellers of electric vehicle recharging services – within the meaning of the Energy Law Act: entities which should be classified as recipients rather than sellers of electricity as they do not resell electricity but provide electric vehicle recharging services (as such, those entities are not required to hold a licence to trade in electricity).

In such a system, the user would be able to choose the seller of vehicle recharging services at a recharging point. Users could take advantage of sellers' services on a one-off basis or use such services of a regular basis (subscription). The seller of services would settle the accounts for the use of electricity and operation of the point with the operator. The operator, in turn, would settle the cost of electricity with the energy seller.

It could happen that the electricity seller, the operator and the seller of recharging services are in fact one and the same entity. However, the proposed system guarantees that the seller of recharging services (e.g. a supermarket) will not be required to hold a licence to trade

in electricity. What is more, under the above system for the sale of recharging services, electric vehicle users will not be required to enter into contracts with electricity sellers for recharging vehicles at recharging points accessible to the public (a contract for the sale of electricity is currently required by law).

1.2 Determining the principles of providing consumers with information on the fuels which may be used to refuel particular vehicles, and the obligation to make this information available in motor vehicle manuals, at refuelling/recharging points and car dealerships

This obligation arises from Article 7 of Directive 2014/94/EU. As users will be able to easily compare the fuel prices at different refuelling points, they will be able to better assess the costs of fuels available on the market, which could encourage them to choose alternative fuels.

1.3 Setting up a system for accessing data on the geographic location/accessibility of recharging points and natural gas refuelling points accessible to the public

This obligation arises from Article 7 of Directive 2014/94/EU. The proposed system will enable users to obtain information about the geographic location of refuelling/recharging points, as well as the fuel prices. Such a system will make it easier for users to select fuels and will encourage them to buy vehicles running on alternative fuels.

1.4 Exempting sellers of electric vehicle recharging services from the obligation to hold licences to trade in electricity

In accordance with the Energy Law Act currently in force, if an undertaking buys electricity and then resells it to its recipients, as a rule, it must obtain a licence to trade in electricity to be able to conduct such activities.

Trade in electricity by means of consumer-owned installations with a voltage of less than 1 kV is exempt from the obligation to obtain a licence. If the purpose of the activities at issue is not 'financial gain', they are not considered business and, therefore, a licence is not required.

Thus, entities offering such services should be treated as energy recipients and not sellers. Furthermore, such entities offer recharging services, and not electricity supplies, to electric vehicle owners.

1.5 Adopting provisions on alternative fuels infrastructure taking into account the specificity of selling these fuels in maritime and inland ports

The Polish provisions on the sale of electricity pose a formal problem. In the case of the sale of electricity for shore-side supply in ports, the entities concerned would be regarded, from the port authorities' point of view, as electricity sellers or even exporters.

In the case of LNG, the absence of provisions governing trade in LNG in ports, including transhipment, constitutes a formal problem. Until appropriate regulations are put in place, any LNG bunkering operations in maritime ports and inland ports must be individually arranged with the Director of the Maritime Office, the port authorities and the shore-side transhipment operator, on the basis of the rules for the transhipment of dangerous goods.

The dynamics of the development of the market for alternative fuels is closely linked to the formal and legal procedures which directly affect the preparation of the investment process. In order to support measures aimed at promoting development, in the first instance, efforts should be made to shorten the time required to prepare this process.

Launching pilot schemes is a good option in this regard. Denmark[32] is a case in point: it used a pilot scheme under TEN-T 2013-2015 to support the development of LNG infrastructure.

2. Support instruments

2.1 Obliging public transport companies to use low-emission vehicles

Companies providing public services (comprising cleaning services, maintaining sanitary safety, providing public transport and water supply, maintaining green public areas, etc.) will be instructed to use low- or zero-emission vehicles. These companies' fleets should be gradually replaced, initially as part of the planned replacement of obsolete vehicles. In order to avoid excessive costs, this process should be spread over 10 years. In the first instance, the obligation to replace the fleet should be imposed on companies providing services in the selected 32 agglomerations and densely populated areas.

