MINISTRY FOR
INNOVATION AND TECHNOLOGY

Report on alternative fuels infrasturcture development in Hungary

2020

INNOVATION AT WORK

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Glossary

Acronym	Full Name	Description
AF	Alternative fuel	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 contribute to its decarbonisation and enhance the environmental performance of the transport sector. They include, inter alia: electricity; hydrogen; biofuels; synthetic and paraffinic fuels; natural gas, including biomethane, in gaseous form (CNG) and liquefied form (LNG); liquefied petroleum gas
AFI	Alternative fuel infrastructure	
AFV	Alternative fuel vehicle	
APU	Auxiliary power	An auxiliary power unit (APU) is a device on an aircraft that provides energy for functions other than propulsion.
BEV	Battery electric vehicle	Also known as all-electric vehicle, BEV's has all its power from its battery packs and thus has no internal combustion engine, fuel cell, or fuel tank.
CEF	Connecting Europe Facility	The Connecting Europe Facility (CEF) is a key EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. CEF investments fill the missing links in Europe's energy, transport and digital backbone.
CNG	Compressed natural gas	Compressing natural gas (which is mainly composed of methane, CH4), to less than 1 percent of the volume it occupies at standard atmospheric pressure. Usually it is stores in cylindrical or spherical shapes.
ESR	Effort Sharing Regulation	Regulation (EU) 2018/842 of the European Parliament and the Council. EU Member States have binding annual greenhouse gas emission targets for 2021-2030 for those sectors of the economy that fall outside the scope of the EU Emissions Trading System (EU ETS). These sectors, including transport, buildings, agriculture, non-ETS industry and waste, account for almost 60% of total domestic EU emissions.
EU ETS	EU Emissions Trading System	The EU ETS works on the 'cap and trade' principle. A cap is set on the total amount of certain greenhouse gases that can be emitted by installations covered by the system. The cap is reduced over time so that total emissions fall.
EUA	European Union allowance	An EUA is a tradable unit under the European Union Emissions Trading System giving the holder the right to emit one tonne of carbon dioxide (CO2), or the equivalent amount of two more powerful greenhouse gases, nitrous oxide (N2O) and perfluorocarbons (PFCs).
FCEV	Fuel cell electric vehicle	Vehicle which uses a fuel cell to power its on-board electric motor, generally using oxygen from the air and compressed hydrogen. A fuel cell vehicle that is fueled with hydrogen emits only water and heat.
GHG	Greenhouse gas	Carbon dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O),

		Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF6) and other gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation;
GPU	Ground power unit	Ground power units supply power to aircraft parked on the ground. Ground power units may also be built into the jetway, making it even easier to supply electrical power to aircraft.
LNG	Liquefied natural gas	Liquefied natural gas is natural gas that has been converted to a liquid form for the ease and safety of natural gas transport.
LPG	Liquefied petroleum gas	LPG is a mixture of propane and butane, and it is being produced as by-product of natural gas and oil refining industry
PHEV	Plug-in hybrid electric vehicle	A PHEV shares the characteristics of both a conventional hybrid electric vehicle, having an electric motor and an internal combustion engine (ICE), and of an all-electric vehicle, having a plug to connect to the electrical grid.
	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.
	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.
	High power recharging point	A recharging point that allows for a transfer of electricity to an electric vehicle with a power of more than 22 kW;
	Shore-side electricity supply'	The provision of shore-side electrical power through a standardised interface to seagoing ships or inland waterway vessels at berth;
	Refuelling point'	A refuelling facility for the provision of any fuel with the exception of LNG, through a fixed or a mobile installation;
NA	Not applicable	
NE	Not estimated	
NECP	National Energy and Climate Plan	To meet the EU's energy and climate targets for 2030, according to Regulation on the governance of the energy union and climate action (EU/2018/1999) EU Member States need to establish a 10-year integrated national energy and climate plan (NECP) for the period from 2021 to 2030. The NECPs outline how the EU Member States intend to address decarbonisation; energy efficiency; energy security; internal energy market; research and innovation
NPF	National Policy Framework	The Directive 2014/94/EU of the European Parliament and the Council of 22 October 2014 (henceforth 'the Directive') requires each member state to produce a national policy framework (NPF) by 18 November 2016 that outlines their national targets and objectives, and supporting actions for the development of the market as regards alternative fuels.
PTW	Powered two-wheelers	
TEN-T	Trans-European Transport	The Trans-European Transport Network (TEN-T) policy addresses the implementation and development of a Europe-wide network of railway

	Network	lines, roads, inland waterways, maritime shipping routes, ports, airports and railroad terminals. The ultimate objective is to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic and territorial cohesion in the EU. The current TEN-T policy is based on Regulation (EU) No 1315/2013
WEM	With existing measures	Projections with measures means projections of anthropogenic greenhouse gas emissions by sources and removals by sinks that encompass the effects, in terms of greenhouse gas emission reductions or developments of the energy system, of policies and measures that have been adopted and implemented;
WAM	With additional measures	Projections with additional measures means projections of anthropogenic greenhouse gas emissions by sources and removals by sinks or developments of the energy system that encompass the effects, in terms of greenhouse gas emission reductions, of policies and measures which have been adopted and implemented to mitigate climatechange or meet energy objectives, as well as policies and measures which are planned for that purpose

I. Executive summary

Switching to alternative fuels is a key element of decarbonising the transport sector. **European Member States were required** by the Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 **to establish a national policy framework** (NPF) **by 18 November 2016 and report on its implementation every three years thereafter**. In their NPF, the Member States should outline their national targets and objectives, and supporting actions for the development of the market as regards alternative fuels, including the deployment of the necessary infrastructure to be put into place.

Hungary's NPF published in 2016 set ambitious targets on infrastructure development. **Since then, many circumstances have changed.** Not all technologies and their cost efficiency have developed as expected especially in case of fuel cells. Battery electric vehicles and plug-in hybrids are penetrating the market rapidly, but other technologies are not. Neither fuel cell electric vehicles nor LNG vehicles have appeared in Hungary. The CNG-fuelled fleet showed moderate growth and LPG use was stagnating. Consumption of biofuels rose and remained the most significiant alternative fuel in road transportation due to the obligatory blending rate.

Publicly accessible electric chargers including high power ones spread rapidly. The growth of CNG infrastructure was moderate, and the number of LPG refueling points started to decline. The first LNG refueling points opened only in 2019. The updated framework established targets to achieve an appropriate level of alternative fuels infrastructure for transport. This document is based on the targets and measures introduced both in the new National Energy Strategy and the National Energy and Climate Plan.

Hungary has published its National Energy and Climate Plan in January 2020 together with the new National Energy Strategy (NECP). For 2030 the NECP set a target of -40% compared to 1990 for mitigation of greenhouse gas (GHG) emission. Also Hungary's GHG reduction target under the Effort Sharing Regulation is -7% for 2030 compared to 2005 for sectors of the economy – including transport - that fall outside the scope of the EU Emissions Trading System (EU ETS). Furthermore Hungary intends to keep the final energy consumption on the 2005 level (785 PJ). Hungary's target for renewable energy share in gross final energy consumption for 2030 is minimum 21%. The NECP also sets a 14% target for the share of renewables in the transport sector with multipliers taken into account as determined in Directive (EU) 2018/2001 of the European Parliament and the Council on the promotion of the use of energy from renewable sources.

Due to the above mentioned developments **the present report includes updated projections on alternative fuels vehicles fleet and revised targets on infrastructure development, in accordance with the new National Energy Strategy and the National Energy and Climate Plan.**

Electromobility and biofuels will be the two most important contributors to achieve the national energy and climate targets for transport. **For electromobility, the framework sets an ambitious target by 2030**. Hungary already supports the spread of electricity consumption in road transportation with a wide range of policies, but with additional measures the number

of electric vehicles will rise above half a million by 2030. It seems **that electricity will fuel the majority of passenger cars, trains and urban bus transport**, the latter due to the Green Bus Program. Yet electrification will increase in other segments as well. **The number of accompanying charging points will also rise significantly** and will surpass 50 000 in 2030 in the "with additional measures" (WAM) scenario.

Hungary also intends to encourage both the consumption and the domestic production of the advanced (second generation) **biofuels.** The share of first-generation biofuels will be increased up to nearly 7% by 2030. The share of advanced (second-generation) biofuels and biogas is planned to increase up to 3.5% in the final energy consumption of the transport sector.[1]

Natural gas vehicles **may play a role in the transport sector, but their significance will remain small in relation to the role of the electric drive vehicles.** The CNG vehicles fleet is expected to grow moderately in the future and to remain marginal. A small increase is expected in the number of CNG buses compared to 2018, but after 1 January 2022[2] their numbers are possibly going to shrink, because after this point, only electric buses used in urban transportation will be eligible for support in the Green Bus Program. **LNG can play a role manly in long distance freight** and to a lesser extent in passenger transport if supply problems are solved and the price of these vehicles decreases**The number of CNG and LNG refuelling points will also increase.** The number of CNG refueling points will increase up to 66 in the WAM scenario (65 in the WEM scenario). LNG demand in the WEM scenario on the two TEN-t corridors in Hungary can be covered with approximately 40 refueling points and with 30 in the WAM.

Financial support of LPG infrastructure is not foreseen, so LPG consumption will decline. In the WAM scenario LPG fleet (only passenger cars) is expected to decrease by half.

Hungary will continuously monitor the development of fuel cell technology. **The future of hydrogen fuel cell vehicles strongly depends on economic factors. If this technology becomes economical, the Hungarian government will examine the possibilities to incentivise its spread.** According to Hungary's projection, hydrogen consumption may appear in the second half of the decade and will probably penetrate long distance freight segment the most. In the WAM scenario, we expect that the number of FCEVs at the end of the decade will reach 2900. 37 refueling points will be needed respectively to satisfy the demand.

[1] Advanced biofuels will be double-counted towards both the 3.5% target and towards the 14% target.
[2] The revision of the Program is being considered to exclude CNG and Euro 6 diesel buses.

II. Introduction

1. The National policy framework on alternative fuels 2016

Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014[3] (henceforth 'the Directive') requires each Member State to establish a national policy framework (NPF) by 18 November 2016 that outlines their national targets and objectives, and supporting actions for the development of the market as regards to alternative fuels, including the deployment of the necessary infrastructure to be put into place. The Directive lists the aspects to be included in the national policy framework. It also presents certain minimum requirements that the alternative fuels infrastructure must meet together with common technical specifications for elements such as the charging points for electric vehicles, refuelling points of all types and user information requirements.

