MINISTERSTVO
PRŮMYSLU A OBCHODU

National Action Plan for Clean Mobility
(NAP CM)

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CONTENTS

Na Františku 32, 110 15 Prague 1
+420 224 851 111
posta@mpo.cz, www.mpo.cz

LIST OF ABBREVIATIONS

AC ..... Alternating current

APU ..... Backup power source

USEP ..... Updated State Energy Policy

ATEM ..... Ateliér ekologických modelů, s. r. o.

AutoSAP ..... Automotive industry association

AVAS ..... Audible warning system

B(a)P ..... Benzo(a)pyrene

BEV ..... Battery Electric Vehicle

CDV ..... Transport Research Centre

CNG ..... Compressed natural gas

CO_2 ..... Carbon dioxide

CONCAWE ..... Environmental research organisation - CONservation of Clean Air and Water in Europe

CHMI ..... Czech Hydrometeorological Institute

CGA ..... Czech Gas Association

CR ..... Czech Republic

CTU ..... Czech Technical University in Prague

DC ..... Direct current

DICI ..... Direct Injection Compression Ignition

VAT ..... Value Added Tax

DME ..... Dimethyl ether

DPF ..... Diesel Particulate Filter

DS ..... Distribution system

TSS ..... Transport sector strategy

UN EEC ..... UN Economic Commission for Europe

EIA ..... Environment Impact Assessment

EC ..... European Commission

ENGVA ..... European Natural Gas Vehicle Association

EP ..... European Parliament

ERO ..... Energy Regulatory Office

PG CR ..... Power grid for the Czech Republic

ESIF ..... European Structural and Investment Funds

EU..... European Union

EUCAR ..... The European Council for Automotive R&D

EU ETS..... European emissions trading system

EURO I - VI ..... European emission standards for motor vehicles

EA..... Energy Act

FCEV ..... Fuel cell electric vehicle

FPT ..... Fiat Powertrain Technologies

H_2..... Hydrogen

HC..... Hydrocarbons

HW..... Hardware

HYTEP..... Czech hydrogen technology platform

FRS CR..... Fire and rescue service of the Czech Republic

CH_4 ..... Methane

ICE..... internal combustion engine, using fuel such as gasoline, diesel, LPG, CNG and LNG

PVT..... personal vehicle transport

IEA..... International Energy Agency

ILUC..... Indirect Land-Use Change

IROP ..... Integrated Regional Operational Programme

ITS ..... Intelligent Transport Systems

Commission ..... European Commission

LNG ..... Liquefied Natural Gas

LPG..... Liquefied Petroleum Gas

LCV..... Light commercial vehicle

MT..... Ministry of Transport

MF..... Ministry of Finance

UPT..... Urban public transport

MRD..... Ministry for Regional Development

MIT ..... Ministry of Industry and Trade

MoLSA ..... Ministry of Labour and Social Affairs

MI ..... Ministry of Interior

MEYS ..... Ministry of Education, Youth and Sports

MA ..... Ministry of Agriculture

ME ..... Ministry of Environment

NAP CM ..... National Action Plan for Clean Mobility

NGV ..... Natural gas vehicle

NMHC ..... Non-methane hydrocarbons

NO_2 ..... Nitrogen dioxide

NO_x ..... Nitrogen oxides

NPE ..... German national platform for electromobility

PC ..... Passenger car

OEM ..... Original equipment manufacturer, a manufacturer of equipment which uses parts components and devices from other manufacturers in the production process and sells the finished product under its own brand name

DP ..... Delivery point

OP EIC ..... Operational Programme Enterprise and Innovation for Competitiveness

OP E ..... Operational Programme Environment

OPT ..... Operational Programme Transport

DTP ..... Delivery or transfer point

UN ..... United Nations

RES ..... Renewable energy sources

DSO ..... Distribution system operator

PHEV ..... Plug-in Hybrid Electric Vehicle

Fuel ..... Fuels

PIDI ..... Positive ignition direct injection engine

PISI ..... Port fuel injection spark-ignition engine

PM_{10} ..... Particulate matter (particles smaller than 10 μm)

$PM_{2.5}$ ..... Particulate matter (particles smaller than 2.5 μm)

DSOR ..... Distribution system operating rules

FS ..... Filling station

RMD..... Road and Motorway Directorate of the Czech Republic

CIA..... Car Importers Association

SEP..... State Energy Policy

SGEI ..... Services of general economic interest

SO_2 ..... Sulphur dioxide

SEP..... State Environmental Policy

TA CR ..... Technological agency of the Czech Republic

TCO ..... Total cost of ownership

TGG ..... Technical guidelines – gas

TEN-T ..... Trans-European network for transport

THC ..... Total HydroCarbons

TRG ..... Technical rules – gas

TS ..... Transformer station

PM ..... Particulate matter

UITP..... International Association of Public Transport

USA ..... United States of America

R&D ..... Research and development

R&D&I..... Research, development and innovation

VOC ..... Volatile organic compounds

VRA ..... Vehicle Refuelling Appliance, station for slow refuelling

TUL ..... Technical University of Liberec

UCTP ..... University of Chemistry and Technology in Prague

NG ..... Natural gas

Env..... Environment

1. Introduction

The National Action Plan for Clean Mobility (NAP CM) for the period from 2015-2018 and looking forward to 2030 is based on the requirement under Directive 2014/94/EU on the deployment of alternative fuels infrastructure to adopt an appropriate national policy framework for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure. **The NAP addresses electromobility, CNG, LNG and, to a limited extent, hydrogen technology** (or fuel cell technology). **Because of its direct links to Directive 2014/94/EU, this document primarily relates to those alternative fuels for which that Directive requires Member States to define, within the context of the aforementioned national framework, national objectives for the development of the relevant recharging and refuelling stations infrastructure as well as in other areas where this is considered desirable (see the section on hydrogen filling stations)**. This focus adopted by the NAP CM also reflects efforts to promote technologies which are currently on the threshold of full commercial use. **In line with the Directive, the NAP CM will be updated every three years.**

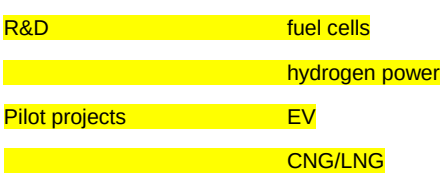
Following on from the basic strategic documents issued by the Government of the Czech Republic in the areas of energy, transport and the environment (the State Energy Policy, the Transport Policy of the Czech Republic for 2014-2020 with the prospect of 2050, the State Environmental Policy of the Czech Republic 2012-2020 and the Regional Development Strategy of the Czech Republic 2014-2020 and the National Programme to Reduce Emissions) and in order to meet the Czech Republic's basic energy, environmental and transport policy objectives, the following proposals have been made:

- a reduction in the negative impacts of transport on the environment, in particular as concerns emissions of air pollutants and emissions of greenhouse gases,
- a reduction in dependence on liquid fuels, a diversification of the source mix and higher energy efficiency in transport.

When preparing this document, we relied on the CR's current and anticipated future commitments to the EU in the area of greenhouse gas emissions and the relevant Europe 2020 strategy objectives, particularly as regards the decarbonisation of the transport sector. In all these respects, the NAP CM also contributes to the implementation of the CR's National Reform Programme 2014 and 2015.

The figure below shows the focus of the NAP CM in relation to existing and new technologies.

Figure 1 Focus of the NAP CM project



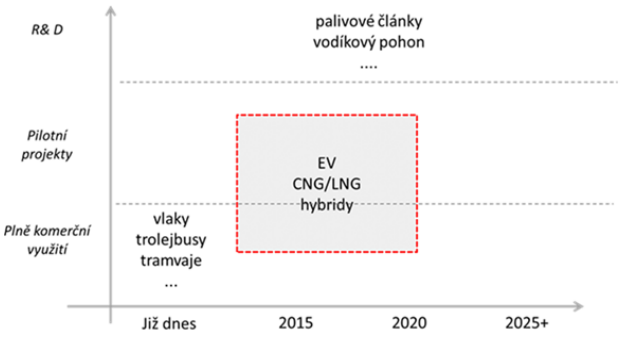
hybrids

Full commercial use trains

trolleybuses

trams

Current situation 2015 2020 2015+



2. Global Objective of the NAP CM

In the NAP CM document, the Government of the CR expresses the country's wish to actively promote alternative fuels in the transport sector, thereby meeting objectives previously laid down by the CR in the areas of energy, transport and the environment. The overall objective of the NAP CM is to create a sufficiently favourable environment for the broader use of selected alternative fuels and powertrains in the transport sector under the conditions applicable to the CR and to achieve conditions in this area that are comparable with other developed EU Member States, so that in the long term (post 2030) electromobility is perceived as a standard technology and natural gas as a standard fuel and hydrogen technology has reached at least the same stage of research and development as electromobility today, i.e. certain basic measures have been implemented to develop this technology over the medium and longer term.