Public services are provided on different bases. In some cases they are provided by companies wholly owned by the municipalities, while other municipalities publish invitations to tender and select private companies for performing public service tasks. Additional points should be awarded in tendering procedures for these services to companies which provide public services using low-emission vehicles. A list of support instruments that the companies could take advantage of to purchase low-emission vehicles, mainly from EU funds, should also be drawn up.

2.2 Introducing an obligation to ensure appropriate connection power for car parks located next to newly erected public buildings and multi-family residential buildings

This obligation would concern newly erected buildings. It would make it possible to avoid the high cost of reconstructing the existing installations in order to set up recharging points in building, where necessary. Details will be specified in an Act.

2.3 Permitting low-emission vehicles to use lanes specially designated for public transport (bus lanes)

Appropriately marked low-emission vehicles would have the right to use the lanes designated for public transport. This right would be granted for a limited period only to avoid crippling public transport when the vehicle market expands.

2.4 Adopting measures facilitating the construction of electric vehicle recharging stations

In accordance with the Construction Law Act of 7 July 1994, there is no requirement to obtain planning approval to build electricity, water supply, sewer, gas, heat and telecommunications connections (Article 29(1)(20) of the Act) and street furniture (Article 29(1)(22) of the Act), which includes recharging points. However, according to the information obtained in the course of public consultations, the practice of administration and architectural authorities is not uniform in this regard, and the authorities sometimes require a building permit. For this reason, the issue must be definitively resolved.

[32] The construction of pilot LNG bunkering infrastructure in the Danish port of Hirtshals will be co-funded from the TEN-T Programme of the European Union. The infrastructure will be used by vessels and road transport, leading to the creation of an integrated transport chain. The project was approved by the Innovation & Networks Executive Agency and is to be implemented by the end of 2015.

2.5 Adopting measures facilitating the construction and reconstruction of distribution networks and connections

This would entail adopting legislative measures facilitating the construction of distribution networks and promoting the use of EU funds for this purpose.

2.6 Introducing low-emission (zero-emission) zones for electric vehicles in towns/cities

This measure would consist in permitting the authorities in agglomerations and densely populated areas to introduce low-emission (zero-emission) transport zones. The borders of these zones would be determined by the individual towns/cities. The zones would be established by municipal council resolutions on the basis of statutory authorisation. This authorisation should initially cover the 32 agglomerations and densely populated areas listed in this scheme. Emission standards should specify permissible ranges of values and be based on the European exhaust emission standards. Depending on the effects of these measures, the possibility of requiring towns/cities to establish such zones could be considered in the future.

This change could be implemented by amending the Environmental Protection Law Act or by adopting a new Act implementing Directive 2014/94/EU.

2.7 Introducing free parking for electric vehicles in paid public car parks

This measure would apply to paid car parks accessible to the public and managed by the municipalities or other public entities.

2.8 Obliging public institutions to ensure at least a 50% share of low-emission vehicles in their fleets by 2025

Public administration authorities should lead the way in the shift towards low-carbon transport.

2.9 Developing a support scheme for local governments involved in the construction of public infrastructure for recharging electric vehicles and refuelling CNG vehicles

Support scheme developed by the minister responsible for energy and the minister responsible for regional development.

2.10 Green public procurement

In tendering procedures for public transport services, public administration authorities should take account of vehicle emissions and the costs of using vehicles during their lifetime, etc. The focus should be on purchasing low-emission vehicles, including, in particular, electric vehicles. Public institutions should be at the forefront of changes and set an example for private entities.

It is already possible under the current regulations to obtain goods that have a less adverse effect on the environment. The key issue is to prepare an appropriate description of the subject of the contract, so that price is not the decisive criterion.

A guideline aimed at supporting these measures and providing information to the competent institutions on how to properly draw up public contracts should be developed with a view to promoting the above solutions and supporting public institutions.

2.11 Supporting the development of low-carbon public transport

Support for the construction of fast chargers for electric buses.