The required coverage and the timings by which this coverage must be put in place are the following:

	Coverage	Timings
Electricity in urban/suburban and other densely populated areas	Appropriate number of publically accessible points	by end 2020
CNG in urban/suburban and other densely populated areas	Appropriate number of points	by end 2020
CNG along the TEN-T core network	Appropriate number of points	by end 2025
Electricity at shore-side	Ports of the TEN-T core network and other ports	by end 2025
Hydrogen in the Member States who choose to develop it	Appropriate number of points	by end 2025

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0094&from=EN

	Coverage	Timings
LNG at maritime ports	Ports of the TEN-T core network	by end 2025
LNG at inland ports	Ports of the TEN-T core network	by end 2030
LNG for heavy-duty vehicles	Appropriate number of points along the TEN-T core network	by end 2025

Table 1 - The required coverage and the timings by which this coverage must be put in place according to the alternative fuels directive

Hungary's NPF was adopted by the Government in 2016. It includes ambitious targets on infrastructure development with three different scenarios on the development of the vehicle fleet using alternative fuels: a pessimistic, a realistic and an optimistic scenario. The realistic scenario includes the following targets on infrastructure development:

	2020	2025	2030
Normal and high power reacharging points =<50kw	2100	8100	20500
High power recharging point >=50kw	150	NE	NE
CNG	62	145	286
LNG	23	83	224
LNG (water)	1	6	8
Hydrogen (700 bar)	2	5	14
LPG	630	650	700

Table 2 - Targets of the alternative fuel infrastructure development plan 2016

Article 10(1) of the Directive states that each Member State shall submit to the Commission a report on the implementation of its national policy framework by 18 November 2019 and every three years thereafter.

Due to technological and political development since the publication of the NFP, the above mentioned targets have been reviewed and revised for this report.

2. Relevant EU policies

Below the most relevant EU legislation and policies are listed.

Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

EU Member States have binding annual greenhouse gas emission targets for 2021-2030 for those sectors of the economy which are outside of the scope of the EU Emissions Trading System (EU ETS). These sectors - including transport, buildings, agriculture, non-ETS industry and waste are responsible for almost 60% of total domestic EU emissions.

Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources

In order to increase the use of renewable energy in the transport sector each Member State shall set an obligation on fuel suppliers to ensure that the share of renewable energy within the final consumption of energy in the transport sector is at least 14 % by 2030 (minimum share). Furthermore there is a sub-target for advanced biofuels produced from feedstocks in Part A of Annex IX. These fuels must reach a minimum of 0.2% of transport energy in 2022, 1% in 2025 and at least 3.5% by 2030. Advanced biofuels will be double-counted towards both the 3.5% target and towards the 14% target. Biofuels produced from feedstocks in Part B of Annex IX will be capped at 1.7% in 2030 and will also be double counted towards the 14% target.

The Directive also defines the methodology for calculating the share of renewable energy in detail. According to Article 26, specific rules should be applied for biofuels, bioliquids and biomass fuels produced from food and feed crops.

Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2019 - amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles

According to this directive Member States have to ensure that contracting authorities and contracting entities take into account lifetime energy and environmental impacts, including energy consumption and emissions of CO_2 and of certain pollutants, when procuring certain road transport vehicles with the objectives of promoting and stimulating the market for clean and energy-efficient vehicles and of improving the contribution of the transport sector to the environment, climate and energy policies of the Union.

The minimum procurement targets for the share of clean vehicles from 2021 until 2025 and from 2026 until 2030 is:

- 23.1% and 23.1% for passanger vehicles below 5 tonnes and light commercial vehicles
- 8% and 9% for heavy duty trucks
- 37% and 53% for buses

Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011

This regulation establishes CO_2 emissions performance requirements for vehicle manufacturers when producing new passenger cars and new light commercial vehicles in order to contribute to achieving the Union's target of reducing its greenhouse gas emissions, as described in Regulation (EU) 2018/842, and the objectives of the Paris Agreement and to ensure the proper functioning of the internal market. The reference value is 95 g/km to be reached in 2021, aiming a 15% CO_2 reduction target until 2025 in the case of passenger cars and light commercial vehicles respectively, and 37.5% for passenger cars and 31% for light commercial vehicles until 2030 following a linear reduction trajectory.

Regulation (EU) 2019/1242 — setting CO_2 emission performance standards for new heavy-duty vehicles

In order to achieve the Union's target of reducing its greenhouse gas emissions by 30 % below 2005 levels in 2030 in the sectors covered by Article 2 of Regulation (EU) 2018/842 and to achieve the objectives of the Paris Agreement and to ensure the proper functioning of the internal market, this Regulation sets CO_2 emission performance requirements for new heavy-duty vehicles whereby the specific CO_2 emissions of the Union fleet of new heavy-duty vehicles shall be reduced compared to the reference CO_2 emissions as follows:

- for the reporting periods of the year 2025 onwards by 15 %;
- for the reporting periods of the year 2030 onwards by 30 %, unless decided otherwise pursuant to the review referred to in Article 15.

The reference CO_2 emissions shall be based on the monitoring data reported pursuant to Regulation (EU) 2018/956 for the period from 1 July 2019 to 30 June 2020 ('the reference period'), excluding vocational vehicles, and shall be calculated in accordance with point 3 of Annex I to this Regulation.

A European Strategy for Low-Emission Mobility

In 2016, the European Commission published a strategy for low-emission mobility. The strategy integrates a broader set of measures to support Europe's transition to low-carbon economy while it also identifies key priorities. The main elements of the Strategy are the following:

- Increasing the efficiency of the transport system with the use of digital technologies, smart pricing and continuously encouraging the shift to lower emission transport modes.
- Improving the deployment of low-emission alternative energy for transport such as advanced biofuels, electricity, hydrogen and renewable synthetic fuels and removing obstacles to the electrification of transport.

- Moving towards zero-emission vehicles. While further improvements to the internal combustion engine will be needed, Europe needs to accelerate the transition towards low- and zero-emission vehicles. [4]
- The strategy reaffirms the 2011 White Paper's ambition that by 2050, greenhouse gas emissions from transport will need to be at least 60% lower than in 1990.

3. Goals of the National Energy and Climate Plan

Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action requires all Member States to produce a national energy and climate plan (hereinafter "NECP"). Hungary has adopted its NECP in January 2020 with the new National Energy Strategy. For 2030 the NECP set a target of -40% compared to 1990 for mitigation of greenhouse gas (GHG) emission. Also EU Member States have binding annual GHG targets under the Effort Sharing Regulation[5] (ESR) for 2021-2030 for those sectors of the economy that fall outside the scope of the EU Emissions Trading System (EU ETS). These sectors include transport, buildings, agriculture, non-ETS industry and waste of which in Hungary emissions of the transport sector are the most significant. Hungary's GHG reduction target under the ESR is -7% for 2030 compared to 2005. Furthermore, Hungary intends to keep the final energy use on the 2005 level (785 PJ). Hungary's target for renewable energy share in gross final energy consumption for 2030 is 21%. The NECP also sets a 14% target for the share of renewables in the transport sector with multipliers taken into account as determined in the Directive (EU) 2018/2001 of the European Parliament and the Council on the promotion of the use of energy from renewable sources.

To achieve the above mentioned targets Hungary will raise the share of first generation biofuels to nearly 7% and the share of advanced biofuels and biogas to 3.5%. Also electric mobility will be a major contributor to the achievement of our targets.

III. Current trends of fuel use and infrastructure development in transport

Energy consumption and in parallel the GHG emission for the transport sector has been growing rapidly since 2013. According to the latest available data, the sector accounts for more than 20% of the country's emissions and 27% of final energy consumption. 95.5% of the energy use of the sector – not considering international water and air transportation - is consumed by road transportation, followed by rail (3%), pipeline (1.4%) and domestic navigation (0,1%). Domestic aviation is insignificant as there are no inland commercial flights operated.

[4] https://ec.europa.eu/transport/themes/strategies/news/2016-07-20-decarbonisation_en

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0842&from=EN

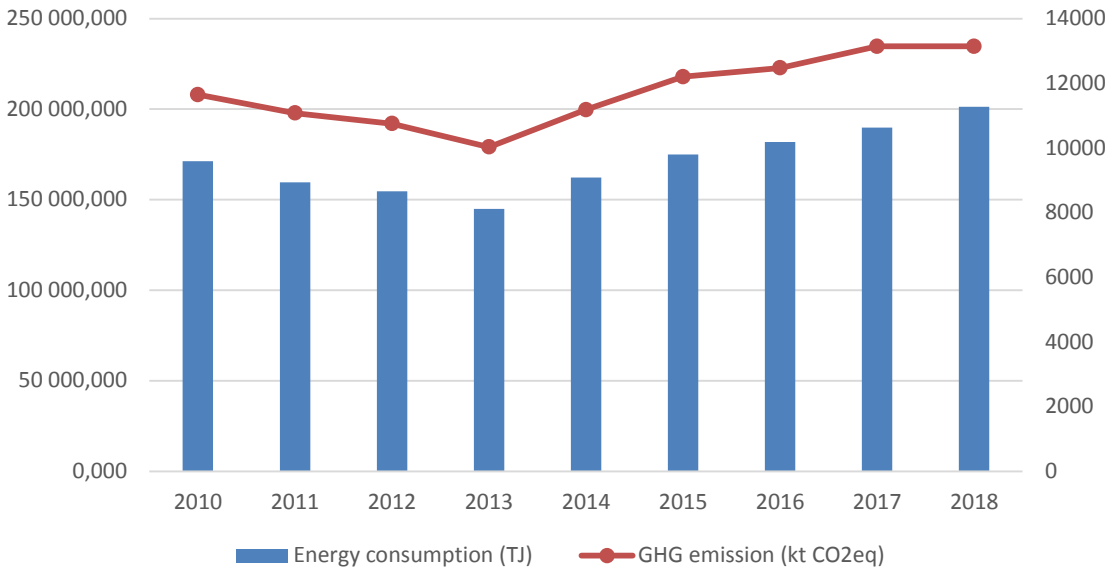

Figure 1 - Trends in energy consumption and GHG emission in the transport sector (2010-2018)

Source: EUROSTAT

The transport sector is dominated by oil and petroleum products with 92% of the total share. Biofuels take up 2%. Electricity and natural gas take up 2-2%, the former is due to its high penetration in railway transport, while the latter is due to pipeline transport.