In a situation where support for the development of alternative fuels for transport is becoming an increasingly critical topic not only in a European, but also in a global context, and where governments of developed countries are providing ever more systematic support for this market segment, it seems absolutely essential that the CR move in the same direction. To do otherwise could expose the CR's competitiveness to considerable risks in the medium and long term, particularly given its highly export-oriented economy and the significant share of its GDP accounted for by the automotive industry. The Czech Republic is a leading manufacturer of motor vehicles and their components. Research and development projects in the area of clean mobility are being carried out here. Support for low-emission vehicles should foster, among other things, the further growth of domestic manufacturers of vehicles and auto parts and of the related infrastructure.

A lack of headway in this area could also adversely affect the CR's future ability to meet its commitments under the EU strategy for reducing greenhouse gas emissions by 2030.

The key principle on which the NAP CM is based is the principle of technological neutrality, in the sense of not targeting public sector support on one single type of alternative fuel. On the other hand, however, the overall objective should be met through technologies that are on the threshold of full commercial use and where active government policies may bring the most added value (i.e. electromobility and natural gas), as well as technologies which, although they are currently still at the stage of testing/pilot projects, can nevertheless be helped by any government funding to reach in the short term at least the stage of semi-commercial use (hydrogen/fuel cells).

This conceptual basis for the NAP CM also reflects Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure. Although the Directive sets out a general definition of alternative fuels, which includes, in addition to electromobility and natural gas (CNG/LNG), hydrogen, biofuels and liquefied petroleum gas (LPG), only in the case of electromobility and natural gas, and partially also in the case of hydrogen, does it impose an obligation on Member States to deploy the relevant infrastructure

of recharging or refuelling points, based on established national objectives and measures set out to support the fulfilment of these objectives.

The share of alternative fuels in transport must be increased in order to achieve the planned reduction in emissions from transport (according to current statistics, biofuels will have the largest share in reducing greenhouse gas emissions from transport to 2020, which are addressed by the National Action Plan for Energy from Renewable Sources). The development of other alternative fuels must be supported in order to achieve the objectives set for 2020. As far as CNG, LNG, electricity and hydrogen are concerned, we reckon that CNG use will play the greatest role in reducing greenhouse gases to 2020. After 2020, we expect to see a significant increase in electromobility and vehicles powered by LNG and subsequently in vehicles based on hydrogen technology.

3. Background

This chapter sets out the basic analytical framework underpinning the definition of the NAP CM's individual strategic and specific objectives and the relevant set of measures for achieving these objectives in order to establish strategies, further steps and measures. In relation to Directive 2014/94/EU, this section also complies with the requirement for the national policy framework for the development of the market and the deployment of the alternative fuel infrastructure to include an assessment of the current state and future development of the market as regards alternative fuels in the transport sector.

3.1 Expected and desired parameters for road transport emissions

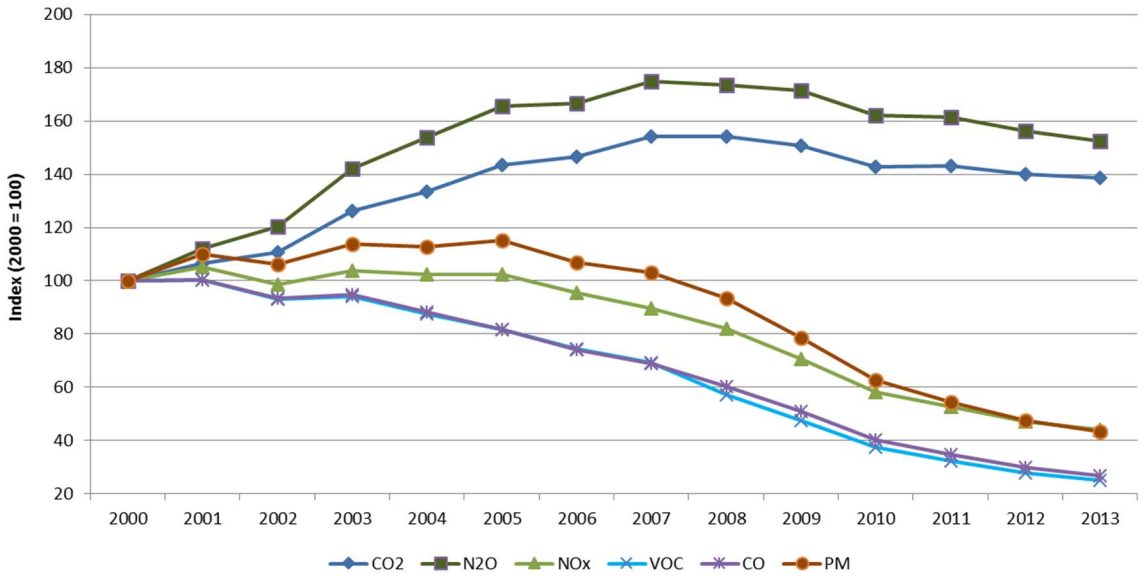
Expected future emissions from road transport, as in other sectors, should be assessed in terms of air protection (emissions of pollutants) and in terms of climate protection (emissions of CO_2, or greenhouse gases).

The tightening of EURO standards has brought a reduction in emissions produced, particularly of carbon monoxide - CO, hydrocarbons - HC, nitrogen oxides - NOx and the volume of particulate matter – PM. The reduction of emissions from the operation of vehicles forces car manufacturers and their suppliers to design new engines and exhaust system components and to use new materials and alternative fuels, which help reduce the volume of pollutants released into the ambient air. However, these substances are not the only ones emitted by cars. The standard does not regulate carbon dioxide, which is often cited in connection with global warming. Carbon dioxide for passenger cars and light commercial vehicles are laid down in Regulations Nos 443/2009 and 510/2011 (see page 74).

3.1.1 Air Protection

In terms of air quality, the emission limits most frequently breached on the territory of the Czech Republic are those for particulate matter in the fractions $PM_{2.5}$, PM_{10}, NO_2, and VOC. Polycyclic aromatic hydrocarbons - in particular benzo(a)pyrene ('B(a)P'), which have important mutagenic, teratogenic and carcinogenic effects, are bound to the surface of the suspended particles. For the most part, these compounds are released from diesel and gasoline engines. The increase in emissions from transport is shown in the figure below. Developments in emissions from transport reflect the increased variety of the vehicle fleet and transport operations.

Graph 1 Increase in emissions from transport [Index (2000 = 100)], 2000-2013



Source: CDV, v.v.i.

Road traffic is a major source of the aforementioned pollutants from transport in the Czech Republic.. Although certain transport emissions are decreasing, the situation remains unsatisfactory.

The areas most affected include large cities and urban agglomerations with a high population density, high traffic volumes and dense road networks. As a whole, the 'road transport' sector currently accounts for approximately 19% of total emissions of nitrogen oxides, about 14% of total emissions of VOC, around 9% of total emissions of primary particulate matter PM_{10}, around 10% of total emissions of primary particulate matter $PM_{2.5}$ and about 7% of total emissions of benzo(a)pyrene. However, the share of the increase in emissions, particularly of benzo(a)pyrene, is many times higher in large cities and urban agglomerations.

The measured area that does not conform to the emission limit for benzo(a)pyrene is showing a significant trend towards enlargement, using moving five-year averages.

During the 2007-2013 period, on average more than 53% of the population lived in areas that did not meet the emission limit for benzo(a)pyrene.