Fast chargers, located in particular at bus line terminals, allow the drivers to quickly recharge the batteries and, therefore, to make better use of electric buses. The support measures in question may take the following forms:

– financial aid (the installations are relatively expensive);

– legislative measures (facilitating the investment process for constructing such installations).

In addition, electric vehicle rental companies could be set up in towns/cities.

2.12 Establishing a system of subsidies for the purchase of electric vehicles

A subsidy scheme for the purchase of electric vehicles will be prepared if no EU support is obtained at EU level. The amount of subsidies will be equal to the current VAT rate on electric vehicles (23% of the net vehicle price). The detailed rules for granting subsidies will be specified in an Act if Poland's proposal is not supported by other EU Member States.

3. Tax instruments

3.1. Zero-rate excise duty on electric vehicles and a lower rate of excise duty on low-emission vehicles

In accordance with the Excise Duty Act of 6 December 2008, the following rates of excise duty apply to passenger vehicles:

(1)18.6% of the taxable amount: for passenger vehicles with an engine capacity exceeding 2,000 cm^3;

(2)3.1% of the taxable amount: for other passenger vehicles.

Electric vehicles are also subject to excise duty. Exemption from this tax would help boost the popularity of electric vehicles.

Prepared by the Ministry of Energy

Table 19. Projected costs of the zero-rate excise duty on electric vehicles

Year	Average net price: amount updated for individual years (PLN '000)	Excise duty rate	Projected number of newly registered EVs (indicative)	Foregone revenue [PLN '000]
2017	102	3.1%	3,307	10,457
2018	96.9		7,871	23,644
2019	91.8		18,734	53,313
2020	81.6		44,587	112,787
2021	76.5		106,119	251,661
2022	61.2		183,016	347,218
2023	56.1		183,016	318,283
2024	56.1		274,525	477,426

Year	Average net price: amount updated for individual years (PLN '000)	Excise duty rate	Projected number of newly registered EVs (indicative)	Foregone revenue [PLN '000]
2025	51		205,894	325,518

Prepared by the Ministry of Energy

3.2 More favourable tax depreciation rates for electric vehicle purchases by companies

As things stand, the wear-and-tear write-downs on passenger vehicles of a value exceeding the equivalent of EUR 20,000 converted into PLN at the National Bank of Poland's average exchange rate on the date on which the vehicle was handed over for use are not regarded as tax-deductible costs.

For electric vehicles, depreciation rules could also be established for vehicles worth more than EUR 20,000, considering the following parameters:

– average electric vehicle price: PLN 126,667;

– average EUR-PLN exchange rate: 4.40;

– current maximum depreciation write-down: PLN 88,000.

It is suggested that the depreciation amount for electric vehicles be increased. The precise higher depreciation threshold for electric vehicles will be specified in an amended Act.

3.3 Seeking to create a legal framework for the application of a reduced VAT rate

VAT is an EU-harmonised tax. In its current form, Directive 2006/112/EC on the common system of value added tax does not permit Member States to apply reduced VAT rates to this category of goods. Reduced rates may be applied only to the supplies of goods or services listed in Annex III to the Directive, and they cannot be lower than 5% of the taxable amount.

In the Communication from the Commission to the European Parliament, the Council and the European and Social Committee on an action plan on VAT: *Towards a single EU VAT area – Time to decide*, the European Commission announced that VAT rates would be revised so that Member States would enjoy more flexibility in implementing them. Therefore, it will be possible to take measures aimed at creating a legal framework for amended VAT rates at the time when work is underway at EU level on the planned modernisation of EU law in this area.

3.4 Exempting electric vehicle recharging points (posts) from real estate tax

There is no clear interpretation as to whether electric vehicle recharging stations are street furniture or structures. After consultations carried out by the Ministry of the Economy, it was suggested that these points be exempt from real estate tax. In some cases such points are regarded by municipalities as street furniture (exempt from real estate tax) and in other cases as structures (subject to real estate tax). A clear-cut exemption of electric vehicle recharging points from the obligation to pay real estate tax would be an incentive for future investors.

Real estate tax constitutes the municipalities' own income, and the municipalities set the rate at their discretion. For structures, the maximum rate in 2016 was 2% of the value of the respective structure.