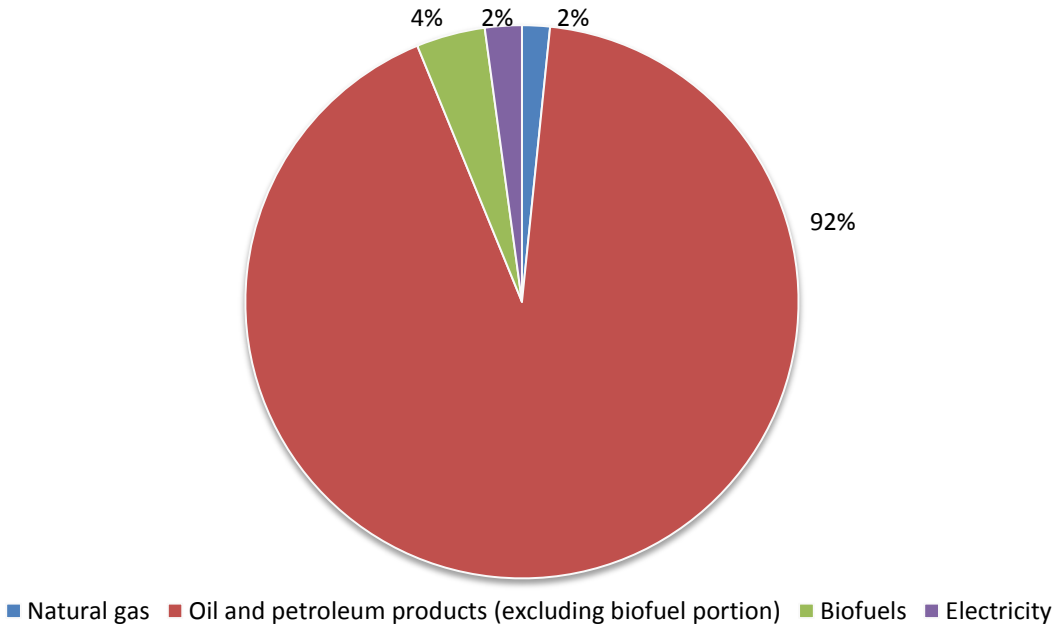

Figure 2 - Energy consumption of the transport sector by fuel in 2018

Source: EUROSTAT

Between 2016 and 2018 the renewable energy share in the transport sector has risen from 7.29% to 8.29% calculated in line with the provisions of the renewable energy directive. This

share was is mainly made up from the use of first generation biofuels and to a lesser extent from electricity use in rail transport.

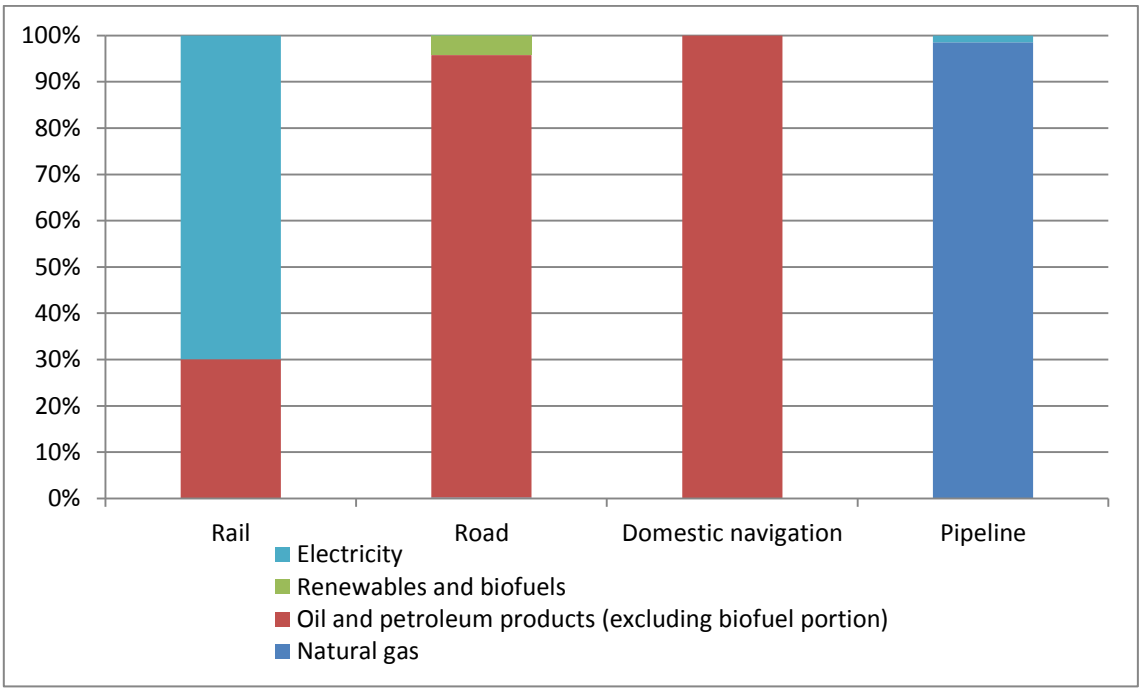

Figure 3 - Share of fuels by transport mode in 2018

Source: EUROSTAT

Oil and petroleum products dominate road transportation. Currently biofuels are the only alternative fuels present in the mix, due to the obligatory blending rates. Electricity use - though growing rapidly - is still marginal, such as is CNG.

Fuel	Percentage of different fuels use for transport [%]		
	2016	2017	2018
Gasoline	33,4%	31,6%	30,9%
Diesel	61,2%	63,7%	64,2%
Electricity	0,05%	0,05%	0,05%
CNG	0,19%	0,20%	0,21%
LNG	0%	0%	0%
Hydrogen	0%	0%	0%
LPG	0,66%	0,61%	0,50%

Fuel	Percentage of different fuels use for transport [%]		
	2016	2017	2018
Biofuels	4,50%	3,80%	4,21%
Synthetic and paraffinic fuels	0%	0%	0%
Other AF	0%	0%	0%
Total Road	100%	100%	100%

Table 3 - Share of fuels in road transport

Source: EUROSTAT

IV. The current use of alternative fuels in the transport sector

1. Electricity

1.1. Road

Electric vehicles have been identified as a key tool in achieving Hungary's targets on GHG mitigation, renewable energy and energy efficiency. Battery electric vehicles on tank-to wheel basis provide the only zero-emission alternative to conventional engines that have already penetrated the market. Furthermore, electric engines come nearly without noise pollution and are much more efficient than those using fossil fuels and need less maintenance thus result in lower operational costs. An additional benefit is that Hungary is less reliant on electricity import than on fossil fuels import.

Yet electric vehicles are still low in numbers mainly due to their higher price and lower range. On the other hand as technology is developing rapidly and as the above mentioned attributes improve, the number of electric vehicles is also growing rapidly. In Hungary, between 2016 and 2018, the number of electric vehicles more than doubled every year. The number of battery electric vehicles and plug-in hybrids are both increasing at a fast rate in numbers reaching 9240 in 2018, which is approximately 0.21% of the entire vehicle fleet of Hungary. 94% of these are passenger cars, but electric light commercial vehicles and buses also appeared. In 2018 the share of newly sold electric cars surpassed 1.5%.

In parallel with the vehicle fleet, the accompanying charging infrastructure has been also growing rapidly since the submission of the last NPF. Official data on the number of charging points is only available from 2017, but between 2017 and 2018 the number of charging points grew by nearly 14 times. Currently private charging infrastructure is not monitored.

The development of the electric vehicle fleet and the accompanying charging infrastructure has been sped up by a wide variety of policies and measures from tax incentives to direct financial support described in section V.

1.2. Rail

In rail transport, naturally electricity has a much higher penetration. In Hungary the length of electrified heavy railway lines is 3113 km. In addition light rail lines are electrified and have significant role in the urban transportation in Budapest and in some of the major cities in Hungary.

Altogether about 40% of the total railway network is electrified. As mainly the high frequency passenger and freight lines are electrified, the share in train kilometres is considerably higher. In 2018, electricity had a 70% share of the final energy consumption in rail transport.

Between 2016 and 2018, the number of electric locomotives did not change dramatically, the growth (from 658 to 672) was only 2%.

1.3. Water

Shore power or shore-supply is the provision of shore-side electrical power to a ship at berth while its main and auxiliary engines are shut down. In 2018 there were 28 shore-side electricity supply facilities in Hungary for inland waterway vessels.

Between 2016 and 2018, the number of electric inland waterway vessels increased by 1.5 times.

1.4. Air

Electricity supply for stationary airplanes relates to the use of electricity by aircraft while their generators or the auxiliary power units (APUs) are not running. This supply can be utilised during passenger embarking and disembarking, when the cabin lighting is required. The electricity can also be used to start the APU, which in turn provides electricity to start the aircraft's engines and generators. Currently there are 51 diesel ground power units (GPUs) and one electric. Moreover, all jetways of Liszt Ferenc International Airport have GPU electric connections.

Air transport is the biggest challenge for alternative fuels to conquer. Accordingly, there is only two electric airplane in Hungary.