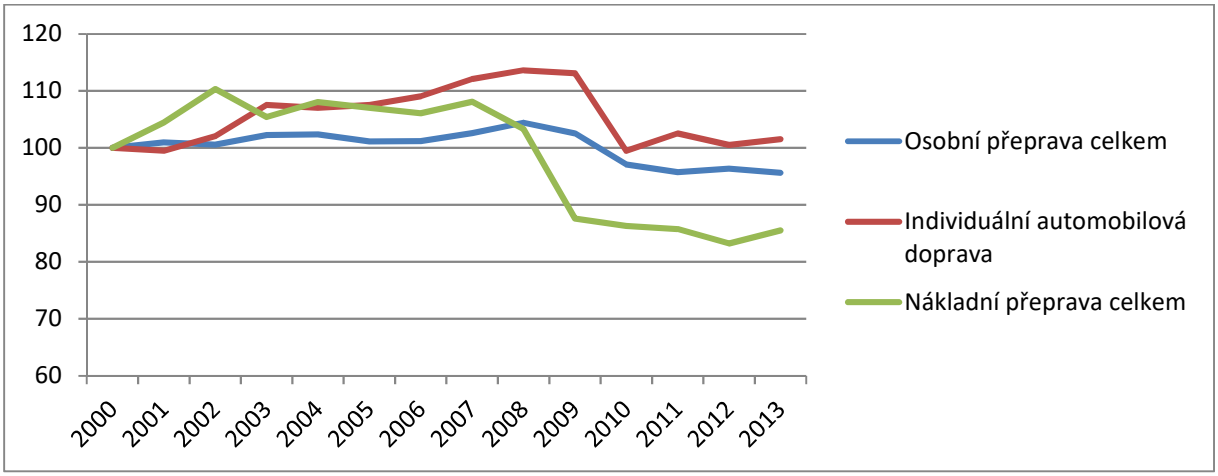
A rolling five-year average shows that the area in which annual and daily emission limits for PM_{10} and $PM_{2.5}$ fractions of particulate matter are exceeded has been gradually growing.

During the 2007-2013 period, on average more than 5% of the population lived in areas with excess annual average concentrations of PM_{10} particulate matter, while an average of around 30% of the population lived in areas with excess daily concentrations of PM_{10} particulate matter.

During the 2007-2013 period, on average more than 11% of the population lived in areas with excess annual concentrations of $PM_{2.5}$ particulate matter. Areas long affected by excess concentrations of benzo(a)pyrene, $PM_{2.5}$, PM_{10} and NO_x are shown below. The most polluted Czech regions over the long term include Moravia-Silesia, Ústí, Olomouc, Zlín and Central Bohemia regions, the Brno agglomeration and Prague.

If follows that maximum efforts to reduce air pollution caused by traffic should be concentrated into these areas.

Graph 2 Interdisciplinary comparison of vehicular carriage from 2010-2013



Source: Transport yearbooks

Total passenger transport

Personal vehicle transport

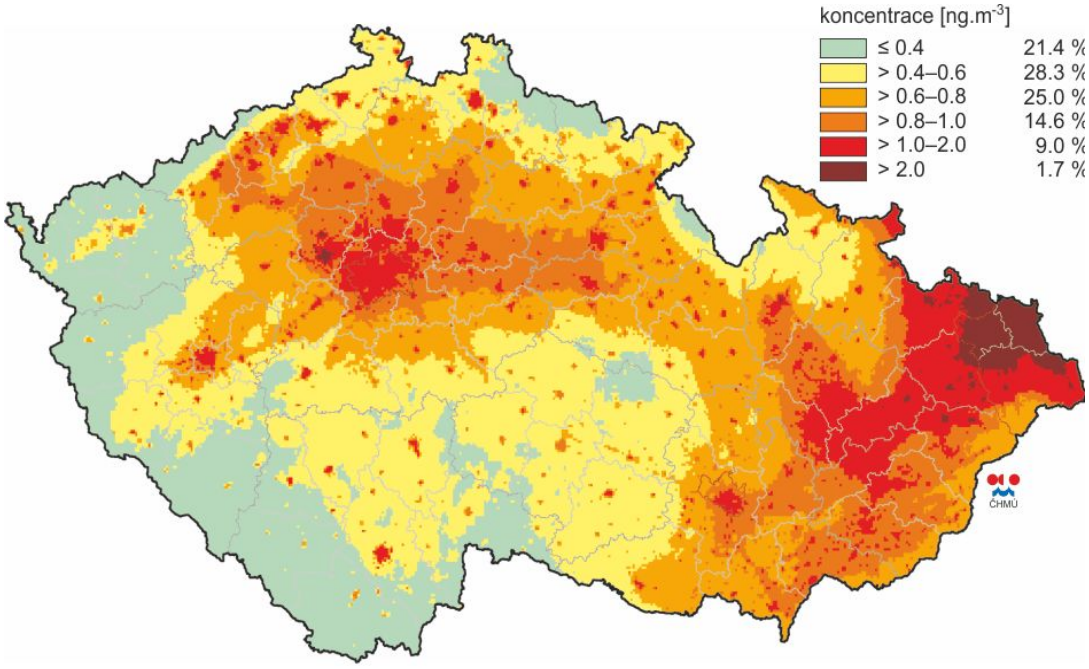
Total freight transport

Increased performance in transport is shown here for comparison. Overall passenger transport performance increased slightly from 2000 to 2008. This was followed by several years of decline. Since 2011, transport numbers have remained relatively stable. In terms of passenger transport, this has been dominated by personal vehicle transport (PVT), which represents over 40% of all traffic. Over recent years, in step with the increasing cost of public transport and a reduction in the number of connections, particularly in the regions, the share of total passenger transport accounted for by PVT has increased. The graph shows that this area of transport has increased since 2008 (2009). There was a sharp decline in 2010 and stagnation between 2011 and 2013.

Freight transport saw a significant increase from 2000-2002, followed by more balanced performance from 2003-2007. A decline was registered in subsequent years (with performance falling by one-fifth in 20012, compared to 2007). 2003 showed a slight recovery, which has continued in 2014-2015.

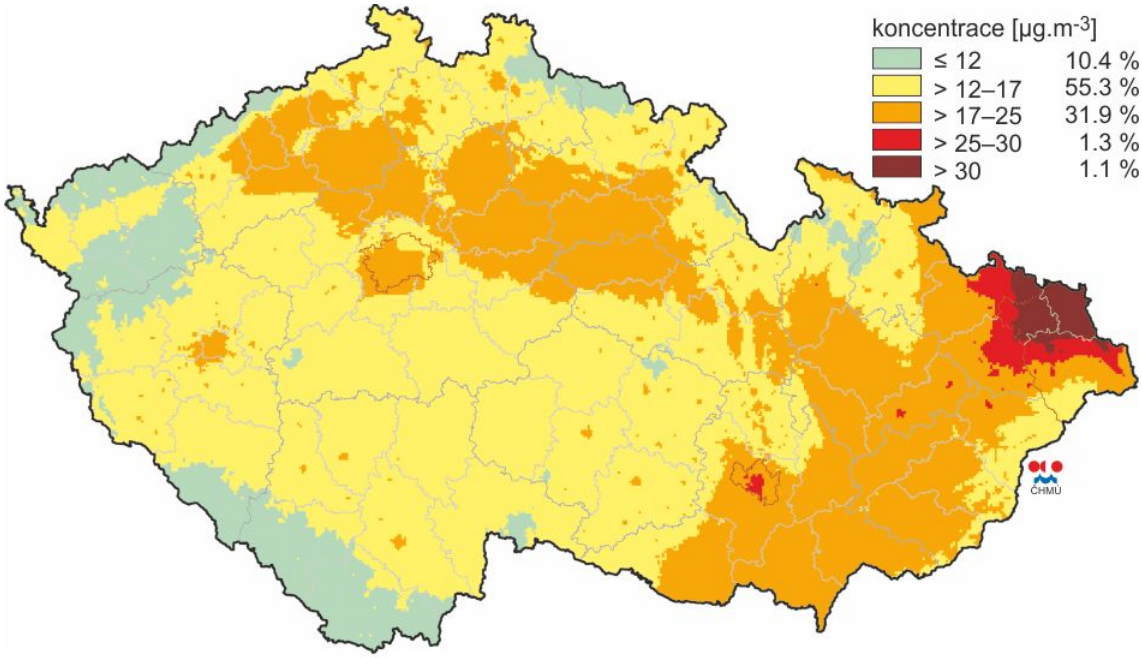
If we compare Graphs 1 and 2 we can see that there was a sharp decline in emissions of $PM_{2.5,}$ NOx, PM_{10}, and VOC from 2000-2013, despite the fact that traffic volumes rose slightly, which is due to stricter requirements for emission limits imposed by EURO norms. In contrast, over the same period emissions of CO_2 and N_2O increased by more than 40%, which is also due to the increasing numbers of vehicles in this country.