3.5 Introducing a registration fee based on the volume of harmful compound emissions, vehicle age and price

Such a change would be to the benefit of the owners of electric vehicles (zero-emission vehicles). The funds obtained in this way by the municipalities could offset the foregone revenue, that is, the money lost due to real estate tax relief.

As a rule, this tax would apply to all vehicles with a mass of up to 3.5 tonnes. Vehicles with a mass exceeding 3.5 tonnes would be covered by a local tax. The registration fee would have to take account of the decrease in the value of the vehicle concerned. The fee would depend on engine capacity, Euro standards and vehicle age. Electric vehicles would be exempt from this fee, and the fee amount should be socially acceptable. Details of the proposal should be set out by the minister responsible for public finance and the minister responsible for energy.

In the long term, the possibility of replacing the excise duty with the registration fee should also be considered.

3.7 Including electric vehicle recharging services in Section D(35) of the Polish Classification of Goods and Services (Polska Klasyfikacja Wyrobów i Usug, PKWiU)

3.8 Reducing the tonnage tax for 'green vessels'

This would entail an amendment to the Tonnage Tax Act of 24 August 2006, which provides for the taxation of income achieved by shipping companies operating maritime vessels in international navigation, according to the size of a vessel (net tonnage). A discount or a lower percentage rate of this tax could be applied to that end.

3.9 Adopting more favourable rates of registration fees for vessels powered by alternative fuels

This measure requires an amendment to the Maritime Code Act.

4. Technical provisions

4.1 Drafting technical and construction provisions for CNG and LNG refuelling stations

4.2 Amending the technical provisions concerning CNG and LNG containers

The requirement that the Transportation Technical Supervision carry out periodic inspections of CNG installations in vehicles, in particular those designed for CNG use, is a burden and an additional cost for vehicle users. The inspections are also conducted too often, especially as vehicles designed for CNG use are manufactured in accordance with the relevant international standards (UNECE Regulation No 110).

Point 4.1.4 of Annex 3 to UNECE Regulation No 100 stipulates that cylinders must be visually inspected every 48 months. The Polish national provisions are more restrictive in this regard since in accordance with the Annex to the Regulation of the Minister for Transport of 20 October 2006 on the technical conditions for the technical supervision of the design, manufacture, operation, repair and modernisation of specialist pressure equipment, CNG containers should undergo an external inspection, a leak test and an operating test of accessory equipment every three years (36 months).

Naturally, the provisions on CNG containers and LNG tanks apply to those containers and tanks which have been manufactured in accordance with the relevant technical standards guaranteeing safe operation. We thereby propose that the dates of inspections of CNG containers be adapted to the requirements of UNECE Regulation No 110, while maintaining

the current scope of tests. We propose that LNG containers be inspected every 48 months and that the current scope of the tests be maintained.

4.3 Repealing provisions preventing untrained persons from refuelling CNG

The Regulation of the Minister for Transport of 20 October 2006 on the technical conditions for the technical supervision of the design, manufacture, operation, repair and modernisation of specialist pressure equipment does not allow vehicle users to refuel CNG vehicles by themselves in Polish territory. If vehicle users were permitted to do this, the costs of operating natural gas refuelling stations could be reduced, which would boost the profitability of building refuelling points.

In order to allow vehicle users to refuel CNG by themselves, it will be necessary to set out the technical conditions for CNG stations (points). Similar legal solutions will need to be put in place for LPG vehicle users, comprising appropriate marking of refuelling pumps and ensuring that a duly authorised worker is present at the fuel station.

4.4 Laying down technical standards for recharging/refuelling points for alternative fuels, consistent with the standards laid down in Directive 2014/94/EU

4.5 Laying down quality requirements, testing and sampling methods for LNG

Drafting a regulation on the basis of the authorisation provided for in the Fuel Quality Monitoring and Control System Act.