Transport mode	AFVs	2016	2017	2018
Road	**Electric Vehicles, EV (total road)**	**1 817**	**4 619**	**9 400**
	Powered Two Wheelers (PTW)	121	142	160
	Electric Vehicles, EV (excl.PTW)	**1 696**	**4 477**	**9 240**
	Electric Passenger Cars (BEV+PHEV)	1 589	4 273	8 844
	• BEV	701	1 935	3 781
	• PHEV	888	2 338	5 063

Transport mode	AFVs	2016	2017	2018
	Electric Light Commercial Vehicles	83	179	372
	• BEV	83	179	372
	• PHEV	0	0	0
	Electric Heavy Commercial Vehicles	0	1	1
	• BEV	0	1	1
	• PHEV	0	0	0
	Electric Buses and Coaches	24	24	23
	• BEV	24	24	23
	• PHEV	0	0	0
Water	Inland Waterway Vessels	96	119	145
	Seagoing Ships	0	0	0
Air	Aircraft	0	1	2
Rail	Locomotives	658	675	672

Table 4 - Electric vehicles fleet (2016-2018)

Transport mode	AFI	2016	2017	2018
Road	**Recharging points (publicly accessible)**	**NE**	**48**	**671**
	Normal power recharging points, P ≤ 22kW (public)	NE	40	630
	High power recharging points, P > 22kW (public)	NE	8	41
	• AC fast charging, 22kW < P ≤ 43 kW (public)	NE	NE	NE
	• DC fast charging, P < 100 kW (public)	NE	NE	NE
	• DC ultrafast charging, P ≥ 100 kW (public)	NE	NE	NE
	Recharging points (private)	NE	NE	NE
Water	Shore-side electricity supply for seagoing ships in maritime ports	NA	NA	NA
	Shore-side electricity supply for inland waterway vessels in inland ports	28	28	28
Air	Electricity supply for stationary airplanes	46	49	52

Table 5 - Numbers of electric recharging points (2016-2018)

Source: Hungarian Energy and Public Utility Regulatory Authority

2. Natural gas

Compressed natural gas (CNG) and liquefied natural gas (LNG) offer an economic and environmentally friendly alternative to diesel and petrol. CNG is mostly used over short to medium distances while LNG - due to its much higher energy density - is suitable for use in long distance transport.

The number of CNG vehicles is still low, but has been growing smoothly since 2016 reaching 3200 in 2018. It is present in all segments of transportation from passenger cars to heavy duty vehicles. In bus transportation CNG is currently the most significant alternative fuel in Hungary. The number of refueling points reached 13 in 2018. 8 of these were deployed in Budapest, and the rest in other cities.

In comparison to CNG there was no LNG fuelled vehicle registered in Hungary in 2018. The first LCNG filling station has been constructed in 2019 at the crossroads of two TEN-T corridors. LNG can be an environmentally friendly alternative also in water transportation however currently there is no LNG-fueled ship registered in Hungary, nor any filling station. The spread of LNG use in the country is currently halted by the lack of LNG import capacities.

Transport mode	AFVs	2016	2017	2018
Road	**CNG Vehicles (total road)**	**2 682**	**3 043**	**3 233**
	Powered Two Wheelers	0	0	0
	CNG Vehicles (excl. PTW)	**2 682**	**3 043**	**3 233**
	CNG Passenger Cars	1 899	2 137	2 259
	CNG Light Commercial Vehicles	449	530	603
	CNG Heavy Commercial Vehicles	102	105	104
	CNG Buses and Coaches	232	271	267
Water	Inland Waterway Vessels	0	0	0
	Seagoing Ships	0	0	0
Air	Aircraft	0	0	0
Rail	Locomotives	0	0	0
Road	**LNG Vehicles (total road)**	**0**	**0**	**0**
	Powered Two Wheelers	**0**	**0**	**0**
	LNG Passenger Cars	0	0	0
	LNG Light Commercial Vehicles	0	0	0
	LNG Heavy Commercial Vehicles	0	0	0
	LNG Buses and Coaches	0	0	0
Water	LNG Inland Waterway Vessels	**0**	**0**	**0**
	LNG Seagoing Ships	0	0	0
Air	Aircraft	0	0	0
Rail	Locomotives	0	0	0

Transport mode	AFVs	2016	2017	2018
	Seagoing Ships	0	0	0
Air	Aircraft	0	0	0
Rail	Locomotives	0	0	0

Table 6 - Numbers of CNG and LNG vehicles (2016-2018)

Transport mode	AFI	2016	2017	2018
Road	**CNG refuelling points (total)**	**10**	**10**	**13**
	CNG refuelling points (public)	10	10	13
	CNG refuelling points (private fleet operators)	0	0	0
	LNG refuelling points (total)	**0**	**0**	**0**
	LNG refuelling points (public)	0	0	0
	LNG refuelling points (private fleet operators)	0	0	0
Water	Maritime Ports - LNG refuelling points	**NA**	**NA**	**NA**
	Inland Ports - LNG refuelling points	**0**	**0**	**0**

Table 7 - Numbers of CNG and LNG refuelling points (2016-2018)

Source: European Alternative Fuels Observatory

3. Hydrogen

While fuel cell electric vehicles (FCEVs) produce zero tailpipe emissions, they have most in common with the traditional internal combustion engine (ICE) vehicles in terms of range and refueling speed. Moreover, the tank-to-wheel efficiency of FCEVs is much better than ICEs. In spite of that, as of 2018, no fuel cell electric vehicles have been registered in Hungary, and no filling stations were deployed. This is mainly because such vehicles are still relatively recent products on the market with high costs and need further development.

Transport mode	AFVs	2016	2017	2018
Road	**Fuel Cell Vehicles, FCEV (total road)**	**0**	**0**	**0**
	Powered Two Wheelers	0	0	0
	Hydrogen Passenger Cars	0	0	0
	Hydrogen Light Commercial Vehicles	0	0	0
	Hydrogen Heavy Commercial Vehicles	0	0	0
	Hydrogen Buses and Coaches	0	0	0
Water	Inland Waterway Vessels	0	0	0
	Seagoing Ships	0	0	0
Air	Aircraft	0	0	0
Rail	Locomotives	0	0	0

Table 8 - Numbers of FCEVs (2016-2018)

Transport mode	AFI	2016	2017	2018
Road	**H2 refuelling points (total)**	**0**	**0**	**0**
	H2 refuelling points – 350 bar (total)	0	0	0
	H2 refuelling points – 350 bar (public)	0	0	0
	H2 refuelling points – 350 bar (private fleet operators)	0	0	0
	H2 refuelling points – 700 bar (total)	0	0	0
	H2 refuelling points – 700 bar (public)	0	0	0
	H2 refuelling points – 700 bar (private fleet operators)	0	0	0

Table 9 - Numbers of hydrogen refuelling points (2016-2018)

4. LPG

Though its share is stagnating, LPG is still the most commonly used alternative fossil fuel in Hungary, as more than 28 000 vehicles use it. Nearly all of these are passenger cars and light commercial vehicles.

Transport mode	AFVs	2016	2017	2018
Road	**LPG Vehicles (total road)**	**28 858**	**27 633**	**28 528**
	Powered Two Wheelers	**0**	**0**	**0**
	LPG Passenger Cars	27 907	26 780	27 642
	LPG Light Commercial Vehicles	944	848	881
	LPG Heavy Commercial Vehicles	5	4	5
	LPG Buses and Coaches	2	1	0
Water	Inland Waterway Vessels	0	0	0
	Seagoing Ships	0	0	0
Air	Aircraft	0	0	0
Rail	Locomotives	0	0	0

Table 10 - Numbers of LPG vehicles (2016-2018)

Transport mode	AFI	2016	2017	2018
Road	**LPG refuelling points (total)**	**600**	**561**	**529**
	LPG refuelling points (public)	600	561	529
	LPG refuelling points (private fleet operators)	0	0	0

Table 11 - Numbers of LPG refuelling points (2016-2018)

Source: European Alternative Fuels Observatory

5. Biofuels

Though the spread of electrification in transport is a key to decarbonize transportation, biofuels should maintain a large part of renewable energy in the transport sector. Biofuel technology is capable of decreasing the need for fossil fuels, while reducing greenhouse gas emissions. First generation biofuels are already largely available on the market. It is important for biofuels to be derived from a sustainable source, so in the long-term, advanced (second generation) biofuel could be the solution. Advanced biofuels offer clear advantage in terms of sustainability over conventional biofuels derived from food crops. Advanced biofuels could be made especially from algae, agricultural by-products and forestry waste, municipal solid waste, and grasses and trees that have been developed for this purpose. However advanced biofuels are in their early stages of development.

As for Hungary, a recently adopted regulation ensures that in 2020 the proportion of bio-components in fuels will increase to 8.2% (6.1% in petrol).

V. National targets and objectives

The NECP defined two scenarios:

- with existing measures (WEM)
- with additional measures (WAM)

The latter is supposed to reach the targets of the NECP on GHG emission reduction, renewables and energy efficiency as described in section I.3. Thus the WAM scenario presents lower values for non-renewable alternative fuels in most cases. The modelling was done using the TIMES model. Details on the modelling work can be found in Hungary's NECP.

Projections on fuel use, vehicle fleet and the targets on the accompanying infrastructure are based on this modelling exercise. Furthermore based on the received expertise from the KTI Institute for Transport Sciences[6] and due to the fact that the present report requires more detailed breakdown by technologies some adjustments were made. These adjustments do not affect the planned achievement of targets in the NECP.

1. Projection of energy consumption in the transport sector

In spite of the continuous improvement in energy efficiency of vehicles, the WEM scenario projects a considerable growth of energy consumption of the transport sector due to the rapid growth of demand for mobility.