Figure 2 Five-year average of mean annual concentrations of benzo(a)pyrene 2009-2013



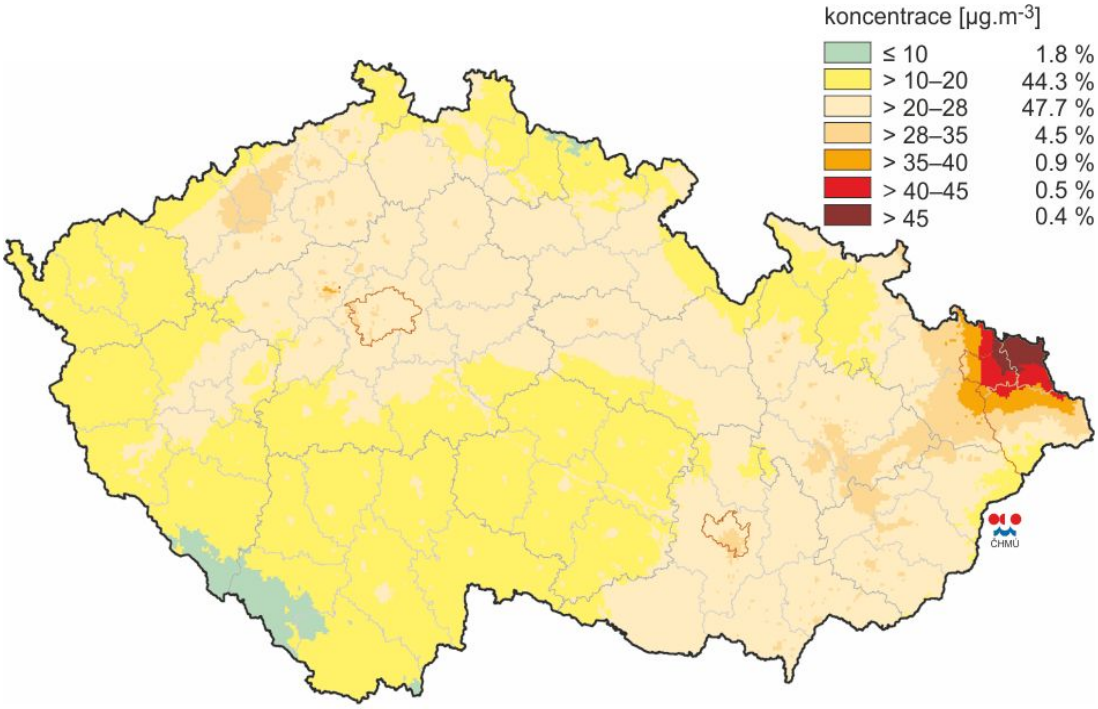
Source: Czech Hydrometeorological Institute

Figure 3 Five-year average of mean annual concentrations of $PM_{2.5}$



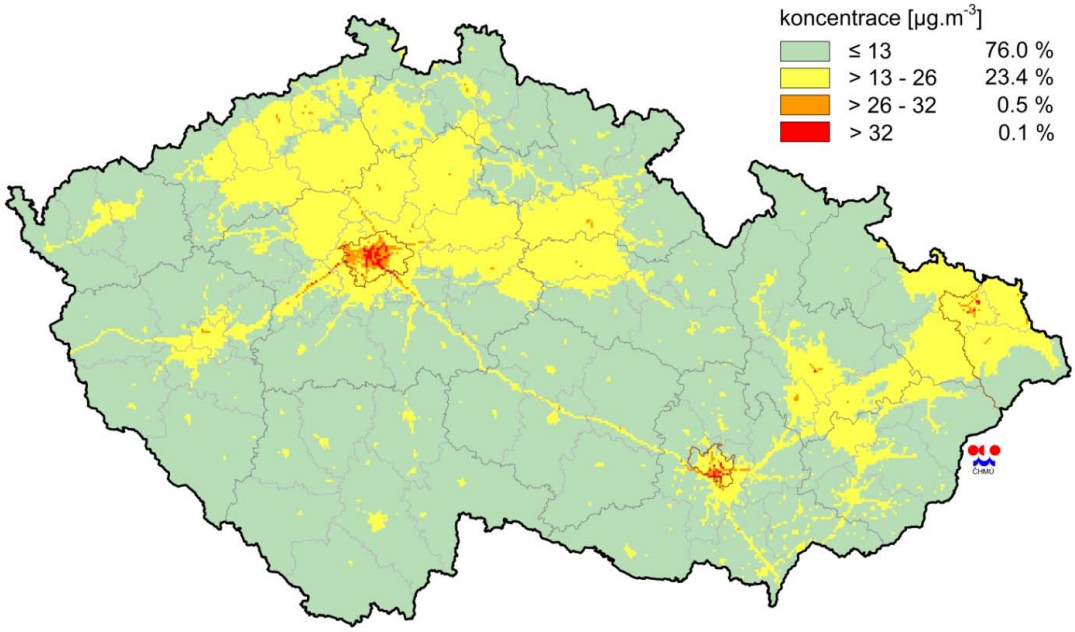
Source: Czech Hydrometeorological Institute

Figure 4 Five-year average of mean annual concentrations of PM_{10} 2009-2013



Source: Czech Hydrometeorological Institute

Figure 5 Five-year average of mean annual concentrations of NO_2 2009-2013



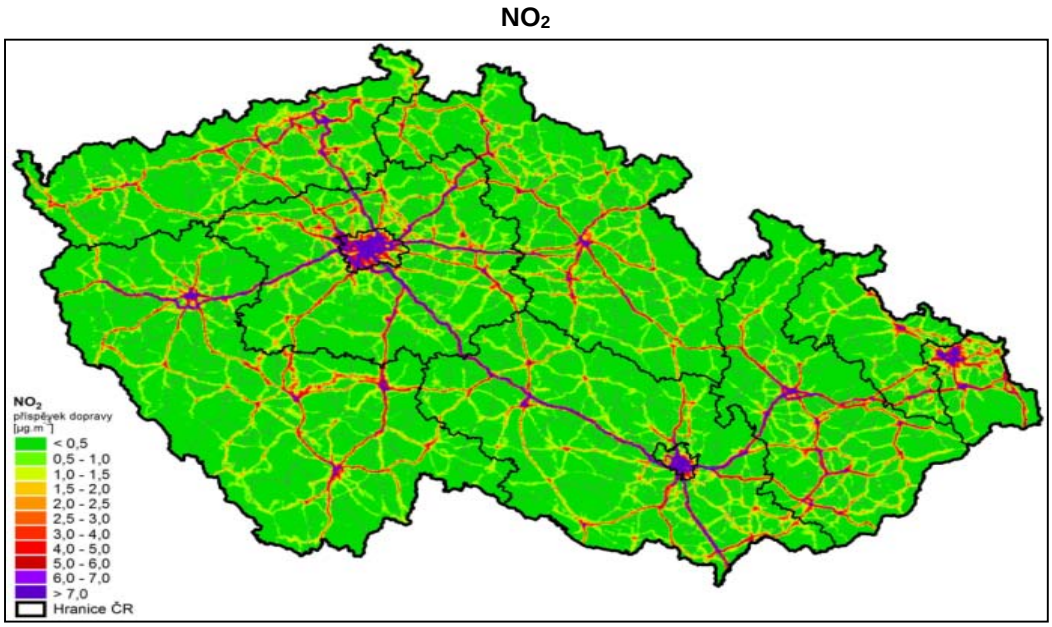
Source: Czech Hydrometeorological Institute

concentration

The 1990s saw a significant reduction in air pollution, particularly from the energy and other industrial sectors, which are currently subject to environmental regulation. The fall in overall emissions of PM_{10}, $PM_{2.5}$ and benzo(a)pyrene and NO2 during the period from 2005 – 2013 was not, however, sufficient to meet the existing emission limits. The figure below shows the share contributed by transport to exceeding emission limits for NO_2: the impact of transport can be seen from the close correlation between increased pollution and sites with heavy traffic, primarily large cities, urban agglomerations and major roads.