4.6 Supplementing and updating tables indicating the energy value of motor fuels laid down in the Regulation of the Prime Minister of 10 May 2011 on the mandatory tender evaluation criteria other than price for certain types of public contracts

4.7 Harmonising the sell price unit of measure for CNG and LNG (natural gas would be sold by kg)

Annex 4: Legal instruments and technical standards applied when constructing CNG and LNG refuelling infrastructure

Acts:

Construction Law Act of 7 July 1994 (Journal of Laws 2016, item 290, as amended) and implementing acts;

Public Roads Act of 21 March 1985 (consolidated text: Journal of Laws 2016, item 1440, as amended).

Implementing acts and regulations:

Regulation of the Minister for Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location;

Regulation of the Minister for the Economy of 26 April 2013 on the technical conditions to be met by gas networks;

Regulation of the Minister for the Economy of 28 December 2009 on occupational health and safety when building and operating gas networks and commissioning natural gas installations;

Cabinet Regulation of 7 December 2012 on the types of technical devices subject to technical supervision;

Regulation of the Minister for the Economy, Labour and Social Policy of 9 July 2003 on the technical conditions for the technical supervision of certain types of pressure equipment;

Regulation of the Minister for the Economy of 21 November 2005 on the technical conditions to be met by liquid fuel depots and stations, long-distance pipelines used to transport oil and petroleum products, and their location;

Regulation of the Minister for the Economy of 6 September 1999 on occupational health and safety when storing, filling up and distributing liquefied gases;

Regulation of the Minister for Internal Affairs and Administration of 24 July 2009 on fire water supply and fire roads;

Regulation of the Minister for Internal Affairs and Administration of 7 June 2010 on fire protection of buildings, other structures and land;

Regulation of the Minister of Infrastructure of 6 February 2003 on occupational safety and health while performing construction work;

Regulation of the Minister for Internal Affairs and Administration of 16 June 2003 on the reconciliation of building permit designs in terms of fire protection;

Regulation of the Minister for the Economy of 27 April 2000 on occupational health and safety while performing welding work;

Regulation of the Minister for Transport of 20 October 2006 on the technical conditions of technical supervision of the design, manufacture, operation, repair and modernisation of specialised pressure equipment;

Regulation of the Minister for Transport and Maritime Economy of 2 March 1999 on the technical conditions to be met by public roads and their location.

Technical standards

Technical Standard of the Chamber of Natural Gas Industry (ST-IGG-1601:2012): *Design, construction and operation of CNG stations. Requirements and recommendations.*

Technical Standard of the Chamber of Natural Gas Industry (ST-IGG-0401:2010): *Gas networks. Explosion risk zones. Assessment and designation.*

Annex 5: Algorithm for calculating the number of recharging points in agglomerations and densely populated areas

The calculations are based on the following assumptions:
1. Total number of vehicles in 2014: 26,472,274;
2. Total number of vehicles in 2020: 32,793,104;
3. Number of electric vehicles in 2020: 76,898;
4. Number of electric vehicles in the selected agglomerations and densely populated areas: 53,829 (70% of the projected number of EVs in Poland);
5. Share of individual vehicle categories:
Passenger vehicles – 96.8%;
Buses – 2.5%;
Heavy duty vehicles – 0.7%.

Determine the number of registered vehicles in the selected agglomerations.
Determine the share ($\boldsymbol{\rho_A}$) of the total number of vehicles registered in the base year in the selected agglomerations – $\boldsymbol{n_b^A}$ compared with the total number of vehicles in Poland ($\boldsymbol{n_b^K}$) in the same year, as forecast: $$\boldsymbol{\rho_A = \frac{n_b^A}{n_b^K}}$$
Determine the share of individual towns in the total number of vehicles in agglomerations.
Determine the share ($\boldsymbol{r_{EV}}$) of electric vehicles in the total number of vehicles$\boldsymbol{n_{2020}^{K\,EV}}$ in Poland in 2020 ($\boldsymbol{n_{2020}^K}$) for the no-support scenario and the development scenario: $$\boldsymbol{r_{EV} = \frac{n_{2020}^{K\,EV}}{n_{2020}^K}}$$ $\boldsymbol{n_{2020}^{K\,EV}}$, $\boldsymbol{n_{2020}^K}$ – figures resulting from the projected increase in the number of vehicles in Poland in 2020
Determine the number ($\boldsymbol{n_{2020}^{A\,EV}}$) of electric vehicles in agglomerations in 2020: $$\boldsymbol{n_{2020}^{A\,EV} = n_{2020}^A \cdot r_{EV}}$$
Determine the number of individual types of electric vehicles (passenger vehicles, heavy-duty vehicles with tractors, buses) projected in agglomerations in 2020.
Determine the operation $\boldsymbol{P_{2020}^{A\,EV}}$ of individual types of electric vehicles (passenger vehicles, heavy-duty vehicles, buses) in agglomerations during one day: $\boldsymbol{w}$ – coefficient of irregularity in daily mileage during one year (ranging between 1.2-1.5 in specialist literature; a value of 1.35 was adopted here), $\boldsymbol{365}$ – number of days in a year