[6] http://www.kti.hu/

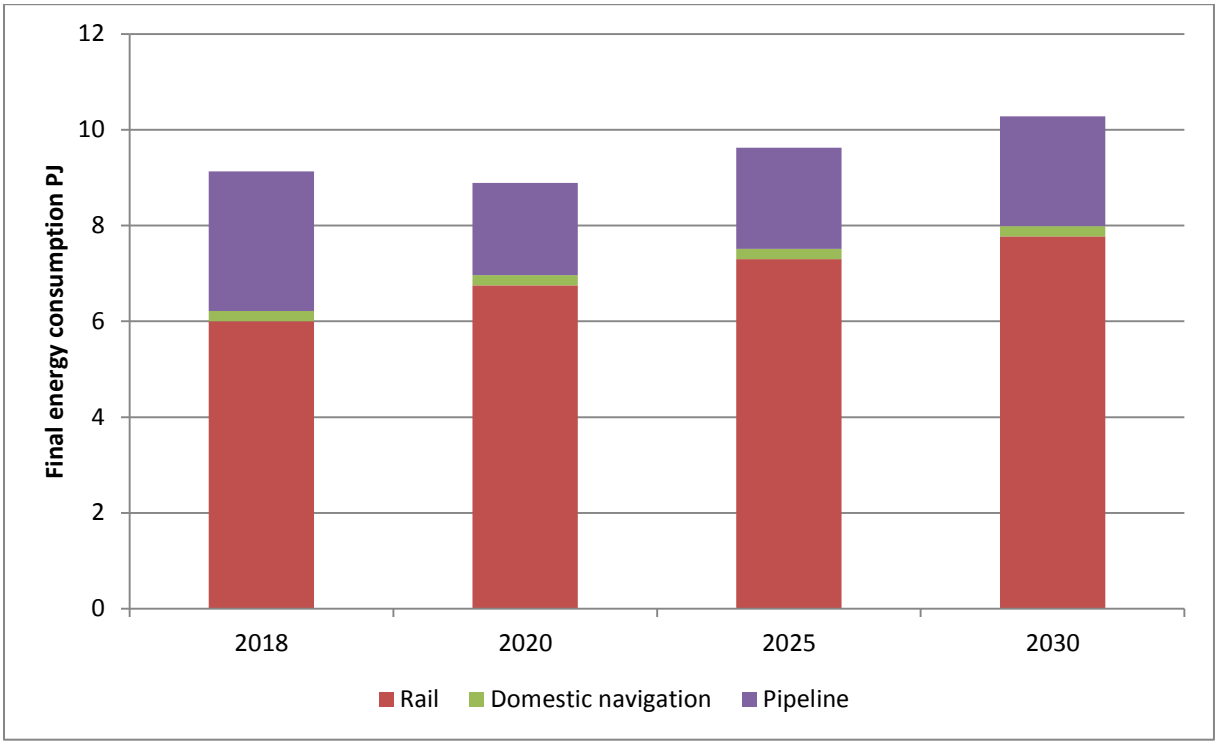

Figure 4 - Projected energy consumption by transport mode without road transport (WEM)

The shares of the differrent segments within road transportation also change. The consumption of cars slightly decreases partly due to the penetration of electric vehicles, while the consumption of light and heavy duty vehicles dramatically rises. The consumption by buses is projected to decrease due to the renewal of the fleet. About 30% of growth in the railway sector is expected, yet road transportation will continue to dominate in energy consumption. Energy consumption in the WAM scenario is only slightly lower.

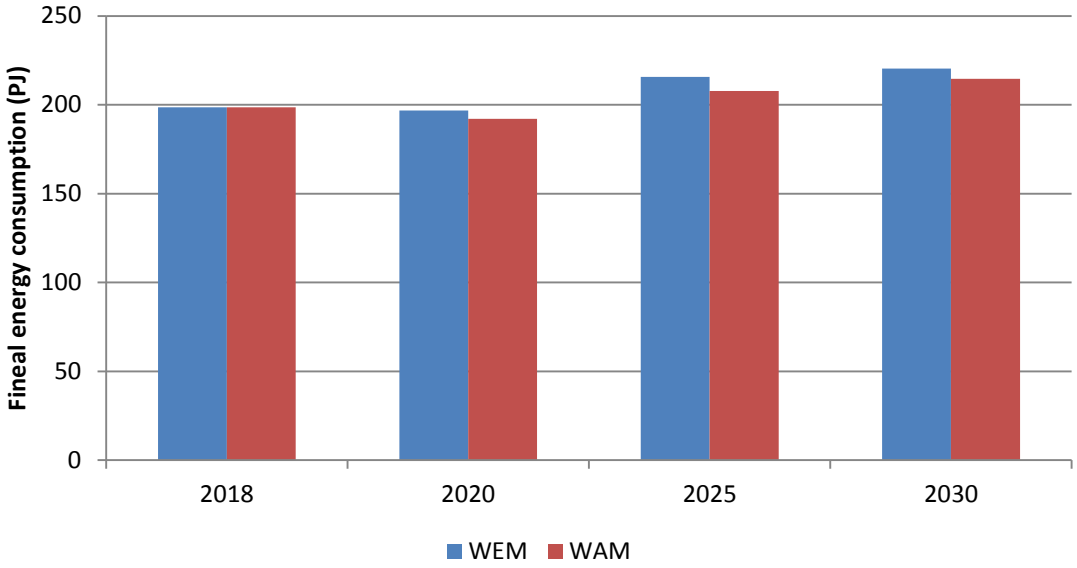

Figure 5 - Comparison of energy consumption in the WEM and the WAM scenarios[7]

Alternative fuels are only expected to have a significant share in road and rail transportation by 2030.

Electricity use in transport will increase by more than 200% in the WEM scenario and by 300% in the WAM and will become the most important alternative fuel in both scenarios. Yet even in the latter scenario, electricity will only represent 8.5% of final energy use of the transport sector. On the other hand, it is important to mention that due to the higher efficiency of electric engines electric vehicles will have a much higher share on vehicle kilometers basis. We expect that second generation biofuels will appear in 2025 and will start to replace first generation biofuels. In both scenarios hydrogen will appear in road transportation, but will not have a significant share in the examined period.

[7] Pipeline transportation not included

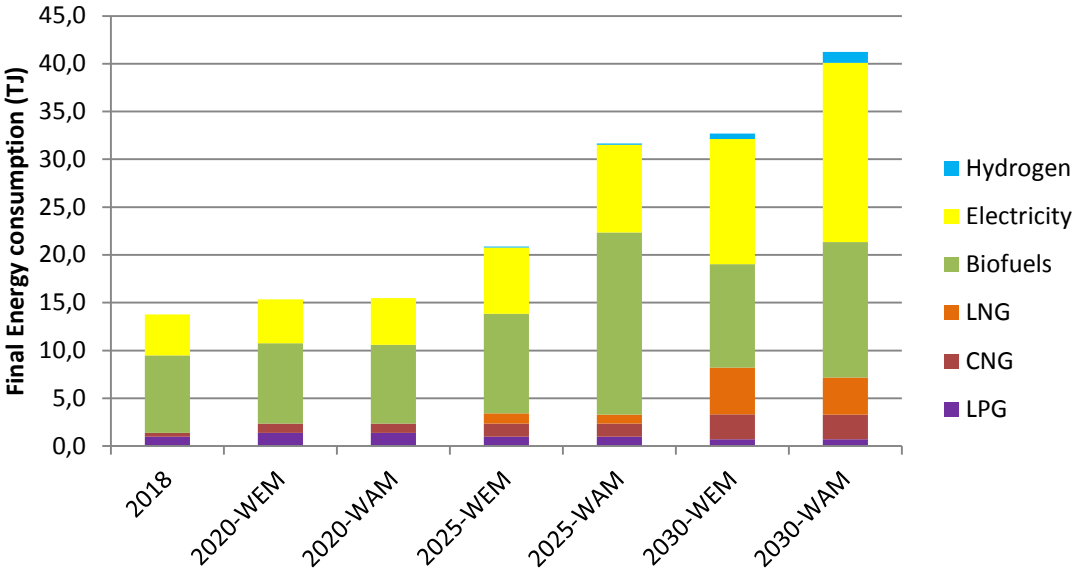

Figure 6 - Consumption of alternative fuels in the WEM and WAM scenarios

Natural gas use in road transportation will increase moderately but will remain marginal. LNG use is expected to appear after 2025 in long distance freight and passenger transport. LPG use on the other hand will slowly decrease.

		WEM			WAM		
	2018	2020	2025	2030	2020	2025	2030
Gasoline	30,9%	35,7%	31,8%	35,0%	34,1%	29,3%	33,2%
Diesel	64,2%	58,5%	60,1%	51,4%	60,0%	57,3%	49,5%
Electricity	0,1%	0,2%	1,4%	4,4%	0,2%	2,2%	6,5%
CNG	0,2%	0,5%	0,7%	1,2%	0,5%	0,7%	1,2%
LNG	0,0%	0,0%	0,5%	2,3%	0,0%	0,5%	1,9%
Hydrogen	0,0%	0,0%	0,0%	0,3%	0,0%	0,1%	0,6%
LPG	0,5%	0,7%	0,5%	0,3%	0,7%	0,5%	0,3%
Biofuels	4,2%	4,4%	5,0%	5,1%	4,5%	9,5%	6,8%
Total Road	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 12 - Share of fuels in road energy consumption in the WEM and WAM scenarios

In other segments than road transportation by 2030, we do not expect any alternative fuels to be used in significant amounts other than electricity in rail transport. In case of inland navigation, LNG use is going to appear, but not in a considerable amount.

2. Projections by technology

2.1. Electricity

In **road transportation,** as the price of batteries will continue to decrease and their capacities increase a massive growth in electric vehicles demand can be predicted for the forthcoming years. Already a wide range of policies and measures support the spread of electric vehicles, but additional ones are also being planned in accordance with Jedlik Ányos Plan to improve the process. In the WEM scenario, the number of electric vehicles in 2030 will reach 420 000 while in the WAM it will surpass half a million.

The highest penetration is expected in case of passenger cars and urban bus transport, yet electrification will increase in other segments as well. Between 2018 and 2030, the number of electric passenger cars will increase by 36 times in the WEM scenario, and by more than 45 times in the WAM scenario. Currently electric passenger cars make up the bulk of the stock of electric road vehicles (94% in 2018), but the share of these vehicles will decrease from 94% to 74%. The numbers of PHEV passenger cars will continue to dominate amongst electric vehicles.

The number of electric buses will grow rapidly as just in the framework of the Green Bus Program, 897 buses will be replaced with electric ones, which is 31% of the current fleet used in urban public transportation.

Both in the WEM and the WAM scenarios, the number of powered two wheelers will also increase by 60 times between 2018 and 2030, reaching approximately 30 000 vehicles.

In addition, we can also expect a significant growth in the number of light commercial electric vehicles due to the growing number of available models. In the WAM scenario, the number of light commercial electric vehicles is predicted to exceed 80 000 units by 2030, which is 20 000 more than the value predicted in the WEM scenario. So, in 2030, the share of this category will represent 14% and 15% of the overall electric vehicles fleet in the WAM and WEM scenarios respectively.

Long-distance freight travel is the biggest challenge for the electrification of road transport, thus we expect the share of electric vehicles in this segment will be marginal for the major part of the decade. On the other hand, we expect fast increase in the fleet after 2025 reaching 9000 units in the WEM scenario, and 16 000 in the WAM scenario.

The accompanying charger infrastructure will also grow rapidly reaching 35 000 in the WEM and 53 000 in the WAM. The share of high power recharging points will also increase from 17% to around 25% in both scenarios. The share of the different technologies among high power chargers was not estimated.