In towns and agglomerations with few industrial sources and no stationary sources of pollution, such as local heating plants, traffic is the main factor affecting air quality and the associated impacts on health, which include reduced immunity, a worsening of the condition of asthma and allergy patients, a greater incidence of respiratory and cardiovascular diseases and genetic mutations to foetuses during pregnancy.

Figure 6 Contribution to NO_2 emissions by the transport sector



Source: ATEM

NO2

Emissions from the transport sector

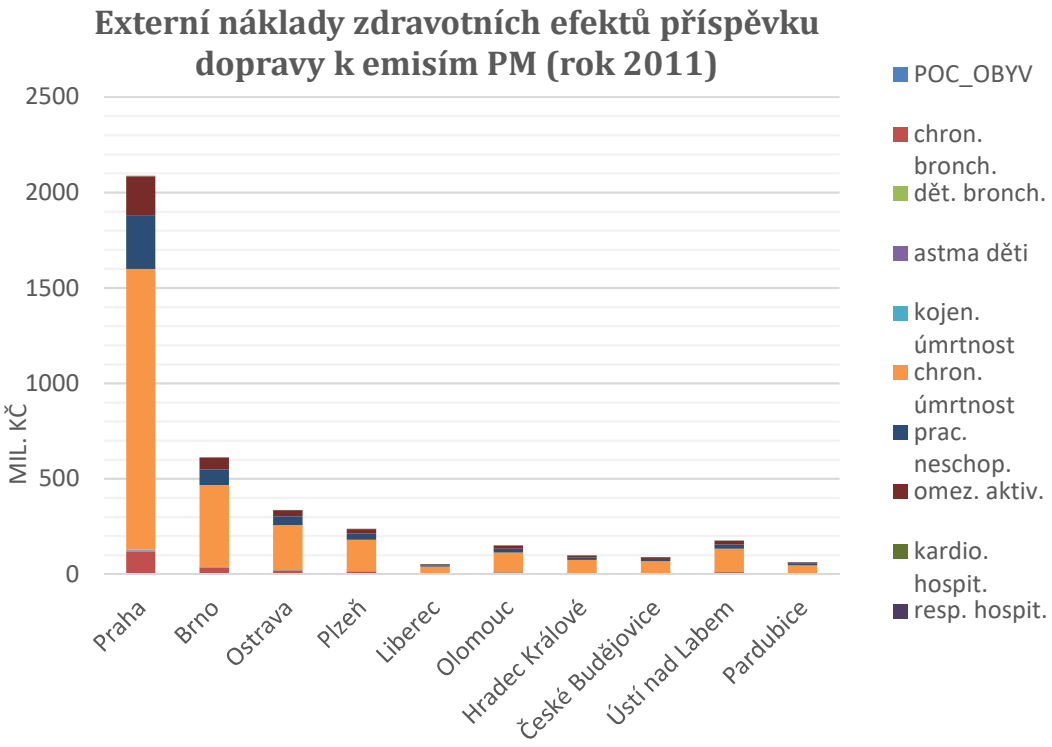
Czech border

- For example: In Western, Central and Eastern Europe, exposure to $PM_{2.5}$ particulate matter has caused about 430 000 premature deaths and led to an aggregate reduction in life expectancy of more than 7 million years.

- According to estimates by the National Institute of Public Health, exposure to PM_{10} particulate matter contributed to around 5 500 premature deaths in the Czech Republic in 2012.
- Quantified external costs for the transport sector related to dust aerosol emissions are estimated to total CZK 5.5 billion a year, where the dominant impact category is premature death (approximately CZK 3.9 billion).

The graph below shows the external costs of the health impacts of the transport sector's contribution to PM emissions (2011) in the largest cities in the CR.

Graph 3 External costs of the health impacts of transport



Source: ATEM 2015

External costs of the health effects of the contribution made by transport to PM emissions (2011)

population	chronic bronchitis	child bronchitis	child asthma	child deaths
sick leave	restricted activity	cardio hospitalisation	respiratory hospitalisation	

Because of this, we would like to find ways to reduce the production of pollutant emissions from the transport sector, primarily in major cities and urban agglomerations.

One way to achieve this goal is to use vehicles with better environmental parameters, particularly those running on natural gas and electric cars.

Further reductions in pollutant emissions can be achieved by introducing new powertrains and alternative fuels in transport (i.e. as a result of requirements to reduce greenhouse gas emissions).

3.1.2 Climate Protection

Climate change is currently one of the most serious and most discussed global environmental issues. It is caused by an intensification of the greenhouse effect in the atmosphere, caused by increased concentrations of anthropogenic greenhouse gas emissions. The transport sector is one of the major producers of greenhouse gas emissions. In 1990, emissions from transport represented only 6.35% of total CO_2 emissions in the Czech Republic. In 2005 this share amounted to 14.45% and, by 2012, emissions from transport had reached 16.9%. This upward trend is particularly ominous, although emissions are still below the values recorded by developed EU countries (for example, in Great Britain, transport contributes 27% of CO_2 emissions). For this reason, it is extremely likely that the share of carbon dioxide emissions contributed by transport will rise in the near term. This trend is primarily linked to the growth in the volume of passenger transport and road freight transport.

Table 1 Growth in emissions expressed as tonnes of CO_2 by type of transport in the CR during the period from 2005-2013

	2005	2009	2010	2011	2012	2013
transport as a whole	18 180	19 098	18 113	18 150	17 760	17 590
PVT	9 890	10 651	10 082	1 094	9 887	9 750
road public transport, including public transport buses	1 ,856	1 883	1 794	1 807	1 776	1 779
road freight transport	5 101	5 180	4 933	4 968	4 883	4 885
rail transport - motor traction	289	298	289	282	273	267
water transport	16	16	13	9	16	16
air transport	1 028	1 070	1 003	990	926	893

Source: Transport yearbook 2013

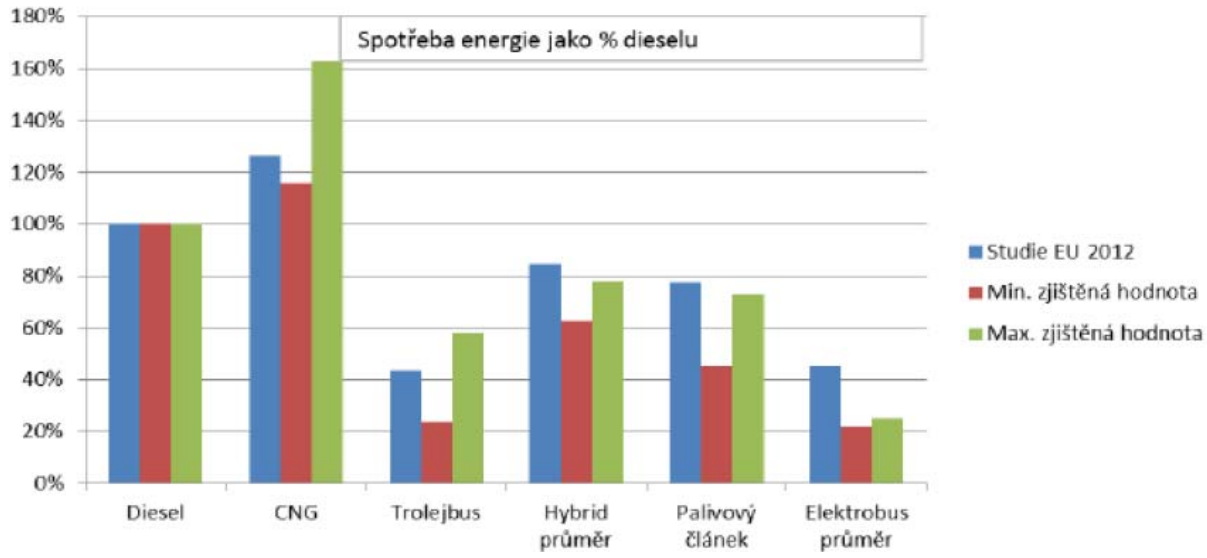
The table shows that passenger cars are the dominant source of CO_2 emissions in this country. Each year, approximately 80 000 passenger cars are added to the register in the Czech Republic.