$$P_{2020}^{A\,EV}(passenger) = w \cdot \frac{n_{2020}^{A\,EV}\,(passenger) \cdot p(passenger)}{365}$$

Determine the number of required rechargings (N) of EVs in agglomerations in 2020:
N – number of required vehicle rechargings per day,
$l_{Z\,EV}$ – range of electric vehicles in km

$$N = \frac{\sum P_{pass+heavy\,duty+bus}^{A\,EV}}{l_{Z\,EV}}$$

Determine the number of recharging points ($P_{Ł}^{A\,EV}$) for electric vehicles in agglomerations:
W_p – capacity of a recharging point resulting from the following formula:

$$P_{Ł}^{A\,EV} = \frac{N}{W_p}$$

Annex 6: Algorithm for calculating the number of CNG refuelling points in agglomerations and densely populated areas

Determine the number of registered vehicles in the selected agglomerations.

Determine the share ($\boldsymbol{\rho_A}$) of the total number of vehicles registered in the base year in the selected agglomerations – $\boldsymbol{n_b^A}$ compared with the total number of vehicles in Poland ($\boldsymbol{n_b^K}$) in the same year, as forecast:

$$\boldsymbol{\rho_A = \frac{n_b^A}{n_b^K}}$$

Determine the projected total number of vehicles in the selected agglomerations in the year resulting from the recommendations set out in Directive 2014/94/EU, that is, in 2020:

$$\boldsymbol{n_{2020}^A = \rho_A \cdot n_{2020}^K}$$

$\boldsymbol{n_{2020}^K}$ – figure resulting from the projected increase in the total number of vehicles in Poland in 2020

Determine the share ($\boldsymbol{r_{CNG}}$) of CNG vehicles $\boldsymbol{n_{2020}^{K\,CNG}}$ in the total number of vehicles in Poland in 2020 ($\boldsymbol{n_{2020}^K}$):

$$\boldsymbol{r_{CNG} = \frac{n_{2020}^{K\,CNG}}{n_{2020}^K}}$$

$\boldsymbol{n_{2020}^{K\,CNG}}$, $\boldsymbol{n_{2020}^K}$ – figures resulting from the projected increase in the number of vehicles in Poland in 2020

Determine the number ($\boldsymbol{n_{2020}^{A\,CNG}}$) of CNG vehicles in agglomerations in 2020:

$$\boldsymbol{n_{2020}^{A\,CNG} = n_{2020}^A \cdot r_{CNG}}$$

Determine the number of individual types of CNG vehicles (passenger vehicles, heavy-duty vehicles with tractors, buses) projected in agglomerations in 2020.