According to the current plans the length of electrified heavy **rail** lines will increase by 273 km by 2030. Extensions of urban lines are also planned. No significant change is expected in the outlook period in the number of electric locomotives.

In **inland navigation** by 2030, the number of electric vessels can reach 450. Concerning the projections, there is no difference between the WEM scenario and the WAM scenario.

The number of shore-side electricity supply points in inland ports will increase from 28 to 36 by 2020.

Transport mode	AFVs		WEM			WAM		
		2018	2020	2025	2030	2020	2025	2030
Road	**Electric Vehicles, EV (total road)**	**9 400**	**24 260**	**203 700**	**419 800**	**24 270**	**299 100**	**533 000**
	Powered Two Wheelers (PTW)	160	1 000	10 000	30 000	1 000	10 000	30 000
	Electric Vehicles, EV (excl.PTW)	**9 240**	**23 260**	**193 700**	**389 800**	**23 270**	**289 100**	**503 000**
	Electric Passenger Cars (BEV+PHEV)	8 844	22 000	185 000	320 000	22 000	280 000	405 000
	• BEV	3 781	7 000	70 000	135 000	7 000	90 000	165 000
	• PHEV	5 063	15 000	115 000	185 000	15 000	190 000	240 000
	Electric Light Commercial Vehicles	372	1 200	8 000	60 000	1 200	8 000	80 000
	• BEV	372	1 000	4 000	30 000	1 000	4 000	40 000
	• PHEV	0	200	40 00	30 000	200	4 000	40 000
	Electric Heavy Commercial Vehicles	1	10	200	8 500	10	200	16 000
	• BEV	1	10	200	8 500	10	200	16 000
	• PHEV	0	0	0	0	0	0	0
	Electric Buses and Coaches	23	50	500	1 300	60	900	2 000
	• BEV	23	50	500	1 300	60	900	2 000
	• PHEV	0	0	0	0	0	0	0
Water	Inland Waterway Vessels	145	210	330	450	210	330	450
	Seagoing Ships	0	0	0	0	0	0	0
Air	Aircraft	2	3	3	3	3	3	3
Rail	Locomotives	672	680	673	663	680	673	663

Table 13 - Electric vehicles fleet in the WEM and WAM scenarios (2018-2030)

Transport mode	AFI		WEM			WAM		
		2 018	2 020	2 025	2 030	2020	2025	2030
Road	**Total recharging points (public* + private)**	**572**	**1 500**	**14 600**	**35 000**	**1 500**	**23 000**	**53 300**
	Recharging points (publicly accessible)	**572**	**1 500**	**14 600**	**35 000**	**1 500**	**23 000**	**53 300**
	Normal power recharging points, P ≤ 22kW (public)	508	1 300	12 100	26 200	1 300	19 100	40 000
	High power recharging points, P > 22kW (public)	64	200	2 500	8 800	200	3 900	13 300
	• AC fast charging, 22kW < P ≤ 43 kW (public)	NE	NE	NE	NE	NE	NE	NE
	• DC fast charging, P < 100 kW (public)	NE	NE	NE	NE	NE	NE	NE
	• DC ultrafast charging, P ≥ 100 kW (public)	NE	NE	NE	NE	NE	NE	NE
	Recharging points (private)	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
Water	Shore-side electricity supply for seagoing ships in maritime ports	NA	NA	NA	NA	NA	NA	NA
	Shore-side electricity supply for inland waterway vessels in inland ports	28	36	36	36	36	36	36
Air	Electricity supply for stationary airplanes	52	NE	NE	NE	NE	NE	NE

Table 14 - Targets on electric recharging points in the WEM and WAM scenario 2020-2030

2.2. Natural gas

According to our expectations, in the WEM scenario the number of CNG vehicles will continuously increase to 39 576 by 2030 and slightly less (38763) in the WAM. Growth is expected mainly for cars. A small increase is expected in the number of CNG buses compared to 2018, but after 1 January 2022[8] their numbers are possibly going to shrink, because after this point, only electric buses used in urban transportation will be eligible for support in the Green Bus Program.

[8] The revision of the Program is being considered to exclude CNG and Euro 6 diesel buses.

In the future, LNG can play a role manly in long distance freight and to a lesser extent in passenger transport if the supply problems are solved and the price of these vehicles decreases. A planned LNG terminal in Croatia and the expansion of a functioning one in Poland can help to solve supply problems.

In the WEM scenario we expect that the number of LNG heavy duty vehicles will reach 8153 and 6480 in the WAM scenario in 2030. LNG demand in the WEM scenario on the two TEN-t corridors in Hungary can be covered with approximately 40 refueling points and with 30 in the WAM.

			WEM			WAM		
Transport mode	**AFVs**	**2018**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
Road	**CNG Vehicles (total road)**	**3 233**	**7 000**	**15 100**	**40 000**	**7 100**	**14 134**	**39 000**
	Powered Two Wheelers	0	0	0	0	0	0	0
	CNG Vehicles (excl. PTW)	**3 233**	**7 000**	**15 100**	**40 000**	**7 100**	**14 134**	**39 000**
	CNG Passenger Cars	2 259	6 000	14 000	39 000	6 000	13 000	38 000
	CNG Light Commercial Vehicles	603	600	700	700	700	700	700
	CNG Heavy Commercial Vehicles	104	100	100	100	100	134	100
	CNG Buses and Coaches	267	300	300	200	300	300	200
Water	Inland Waterway Vessels	0	0	0	0	0	0	0
	Seagoing Ships	0	0	0	0	0	0	**0**
Air	Aircraft	0	0	0	0	0	0	0
Rail	Locomotives	0	0	0	0	0	0	0
Road	**LNG Vehicles (total road)**	**0**	**0**	**2 020**	**8 030**	**0**	**2 020**	**6 030**
	Powered Two Wheelers	0	0	0	0	0	0	0
	LNG Passenger Cars	0	0	0	0	0	0	0

Transport mode	AFVs	2018	WEM			WAM		
			2020	2025	2030	2020	2025	2030
	LNG Light Commercial Vehicles	0	0	0	0	0	0	0
	LNG Heavy Commercial Vehicles	0	0	2 000	8 000	0	2 000	6 000
	LNG Buses and Coaches	0	0	20	30	0	20	30
Water	LNG Inland Waterway Vessels	0	0	1	1	0	1	1
	LNG Seagoing Ships	0	0	0	0	0	0	0
Air	Aircraft	0	0	0	0	0	0	0
Rail	Locomotives	0	0	0	0	0	0	0

Table 15 –CNG and LNG fleet in the WEM and WAM scenarios (2018-2030)

Transport mode	AFI	2018	WEM			WAM		
			2020	2025	2030	2020	2025	2030
Road	**CNG refuelling points (total)**	**13**	**12**	**25**	**66**	**12**	**24**	**65**
	CNG refuelling points (public)	13	12	25	66	12	24	65
	CNG refuelling points (private fleet operators)	0	0	0	0	0	0	0
	LNG refuelling points (total)	**0**	**1**	**15**	**40**	**1**	**15**	**30**
	LNG refuelling points (public)	0	1	15	40	1	15	30
	LNG refuelling points (private fleet operators)	0	0	0	**0**	0	0	0
Water	Maritime Ports - LNG refuelling points	NA	NA	NA	NA	NA	NA	NA
	Inland Ports - LNG refuelling points	**0**	**1**	**9**	**10**	**1**	**9**	**10**

Table 16 - Targets on CNG and LNG refuelling points in the WEM and WAM scenarios (2020-2030)

2.3. Hydrogen

Hungary will continuously monitor the development of fuel cell technology. The future of hydrogen fuel cell vehicles strongly depends on the economical factor. If this technology

becomes economical, the Hungarian government will facilitate its spread. According to our projection, hydrogen use may appear in the second half of the decade and will probably penetrate the long distance freight segment the most. In the WEM scenario, we expect that the number of FCEVs at the end of the decade will reach 1460 and 2900 in the WAM. 26 and 37 refueling points will be needed respectively to satisfy the demand for fuel.

Transport mode	AFVs		WEM			WAM		
		2018	2020	2025	2030	2020	2025	2030
Road	**Fuel Cell Vehicles, FCEV (total road)**	**0**	**0**	**330**	**1460**	**0**	**540**	**2900**
	Powered Two Wheelers	0	0	0	0	0	0	0
	Hydrogen Passenger Cars	0	0	200	700	0	300	1400
	Hydrogen Light Commercial Vehicles	0	0	60	200	0	100	400
	Hydrogen Heavy Commercial Vehicles	0	0	50	500	0	100	1 000
	Hydrogen Buses and Coaches	0	0	20	60	0	40	100
Water	Inland Waterway Vessels	0	0	0	0	0	0	0
	Seagoing Ships	0	0	0	0	0	0	0
Air	Aircraft	0	0	0	0	0	0	0
Rail	Locomotives	0	0	0	0	0	0	0

Table 17 Table – FCEVs fleet in the WEM and WAM scenarios (2018-2030)

Transport mode	AFI		WEM			WAM		
		2018	2020	2025	2030	2020	2025	2030
Road	**H2 refuelling points (total)**	**0**	**0**	**6**	**26**	**0**	**10**	**37**
	H2 refuelling points – 350 bar (total)	0	0	4	17	0	7	24
	H2 refuelling points – 350 bar (public)	0	0	4	17	0	7	24
	H2 refuelling points – 350 bar (private fleet	0	0	0	0	0	0	0

Transport mode	AFI		WEM			WAM		
		2018	2020	2025	2030	2020	2025	2030
	operators)							
	H2 refuelling points – 700 bar (total)	0	0	2	9	0	3	13
	H2 refuelling points – 700 bar (public)	0	0	2	9	0	3	13
	H2 refuelling points – 700 bar (private fleet operators)	0	0	0	0	0	0	0

Table 18 - Targets on hydrogen refuelling points

2.4. LPG

Financial support of LPG use is not foreseen, thus as other alternative technologies with lower emission become more economical and the LPG fleet is expected to decrease by half until 2030 in both scenarios.