The Transport Faculty of the CTU in Prague prepared a study comparing the issue of emissions from buses running on CNG and electricity and buses with conventional diesel powertrains for Plzeňské městské dopravní podniky a.s. (Pilsen Urban Transport Company).

Compared to the older diesel powertrains, natural gas engines reduced CO_2 production by an initially estimated 25%, based on the same distance driven. More accurate calculations, which take account of the lower efficiency of CNG engines and other necessary losses, reduce the advantage provided by CNG to 13%.

When comparing energy consumption, CNG powertrains have higher consumption compared to diesel engines. In contrast, electric powertrains score higher in this comparison.

Figure 7 Comparison of energy consumption by different types of powertrain



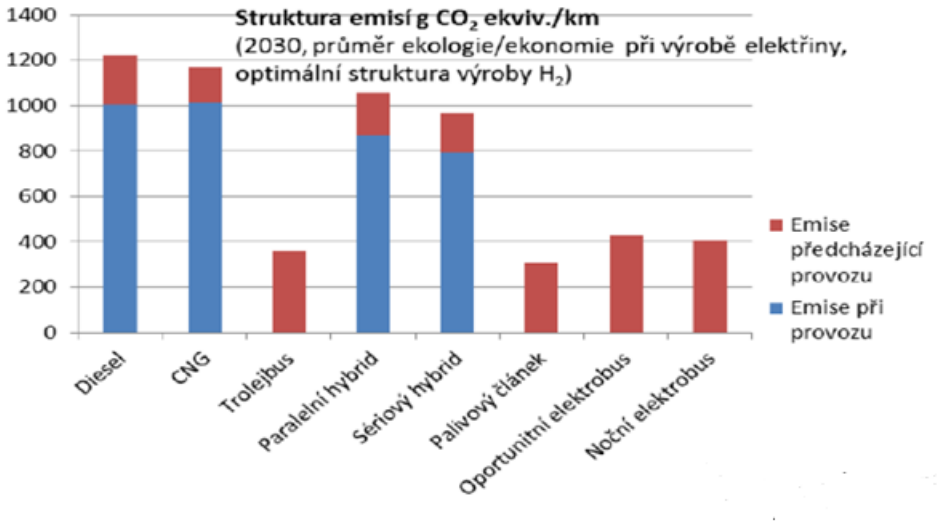
Source: Study: Comparison of the application potential of electromobility and compressed natural gas powered vehicles in urban public transport over the next 10 years (CTU)

Energy consumption as a % of diesel
EU study 2012
Min. value found
Max.value found

Diesel	CNG	Trolleybus	Average hybrid	Fuel cell	Average electric bus

Figure 8 provides a comparison of totally emissions, with diesel engines showing the highest values. CNG engines are somewhat lower, followed by hybrids. Night electric buses have the lowest emissions.

Figure 8 Comparison of emissions from different types of powertrain in buses



Source: Study: Comparison of the application potential of electromobility and compressed natural gas powered vehicles in urban public transport over the next 10 years (CTU)

Structure of emissions g CO2 equivalent/km

2030, ecological/economic average for electricity production

Optimal structure for H2 production

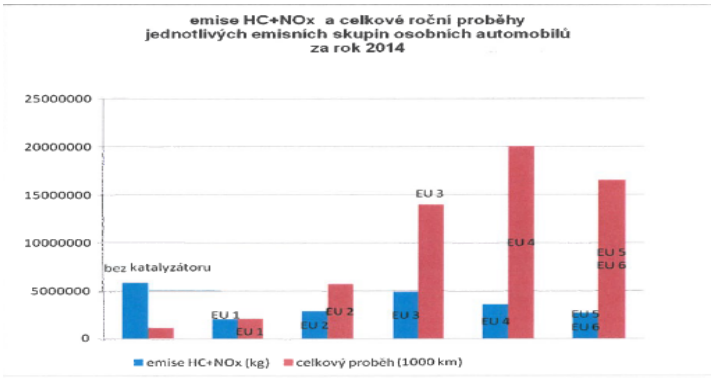
Emissions prior to operation

Emissions during operation

Diesel CNG Trolleybus Parallel hybrid Serial hybrid Fuel call Opportunity electric bus Night electric bus

With regard to the age of vehicles, TÜV SÜD carried out a study which shows that the oldest vehicles, although their annual mileage is very low, are the worst polluters in terms of CO a NO_x emissions.

Graph 4 Emissions and annual mileage of passenger cars, by emission group



Source: TÜV SÜD Czech s.r.o.

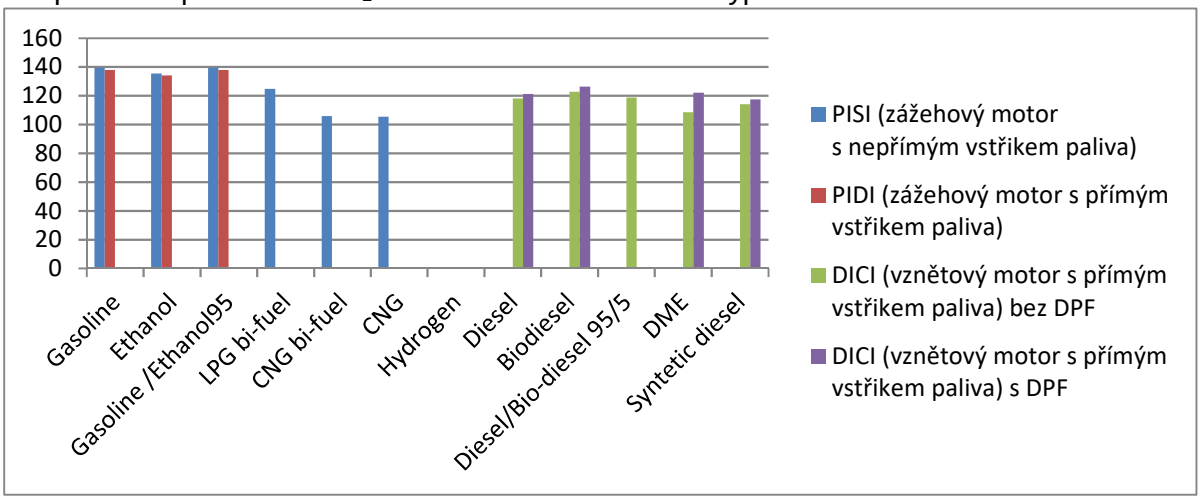
Emissions of HC+NOx and overall annual performance of individual emission groups from passenger cars in 2014

No catalyser

Emissions of HC+Nox (kg) overall performance (1,000 km)

In its study entitled 'Well-to-wheels Analysis of Future Automotive Fuels and Powertrains in the European Context', the European Commission compares different types of fuel and their CO_2 emissions/km. The graph below shows that engines running on traditional petrol, diesel or biodiesel produced the highest values. Natural gas engines had lower emissions.

Graph 5 Comparison of CO_2 emissions/km for different types of fuel



Source: European Commission, EUCAR and CONCAWE: Well-to-wheels Analysis of Future Automotive Fuels and Powertrains in the European Context

PISI (port-injection spark-ignition petrol engine)
DISI (direct injection spark-ignition petrol engine)
DICI (direct injection compression ignition diesel engine) without DPF
DICI (direct injection compression ignition diesel engine) with DPF

In a programme funded by Operational Programme Environment - Priority Axis 2, 5 diesel buses complying with EURO 2 emission standards were replaced by 2 new buses with compressed natural gas (CNG) powertrains, with the new buses providing the same service (approximately 49 000 km/year). This replacement of part of the transport company's fleet will result in annual savings amounting to 1 703 tonnes of emissions[1].