Determine the operation $\boldsymbol{P_{2020}^{A\,CNG}}$ of individual types of CNG vehicles (passenger vehicles, heavy-duty vehicles, buses) in agglomerations per dayc):
$\boldsymbol{w}$ – coefficient of irregularity in daily mileage during one year (ranging between 1.2-1.5 in specialist literature; a value of 1.35 was adopted here),
$\boldsymbol{365}$ – number of days in a year

$$\boldsymbol{P_{2020}^{A\,CNG}(passenger) = w \cdot \frac{n_{2020}^{A\,CNG}\,(passenger) \cdot p(passenger)}{365}}$$

Determine the number of required rechargings ($\boldsymbol{N}$) of CNG vehicles in agglomerations in

2020:
$\boldsymbol{N}$ – number of required vehicle rechargings during one day,
$\boldsymbol{l_{Z\,CNG}}$ – range of CNG vehicles in km

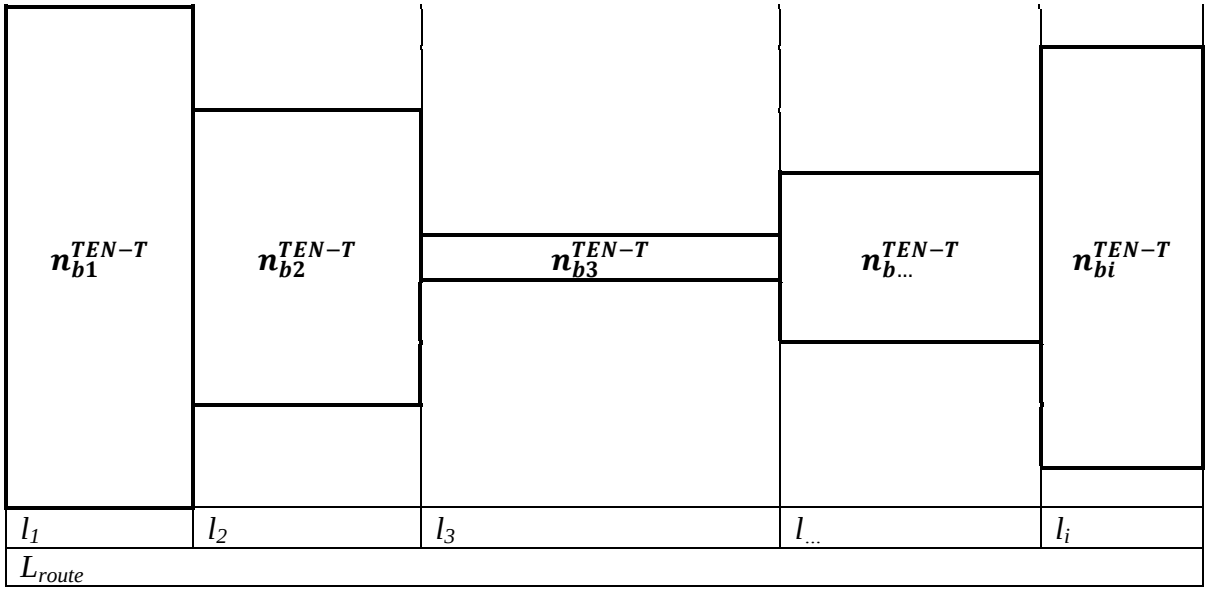
$$\boldsymbol{N = \frac{\sum P^{A\,CNG}_{pass+heavy\,duty+bus}}{l_{Z\,CNG}}}$$

Determine the number of recharging points ($\boldsymbol{P^{A\,CNG}_{Ł}}$) for CNG vehicles in agglomerations:
$\boldsymbol{W_p}$ – the capacity of a recharging point resulting from the following formula:

$$\boldsymbol{P^{A\,CNG}_{Ł} = \frac{N}{W_p}}$$

Annex 7: Algorithm for calculating the number of natural gas refuelling points on the TEN-T Core Network

Determine the average number of motor vehicles moving along a selected route, on the basis of the map of average daily motor-powered vehicle traffic volumes in the national road network prepared by the GDDKiA every five years (based on the last edition from 2010) – $\boldsymbol{n_b^{TEN-T}}$



$\boldsymbol{n_{b1,2,3,...}^{TEN-T}}$ – number of vehicles moving on the first, second and third section during one day in the base year – 2010;
$\boldsymbol{l_{1,2,3,...}}$ – length of the road sections forming the TEN-T route concerned, e.g. Gdynia-Katowice/Sławków;
$\boldsymbol{L_{relacji}}$ – length of the road sections forming the TEN-T route concerned, e.g. Gdynia-Katowice/Sławków;
$\boldsymbol{I_{b1} = n_{b1}^{TEN-T} \cdot l_1}$ – product of vehicle traffic volume on the first section during one day in the base year;
$\boldsymbol{n_{b\,ROUTE}^{TEN-T}}$ – number of vehicles on the selected route during one day in the base year.