Transport mode	AFVs		WEM			WAM		
		2018	2020	2025	2030	2020	2025	2030
Road	**LPG Vehicles (total road)**	**28 528**	**26 000**	**19 000**	**14 000**	**26 000**	**19 000**	**14 000**
	Powered Two Wheelers	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	LPG Passenger Cars	27 642	26 000	19 000	14 000	26 000	19 000	14 000
	LPG Light Commercial Vehicles	881	0	0	0	0	0	0
	LPG Heavy Commercial Vehicles	5	0	0	0	0	0	0
	LPG Buses and Coaches	0	0	0	0	0	0	0
Water	Inland Waterway Vessels	0	0	0	0	0	0	0
	Seagoing Ships	0	0	0	0	0	0	0
Air	Aircraft	0	0	0	0	0	0	0
Rail	Locomotives	0	0	0	0	0	0	0

Table 19 -LPG vehicles fleet in the WEM and WAM scenarios (2018-2030)

Transport mode	AFI		WEM			WAM		
		2018	2020	2025	2030	2020	2025	2030
Road	**LPG refuelling points (total)**	**529**	**529**	**500**	**460**	**529**	**500**	**460**
	LPG refuelling points (public)	529	529	500	460	529	500	460
	LPG refuelling points (private fleet operators)	NE	NE	NE	NE	NE	NE	NE

Table 20 - LPG refueling point in the WEM and WAM scenarios (2018-2030)

2.5. Biofuels

Hungary intends to encourage both the consumption and the domestic production of advanced (second generation) biofuels in the framework of the "transport greening" program. Hungary will investigate the possible policies and measures. Successful domestic production of second generation fuels can make a significant contribution to our GHG targets. Another advantage is that indigenously produced biofuels can displace imported fossil fuel, while increasing the security of energy supply.

Taking into account the multiplicators of the renewable energy directive advanced biofuels will account for 45% of the transport sector's renewable energy consumption in 2030 while first-generation biofuels (including used cooking oil) will have a share of 20%. Second-generation biofuels are expected to play a key role in Hungary in the mid-2020s.

3. Alternative fuels development

The following two tables show the past and expected ratio of alternative fuel vehicles and alternative fuel refuelling points.

	2016			2017			2018		
	Supply	Demand	Ratio	Supply	Demand	Ratio	Supply	Demand	Ratio
Electricity	NE	1817	NE	48	4619	96	671	9400	14
CNG (incl. Biomethane)	10	2682	268	10	3043	304	13	3233	249
LNG (incl. Biomethane)	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0
LPG	600	28858	48	561	27633	49	529	28528	54

Table 21 - Alternative fuel vehicles per refuelling points (2016-2018)

		2020			2025			2030		
		Supply	Demand	Ratio	Supply	Demand	Ratio	Supply	Demand	Ratio
WEM	Electricity	1500	24260	16	14600	203700	14	35000	419800	12
	CNG (incl. Biomethane)	12	7000	598	25	15100	612	66	40000	606
	LNG (incl. Biomethane)	1	0	0	15	2020	135	40	8030	201
	Hydrogen	0	0	0	6	330	55	26	1460	56
	LPG	529	26000	49	500	19000	38	460	14000	30
WAM	Electricity	1500	24270	16	23000	299100	13	53300	533000	10
	CNG (incl. Biomethane)	12	7100	617	24	14134	590	65	39000	604
	LNG (incl. Biomethane)	1	0	0	15	2020	135	30	6030	201
	Hydrogen	0	0	0	10	540	54	37	2900	78
	LPG	529	26000	49	500	19000	38	460	14000	30

Table 22 - Alternative fuel vehicles per refuelling points in the WEM and WAM scenarios (2020-2030)

VI. Existing and planned policies and measures

The tables below summarize policies and measures of 4 types[9]:

1) Legal (Legislative & Regulatory) measures.
2) Policy measures: measures to ensure national targets and objectives.
3) Deployment and manufacturing supports.
4) Research, technological development and demonstration (RTD&D).

[9] The budgets of the policies are presented in EUR using average annual excehange rates (Eurostat) as follows:

2016: 311,44 HUF/EUR

2017: 309,19 HUF/EUR

2018: 318,89 HUF/EUR

Future estimated budget: 335,93 HUF/EUR (exchange rate on 03.10.2020, Hungarian National Bank)

1. Legal measures

No.	Denomination	Details	
1	Raising the blend rate of biofuels	**DESCRIPTION**	According to Government Decree 186/2019 (VII.26) the mandatory blend rate of biofuels will be raised from 6.4% to 8.4% from 2020.
		AF FIELD	AF
		ALTERNATIVE FUEL	Biofuel
		TYPE	Norms & Requirements
		TRANSPORT MODE	Road
		APPLICATION LEVEL	National
		START YEAR	2020
		STOP YEAR	-
		OBSERVATIONS	
2	Bill on Electromobility (in Act I. of 1988 on Road Transport) (in Act I. of 1988 on Road Transport)	**DESCRIPTION**	The Bill on Electromobility intends to organize an already existing, fast-moving but disorderly exercised practice for electric cars by introducing a regulation on electromobility services. The draft aims to clarify the concept of electromobility service and related licensing, reporting obligation, and reporting rules. The implementing regulation, which is under preparation, will complement the Bill on Electromobility with detailed arrangements and procedures.
		AF FIELD	Combination
		ALTERNATIVE FUEL	Electricity
		TYPE	Norms & Requirements
		TRANSPORT MODE	Road
		APPLICATION LEVEL	National
		START YEAR	2019
		STOP YEAR	-
		OBSERVATIONS	
3	Green licence plate	**DESCRIPTION**	According to Government decree 326/2011. (XII. 28.) light green licence plates are issued for environmentally friendly vehicles. Environmentally friendly vehicles are zero emission vehicles and electric vehicles that comply with requirements on range. Apart from tax allowances presented in line 6 vehicles with green licence plates are exempted from parking fees. Furthermore, green licence plates help raise awareness.
		AF FIELD	AFV
		ALTERNATIVE FUEL	Combination
		TYPE	Permits
		TRANSPORT MODE	Road
		APPLICATION LEVEL	National
		START YEAR	2015
		STOP YEAR	-
		OBSERVATIONS	

No.	Denomination	Details	
4	Settlement planning and construction requirements related to electric charging infrastructure	**DESCRIPTION**	Government Decree 253/1997. (XII. 20.) on national settlement planning and construction requirements ensures that it is obligatory to consider aspects that help electric mobility to spread in residential environments. It sets the requirements on electric infrastructure deployment for certain car parks.
		AF FIELD	AFI
		ALTERNATIVE FUEL	Electricity
		TYPE	Norms & Requirements
		TRANSPORT MODE	Road
		APPLICATION LEVEL	National
		START YEAR	2016
		STOP YEAR	-
		OBSERVATIONS	
5	Government Decree 243/2019. (X. 22.) on certain issues of electric mobility service	**DESCRIPTION**	Government Decree 243/2019. (X. 22.) sets detailed rules on electric mobility services including permits, pricing rules, data reporting etc.
		AF FIELD	AF
		ALTERNATIVE FUEL	Electricity
		TYPE	Norms & Requirements
		TRANSPORT MODE	Road
		APPLICATION LEVEL	National
		START YEAR	2019
		STOP YEAR	-
		OBSERVATIONS	In Hungarian: http://njt.hu/cgi_bin/njt_doc.cgi?docid=216266.373513
6	Creating more favourable rules for LNG use in inland water transportation (Planned)	**DESCRIPTION**	Amending rules on establishing, operating and decommissioning of port and ferry crossings (Government Decree 510/2017 (XII. 29.)) to create more favourable rules for LNG infrastructure development used in inland water transportation.
		AF FIELD	AFI
		ALTERNATIVE FUEL	Combination
		TYPE	Norms & Requirements
		TRANSPORT MODE	Water
		APPLICATION LEVEL	National
		START YEAR	2020
		STOP YEAR	-
		OBSERVATIONS	
6	Incentivizing the indigenous production of advanced biofuels (Planned)	**DESCRIPTION**	Hungary intends to encourage both the consumption and the domestic production of advanced (second generation) biofuels in the framework of the "transport greening" program. Hungary will investigate the possible policies and measures.
		AF FIELD	AFI

No.	Denomination	Details	
		ALTERNATIVE FUEL	Biofuels
		TYPE	Norms & Requirements
		TRANSPORT MODE	Road
		APPLICATION LEVEL	National
		START YEAR	-
		STOP YEAR	-
		OBSERVATIONS	

Table 23 - Legislative & Regulatory measures

1. Policy measures

No.	Denomination	Details		
Category 1: M1 - Measures to ensure national targets and objectives				
M1.1	**Jedlik Ányos Plan 2.0**	**DESCRIPTION**		Jedlik Ányos Plan is the main policy document in Hungary on the promotion of electric mobility. The first version of the plan was published in 2015. Jedlik Ányos Plan 2.0 has been adopted in 2019. The plan determines goals, policies and measures on the following fields: formation of detailed market model; charging infrastructure development; promotion of electric vehicles; deploying charging infrastructure and expanding the electric vehicle fleet of the central and local governments; decarbonisation of public transportation and development of electric buses; energy production of local governments and development of smart grid solutions; utilising the cost reduction possibilities in charging; awareness-raising related to electric mobility. [10]
		AF FIELD		Combination
		TYPE		Other
		INDICATOR		
		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	-
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	2020	-
			2021-2025	-
			2026-2030	-
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2019
		Stop Year		2030

[10] Available in Hungarian: https://www.kormany.hu/download/f/a9/a1000/Hazai%20elektromobilit%C3%A1si%20strat%C3%A9gia.pdf

M1.2	**Financial support for buying electric vehicles**	**DESCRIPTION**		Financial support for individuals and enterprises for buying electric cars and light duty vehicles under 3,5 t. The support cannot exceed 21% of the purchasing price of the vehicle or 1.5 million HUF. The purchase price of the vehicle cannot exceed 20 million HUF. The scheme is being redesigned to favor BEVs with lower prices and the inclusion of additional funds is also considered.
		AF FIELD		AFV
		TYPE		Financial incentives
		INDICATOR		Subsidies
		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	6 422
			2017	7 438
			2018	16 620
			2019	9 222
		FUTURE ESTIMATED BUDGET [k€]	2020	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2016
		Stop Year		-
M1.3	**Public procurement of electric vehicles and deployment of chargers**	**DESCRIPTION**		Public procurement of electric cars and light duty vehicles by the institutions of the central government.
		AF FIELD		AFV
		TYPE		Financial incentives
		INDICATOR		Public procurement incentives
		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	4487
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	2020	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2017
		Stop Year		2017