Table 2 Comparison of emissions from a bus complying with EURO 2 standards and running on CNG

Pollutant	EURO 2 (g/km)	Annual emissions (kg/year)	CNG (g/km)	Annual emissions (kg/year)
NOx	9.1686	446.51	1.5104	73.55
PM	0.2620	12.76	0.0128	0.62

[1] Project feasibility study - Acquisition of CNG buses as replacements for diesel public transport vehicles in the town of Chomutov.

SO_2	0.0067	0.32	0.000023	0.011

Source: Project feasibility study - Acquisition of CNG buses as replacements for diesel public transport vehicles in the town of Chomutov

3.1.3 State of the vehicle fleet (including the situation in the public administration)

The number of motor vehicles in the Czech Republic has been rising steadily for more than 20 years. For example, in 1990 over 2.4 million passenger cars were registered in the CR, in 2000 approximately 3.4 million and in 2010 almost 4.5 million cars. According to the latest statistics, there were almost 4.9 million cars on 31 December 2014. The growth in the vehicle fleet is most noticeable in this category.

The number of goods vehicles rose until around 2008, but has since stagnated owing to the global economic recession and the associated fall in the transport of goods.

Over the past 10 years, the number of buses has remained at around 20 000.

More detailed statistics on the vehicle fleet are shown in the table below

Table 3 Vehicle fleet in the CR

	2008	2009	2010	2011	2012	2013	2014
Motorcycles	892 796	903 346	924 291	944 171	964 964	984 270	1 005 452
Passenger cars	4 423 370	4 435 052	4 496 232	4 581 642	4 698 800	4 787 849	4 893 562
Microbuses and buses	20 375	19 943	19 653	19 674	19 729	19 716	19 889
Goods vehicles	589 598	587 032	584 921	585 729	593 552	601 752	617 369
Tractor units	17 814	14 735	13 045	11 503	8 664	7 208	6 159
Semi-trailers	53 623	52 415	53 637	56 184	57 856	59 995	63 470
Trailers	238 712	258 891	278 137	299 546	308 791	332 226	358 524
Special vehicles	43 609	39 300	36 660	34 797	33 428	32 709	32 249

Source: AutoSAP

The average age of vehicles in the CR today is 14.5 years. We can assume that this will gradually fall into line with the EU average, which is 7.5 years. The growing number of new car purchases is positively reflected in the increase in the number of ‘cleaner’ vehicles in the CR. In terms of reducing pollutant emissions from traffic, the renewal of the vehicle fleet with new vehicles, complying with stricter emission limits, has a major impact.

The number of vehicles with alternative powertrains can be estimated from unofficial statistics. The largest proportion comprises vehicles with LPG powertrains, numbering around 200 000. Around 9 000 CNG-powered vehicles were also in operation at the end of 2014 (according to the CGA). It is estimated that around 1 500 vehicles with hybrid powertrains are in operation in the CR, and around 300 all-electric vehicles (BEV).

As far as the situation in the public administration is concerned, we can refer to the Programme to replace the public administration vehicle fleet, approved by Government Resolution No 1592 of 16 December 2008, which aims, by 1 January 2014, to reach a point where 25% of vehicles

in the total fleet used by government agencies (excluding vehicles used by the Police of the CR and the Fire and Rescue Service for primary operations) are 'environmentally friendly'. In 2008, the requirements for an 'environmentally friendly' vehicle were met by a vehicle complying with the EURO 5 minimum emission limit and also depended on the power of the vehicle's engine and powertrain (petrol, diesel) and specific limits on CO_2 emissions[2]. At the end of the Programme, a total of 811 'environmentally friendly' vehicles were operated by all the ministries, regional authorities and other government organisational units, of which only 15 used alternative fuels (13 electric cars and 2 CNG vehicles). The total proportion of 'environmentally friendly' vehicles was almost 17%[3], but the proportion of vehicles powered by alternative fuels amounted to only 0.3%. This situation is set to change in the future.

Table 4 Status of the public administration vehicle fleet as at 1 January 2014

Government Agency	Environmentally-friendly vehicles	Vehicles powered by alternative fuels	Vehicles in operation	Share [%]	Share of vehicles powered by alternative fuels [%]
Ministries	396	4 (all electric cars)	3 334	11.9	0.12
Regional authorities	166	10 (8 electric cars, 2 CNG vehicles)	499	33.3	2
Authorities	249	1 electric car	975	25.5	0.1
Total	811	15	4 808	16.9	0.31

Source: ME

3.1.4 Expected development of traffic performances

The Ministry of Transport strategic document outlining the development of the transport infrastructure 'Transport Sector Strategies, 2nd Phase' states that we anticipate growth of 51% in total traffic output for passenger transport (measured in passenger-kilometres) and of 74%

[2] Note on the categories of environmentally friendly vehicles:

I = Vehicles with a power output of 60 kW or less: CO_2 emissions of 135 g/km or less (injection engine); CO_2 emissions of 120 g/km or less (ignition engine)

II = Vehicles with a power output of 61 kW to 80 kW: CO_2 emissions of 155 g/km or less (injection engine); CO_2 emissions of 130 g/km or less (ignition engine)

III = Vehicles with a power output of 81 kW to 120 kW: CO_2 emissions of 170 g/km or less (injection engine); CO_2 emissions of 145 g/km or less (ignition engine)

IV = Vehicles with a power output over 121 kW: CO_2 emissions of 200 g/km or less (injection engine); CO_2 emissions of 170 g/km or less (ignition engine)

[3] This target was not met because the programme was shut down ahead of schedule by a government austerity measure in June 2012.

in freight transport (measured in tonne-kilometres) between 2010 and 2050. Compared with 2010, the volume of passenger transport journeys is also expected to increase by 11% in 2020, 20% in 2035 and 22% in 2050. Similarly, the volume of freight transport is expected to rise by 29% between 2010 and 2050.

Owing in particular to the expected rises in fuel prices, we assume there will be a slight decrease in the share taken by individual passenger transport or road freight transport, in favour of rail and, to a certain extent, water transport. Road transport will nevertheless remain the dominant mode. These figures clearly show the need to vigorously explore ways of limiting the adverse environmental impacts of this form of transport.

Table 5 Traffic forecast (passenger-kilometres (pkm))

	Year	MT data	DSS2 results				TEN CONNECT for EU 12	iTREN for EU 12
		2000	2010model=100%	2020	2035	2050	2030/2005	2030/2005
Passenger kilometres	Vehicular transport	88%	51 511 million pkm=100%	112%	123%	133%	131%	130%
	Bus transport	89%	3 972 million pkm=100%	112%	153%	150%	-	103%
	Rail transport	107%	6 955 million pkm=100%	112%	152%	155%	108%	166%
	Air transport	55%	3 791 million pkm=100%	140%	164%	172%	212%	176%
	Total	88%	66 228 million pkm=100%	115%	130%	138%	134%	132%
Modal split	Year	2000	2010	2020	2035	2050		
	Vehicular transport	79.9%	77.8%	77.0%	73.5%	74.6%		
	Bus transport	7.6%	6.0%	5.8%	7.0%	6.5%		
	Rail transport	8.3%	10.5%	10.2%	12.3%	11.7%		
	Air transport	4.1%	5.7%	7.0%	7.2%	7.1%		
	Total	100%	100.0%	100%	100%	100%		

Source: Ministry of Transport

Table 6 Traffic forecast (tonne-kilometres (tkm))

	Year	MT statistics		DSS2 results			TRANS-TOOLS for the CR	
		2000	2010=100%	2020	2035	2050	2020/2005	2030/2005
Ton kilometres	Rail transport	126%	13 770 million tkm=100%	123%	133%	146%	210%	267%
	Road transport	75%	51 832 million tkm=100%	128%	166%	174%	152%	181%
	Domestic water transport	114%	679 million tkm=100%	170%	215%	234%	153%	177%
	Air transport	169%	22 million tkm=100%	105%	118%	132%	-	-
	Total	86%	66 304 million tkm=100%	127%	160%	169%	-	-
Modal split	Year	2000	2010	2020	2035	2050		
	Rail transport	30.5%	20.8%	20.0%	17.3%	17.9%		
	Road transport	68.1%	78.2%	78.6%	81.2%	80.6%		
	Domestic water transport	1.3%	1.0%	1.4%	1.4%	1.4%		
	Air transport	0.1%	0.0%	0.0%	0.0%	0.0%		
	Total	100.0%	100.0%	100.0%	100.0%	100.0%		

Source: Ministry of Transport

3.2 Current situation and predictions for further development of different types of alternative fuels

3.2.1 Electric vehicles

Electromobility is one of the transport sectors that has developed very dynamically over recent years. The main global factors driving its growth are as follows:

a) Regulation of CO_2 emissions

Regulation of CO_2 emissions is subject to international treaties (Kyoto Protocol) and, particularly from an EU perspective, is one of the key parameters for reducing the adverse effects of climate change to a minimum.

b) Pressure to improve air quality, particularly in urban areas.