$$\sum_{n=1}^{n=i} I_b = I_{b1} + I_{b2} + I_{b3} + \cdots + I_{bi}$$

$$n_{b\,ROUTE}^{TEN-T} = \frac{\sum \sum_{n=1}^{n=i} I_{bi}}{L_{route\ 1...i}}$$

Determine the share ($\boldsymbol{\rho_{TEN-T}}$) of the total number of vehicles moving along a selected TEN-T route ($\boldsymbol{n_b^{TEN-T}}$) in the base year 2010 compared with the total number of vehicles in Poland ($\boldsymbol{n_b^K}$) projected in that year, on the basis of figures or tables:

$$\rho_{TEN-T} = \frac{n_b^{TEN-T}}{n_b^K}$$

Determine the projected total number of vehicles (n_{2025}^{TEN-T}) on the selected TEN-T route in 2025 (the year stipulated in Directive 2014/94/EU):
n_{2025}^K – figure resulting from the projected increase in the number of vehicles in Poland in 2025

$$n_{2025}^{TEN-T} = \rho_{TEN-T} \cdot n_{2025}^K$$

in the no-support scenario and the development scenarios

Determine the share $r_{CNG}$of CNG vehicles ($n_{2025}^{K\,CNG}$) in the total number of vehicles in Poland in 2025 (n_{2025}^K):
$n_{2025}^{K\,CNG}$ and n_{2025}^K – figures resulting from the projected increase in the number of vehicles in Poland

$$r_{CNG} = \frac{n_{2025}^{K\,CNG}}{n_{2025}^K}$$

similarly for LNG, the no-support scenario and the development scenario

Determine the number ($n_{2025\,ROUTE}^{TEN-T\,CNG}$) of natural gas vehicles moving along the TEN-T route concerned in 2025:

$$n_{2025\,ROUTE}^{TEN-T\,CNG} = n_{2025\,ROUTE}^{TEN-T} \cdot r_{CNG}$$

similarly for LNG, the no-support scenario and the development scenario

Determine the number of refuelling operations for CNG ($C_{fuel\,2025}^{TEN-T\,CNG}$) and LNG ($C_{fuel\,2025}^{TEN-T\,LNG}$) vehicles moving along the TEN-T route concerned:
L_{route} – length of the TEN-T route being analysed in km,
Z^{CNG} – average range of a CNG vehicle

$$C_{fuel\,2025}^{TEN-T\,CNG} = \frac{L_{route}}{Z^{CNG}} \cdot n_{2025}^{TEN-T\,CNG}$$

similarly for LNG, the no-support scenario and the development scenario

Determine the number of refuelling points ($N_{2025}^{TEN-T\,CNG}$) necessary on the TEN-T route being analysed:
W_{pt} – the daily capacity of a refuelling point

$$N_{2025}^{TEN-T\,CNG} = \frac{C_{fuel\,2025}^{TEN-T\,CNG}}{W_{pt}}$$

similarly for LNG, the no-support scenario and the development scenario

Check the required number of refuelling points in terms of ensuring the continuity of traffic on the TEN-T route being analysed.

Determine the average distance between refuelling points resulting from the above calculations:

$$l_{av}^{TEN-T\ CNG} = \frac{L_{route}}{N_{2025}^{TEN-T\ CNG}}$$

similarly for LNG, the no-support scenario and the development scenario

Check compliance with the requirement to ensure the continuity of vehicle traffic along the route being analysed:

$$l_{av}^{TEN-T\ CNG} \leq Z^{CNG}$$

on routes where $l_{av}^{TEN-T\ CNG} \geq Z^{CNG}$, the number of refuelling points should be increased so that condition 8b is fulfilled, similarly for LNG, the no-support scenario and the development scenario.

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