M1.4	**Support to lease electric cars and light commercial vehicles**	**DESCRIPTION**		Non-refundable grant to privately held companies to lease 200 electric cars and light commercial vehicles.
		AF FIELD		AFV
		TYPE		Financial incentives
		INDICATOR		Subsidies
		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	-
			2018	471
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	2020	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2017
		Stop Year		2017
M1.5	**Supporting the organization of the European Mobility Week and Car Free Weekend in a form of non-refundable grant**	**DESCRIPTION**		Environmental awareness-raising campaign focusing on transport. Support for municipalities and organisations owned by municipalities to cover the costs related to the European Mobility Week and the Car Free Day.
		AF FIELD		Combination
		TYPE		Education / Information
		INDICATOR		
		ALTERNATIVE FUEL		Combination
		TRANSPORT MODE		Combination
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	151
			2018	439
			2019	554
		FUTURE ESTIMATED BUDGET [k€]	2020	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2017
		Stop Year		-

M1.6	**Support for acquiring electric cars and deploying charging infrastructure based on case by case decision**	**DESCRIPTION**		Financial support for acquiring electric cars and deploying charging infrastructure based on case by case decision for churches, civil society organisations and municipal associations.
		AF FIELD		Combination
		TYPE		Financial incentives
		INDICATOR		Subsidies
		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	-
			2018	-
			2019	3576
		FUTURE ESTIMATED BUDGET [k€]	2020	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2019
		Stop Year		2019
M1.7	**Usage-based road toll for heavy duty vehicles**	**DESCRIPTION**		Vehicles above 3.5 tonnes are obliged to pay a usage-based road toll. The amount to be paid depends on the vehicle's number of axes and on environmental performance (Euro norm). It gives incentive for better organisation of freight delivery, better use of payload capacity and for using vehicles with lower emission.
		AF FIELD		AFV
		TYPE		Financial incentives
		INDICATOR		Charges / fees
		ALTERNATIVE FUEL		Combination
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	-
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	2020	-
			2021-2025	-
			2026-2030	-
		TOTAL ESTIMATED BUDGET [k€]		-
		Start Year		2013
		Stop Year		-

M1.8	**Tax allowances for environmentally friendly vehicles**	**DESCRIPTION**		Fully electric, partially electric plug-in cars and zero-emission cars are exempt from motor vehicle tax, company car tax and registration tax. Moreover, for buses, lorries and trucks the rate of the motor vehicle tax is dependent on the environmental classification of the vehicle. Trucks also receive tax allowance for using combined transportation. The rate of company car tax and registration tax also depends on the environmental classification of the vehicle.
		AF FIELD		AFV
		TYPE		Financial incentives
		INDICATOR		Taxes reduction / exemption
		ALTERNATIVE FUEL		Combination
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	-
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	2020	-
			2021-2025	-
			2026-2030	-
		TOTAL ESTIMATED BUDGET [k€]		-
		Start Year		2016
		Stop Year		-
Category 2: M2 - Measures that can promote AFI in public transport services				
M2.1	**Green Bus Programme**	**DESCRIPTION**		The replacement of 1290 buses with EURO6 (294), CNG fuelled (99) and electric ones (897) in 9 years. The central government provides a maximum 20% subsidy for local governments and public transport companies on the purchase price of these buses. Promotion of the accompanying charger infrastructure in case of electric buses. [11]Revision of the Program is being considered to exlcude Euro6 and CNG buses.
		AF FIELD		Combination
		TYPE		-
		INDICATOR		-

[11] Alternative fuels affected: CNG, Electricity;
The amount of subsidy provided by the central government is 36 bn HUF the total investment cost is 175 bn HUF.

		ALTERNATIVE FUEL		Combination
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	-
			2017	-
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	2020	-
			2021-2025	-
			2026-2030	-
		TOTAL ESTIMATED BUDGET [k€]		107 165
		Start Year		2020
		Stop Year		2029
M2.2	**Promotion of LNG use for shipping on road and water (Planned)**	**DESCRIPTION**		LNG due to its high energy density can be a viable alternative fuel for heavy duty vehicles and for transportation on water.
		AF FIELD		AF
		TYPE		
		INDICATOR		
		ALTERNATIVE FUEL		LNG (incl. Biomethane)
		TRANSPORT MODE		Combination
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	2016	
			2017	
			2018	
			2019	
		FUTURE ESTIMATED BUDGET [k€]	2020	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		
		Stop Year		

Table 24 - Policy measures

2. Deployment and manufacturing support

No.	Denomination	Details	
1	**Electric Charging Stations Sub-Program for Municipalities**	**DESCRIPTION**	It contributes to the development of electromobility in a form of providing incentives for municipalities to develop electric charging stations. 49 chargers were installed within the Framework of the program.
		AF FIELD	AFI

		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	**2016**	4 013
			2017	-
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	**2020**	-
			2021-2025	-
			2026-2030	-
		TOTAL ESTIMATED BUDGET [k€]		4 013
		Start Year		2016
		Stop Year		2016
1	**Support for public transportation company to deploy fast chargers**	**DESCRIPTION**		Non-refundable grant was given to the state-owned bus company to support the deployment of fast chargers.
		AF FIELD		AFI
		ALTERNATIVE FUEL		Electricity
		TRANSPORT MODE		Road
		APPLICATION LEVEL		National
		CURRENT AND PAST ANNUAL BUDGET [k€]	**2016**	-
			2017	48
			2018	-
			2019	-
		FUTURE ESTIMATED BUDGET [k€]	**2020**	-
			2021-2025	-
			2026-2030	-
		TOTAL ESTIMATED BUDGET [k€]		48
		Start Year		2017
		Stop Year		2017

Table 25 - Deployment and manufacturing support

3. Research, technological development and demonstration (RTD&D)

No.	Denomination	Details		
1	PAN-LNG-4-DANUBE project	**DESCRIPTION**		The overall objective of the Action financed from Connecting Europe Facility (CEF) is to foster LNG use in inland navigation sector across the Danube. The Action, including a study and a real-life pilot deployment, is implemented in the Core Port of Csepel-Freeport, in the southern part of Budapest on the Rhine-Danube Core Network Corridor. 1) The first specific objective is to understand all necessary technical, economic and customer-related requirements. 2) Another objective is to build experience through two pilots: one pilot for the innovative LNG bunkering and refuelling station for vessels and trucks in the Freeport of Csepel, and one pilot to retrofit and operate a freight vessel with LNG propulsion. [12]
		AF FIELD		Combination
		ALTERNATIVE FUEL		LNG (incl. Biomethane)
		TRANSPORT MODE		Water
		CURRENT AND PAST ANNUAL BUDGET [k€]	**2016**	
			2017	
			2018	
			2019	
		FUTURE ESTIMATED BUDGET [k€]	**2020**	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		
		Start Year		2016
		Stop Year		2021
		TOTAL ESTIMATED BUDGET [k€]		12000
		Start Year		2021
		Stop Year		2023
2	CNG Clean Fuel Box Project	**DESCRIPTION**		The Action financed from Connecting Europe Facility (CEF) was a market deployment pilot of an innovative CNG refuelling network that would have been implemented in Hungary along two transport Core Network Corridors (Mediterranean and Orient/East-Med). The objective of the Action was to develop CNG availability and use at country level. This would have been achieved through the deployment of Clean Fuel Box (CFB) refuelling network solution, a CNG self-service station network able to refill CNG vehicles independently of the gas distribution network based on a 24/7 service.[13] The project has only been implemented partially.
		AF FIELD		Combination

[12] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2014-hu-tmc-0629-m

[13] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2015-hu-tm-0315-m

		ALTERNATIVE FUEL		CNG (incl. Biomethane)
		TRANSPORT MODE		Road
		CURRENT AND PAST ANNUAL BUDGET [k€]	**2016**	
			2017	
			2018	
			2019	
		FUTURE ESTIMATED BUDGET [k€]	**2020**	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		1957,7
		Start Year		2016
		Stop Year		2018
3	**PAN-LNG Project**	**DESCRIPTION**		The Action financed from Connecting Europe Facility (CEF) aimed at fostering the use of LNG/LCNG across Europe and the development of a mid to long-term strategy for the use of natural and bio-gas in the road transportation in Hungary. The project plan included studies, works and pilot deployment for: 1) five LNG/LCNG filling stations to deliver LNG as a replacement for diesel for heavy duty vehicles (HDV) and 2) a Small Scale pilot liquefaction plant, to develop the most advanced long term solution for the LNG supply, based on fossil gas wells and on biogas sources. [14] The project has only been implemented partially.
		AF FIELD		Combination
		ALTERNATIVE FUEL		LNG (incl. Biomethane)
		TRANSPORT MODE		Road
		CURRENT AND PAST ANNUAL BUDGET [k€]	**2016**	2262,9
			2017	
			2018	9,5
			2019	
		FUTURE ESTIMATED BUDGET [k€]	**2020**	
			2021-2025	
			2026-2030	
		TOTAL ESTIMATED BUDGET [k€]		2272,3
		Start Year		2015
		Stop Year		2018

Table 26 - Research, technological development and demonstration (RTD&D)

[14] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2014-hu-tmc-0629-m

VII. Financial resources

Hungary's revenues associated with the auctioning of emission allowances (EUA) under the EU Emission Trading System support the Green Economy Financing Scheme. Currently half of the funds of the Green Economy Financing Scheme is spent on the promotion of electric mobility.

For developing the necessary electric charging infrastructure in the transport sector, for developing second-generation biofuels, for promoting alternative-road freight transport, and for the replacement of the postal or other (public) services fleet with clean vehicles, non-refundable supports to be granted within the relevant operational programs of the 2021-27 programming period may be considered. Market-based loans and loans from the European Investment Bank can also finance both the electrification of the transport sector and the development of the connected infrastructure system. Support for alternative public road transport will probably come from additional revenues due to the rise of the price of EUAs, while the expansion of the electric fleet of the Hungarian Government would be covered from the national budget. Resources for the European Clean Mobility Fund (as part of CEF) are also available to support sustainable and innovative transport.