With increasing urbanisation, when an ever-increasing proportion of the Earth's population will live in cities and urban agglomeration, the issue of air quality, i.e. local emissions of all types of substances, as well as noise, is becoming one of the political priorities. The fact that the measures already implemented reduce emissions from stationary sources means that emissions from mobile sources are becoming ever more important. Given that no emissions are produced at the place of operation, electromobility is also an effective tool for tackling emissions and air pollution and therefore enjoys the requisite political backing.

c) Security of supply

Dependence on oil supplies, particularly from political unstable regions, is one of the most important geopolitical challenges and reducing this dependence is one of the EU's primary goals. The risk of supply constraints or sharp swings in prices are seen as major threats (Russian gas supplies to the Czech Republic cover approximately 65% of domestic consumption). The CR has stocks which can cover up to 100 days of any potential supply shortfall as a protection against restricted supplies of natural gas. In future an option will also exist to supply the gas network from biogas plants, as in Germany. The use of electricity, which will also increasingly be produced locally, will help to reduce this exposure.

The following additional influences should be added to these factors, which will also support promising trends in the development of electromobility:

d) Customer access

A change in perception will also take place on the part of the customer. Both research and empirical observation show that in the general public have become increasingly interested in solutions and products with a lower environmental impact. This interest reflects not just rising prices or regulatory restrictions but an active approach on the part of people who are increasingly willing to pay more for cleaner solutions. A more socially responsible approach is also emerging in companies operating major fleets.

e) Readiness of suppliers

Technological progress has gradually resulted in the achievement of an acceptable driving range for electric vehicles on a single charge, which can also be effectively extended by rapid charging. Plug-in hybrid car technology has also solved the range issue, as it combines pure electric operation for short distances with conventional fuel-powered operations. The price of electric cars is gradually decreasing, while at the same time the available range is expanding. Virtually all the major automotive players are active in the field of electromobility and are prepared to respond to growing demand.

3.2.1.1 Baseline predictions - the situation in the Czech Republic

The development of electromobility in the Czech Republic is still in its infancy. The main reasons include:

- The price of electric cars, which is higher compared to cars with conventional engines (the price of batteries must be reduced in future, which will be reflected in the price of electric vehicles).
- The lack of a regulatory framework (electromobility as a form of clean transport has not been eligible for support in the Czech Republic, with the exception of consumer tax, and there is no strategy for its development).
- Economic reasons (electromobility is not yet fully commercial, the market is still at a formative stage).
- The range of vehicles is limited (the limited range of models in different segments of the mass sales market relates to the fact that the Czech market is not attractive for major players, and delays can be expected in comparison with Western Europe).
- The lack of charging infrastructure (low density of the network of charging points, particularly for fast charging).
- The prejudices and distrust expressed by users with limited practical experience (huge emphasis on the risks associated with electric powertrains, distrust of untested technologies).
- Low sensitivity to environmental issues, in particular the reduction of CO_2 emissions.

These are the main reasons why increases in sales of electric vehicles remain slow, although recent years have shown a significant upward trend (e.g. a record 222 electric vehicles were sold in 2014; source: Car Importers Association). Sales are also increasingly less influenced by supplies of vehicles to pilot projects, particularly by the energy companies (ČEZ, PRE, E.ON), and the proportion of deliveries to normal customers, both on the part of companies and households is growing. This trend reflects the fact that the electric car is increasingly seen as a real alternative for road traffic and reflects both the expanding range of types and brands, as well as the decreasing cost of electric vehicles, or the fact that in terms TCO - Total Costs

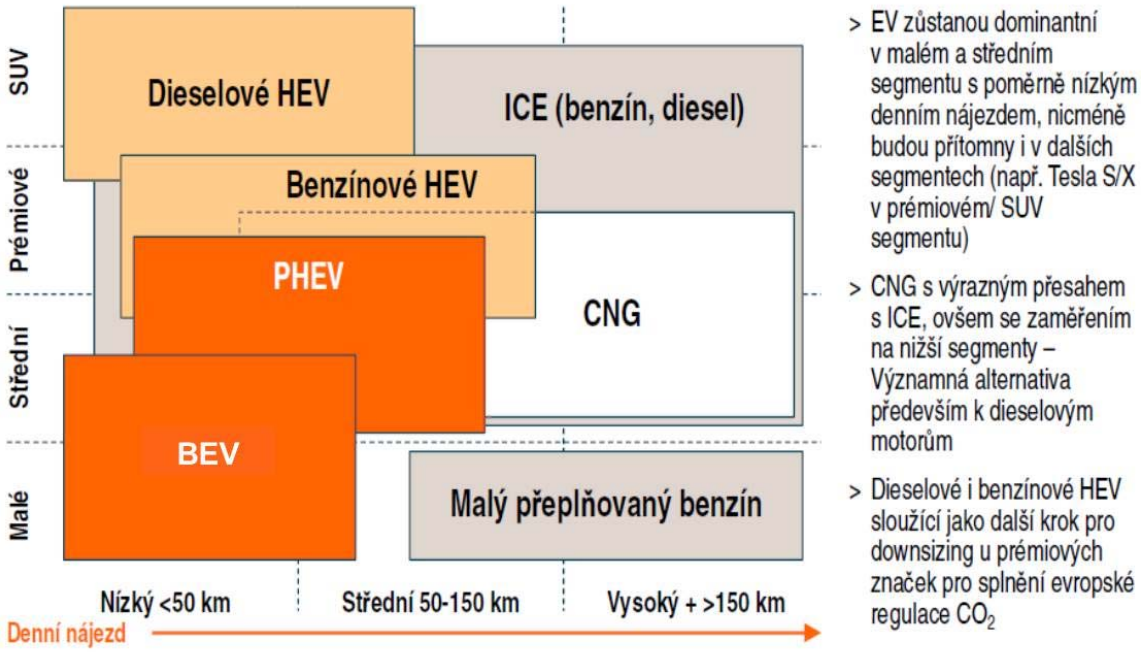
of Ownership, electric cars are already, under certain conditions, a competitive alternative to vehicles with internal combustion engines.

We therefore expect that over the coming years, interest in electromobility will continue to grow and it will gradually become commercialised. This reasoning primarily relies on the following factors:

- Further tightening of the regulatory framework for CO2 for combustion engines (forcing car manufacturers to expand the range of electric vehicles).
- Economic reasons (a reduction of the cost of electric vehicles, especially batteries, will increase their economic potential, based on an analysis of TCO).
- Pressure to increase the quality of life, particularly in cities (the increasing role played by traffic in terms of the burden placed on the population).

The commercial development of electromobility cannot be viewed in terms of the rapid displacement of conventional fuels in transport by electricity, but as an evolutionary process, where a variety of fuels, including alternative fuels, find their application in different market segments, complementing each other rather than competing. This situation can be illustrated by the following figure.

Figure 9 Example of expected use of alternative fuel vehicles in Europe (normal use)



Explanation BEV - a vehicle with an all-electric motor, PHEV - Plug-in hybrid vehicle (allows charging from a wall socket), HEV - Hybrid vehicle (non-rechargeable from a wall socket), EV - general designation of electric vehicles that can be recharged from a wall socket (BEV + PHEV) ICE - Internal combustion engine powered by gasoline, diesel, LPG, CNG and LNG

SUV	Diesel HEV	ICE (petrol, diesel)
Premium	Petrol HEV	
Medium	PHEV	CNG
Small	BEV	Small supercharged petrol
Low	Medium	High

Daily journeys

EV will continue to dominate the small and medium segment with relatively short daily journeys, but will also be present in other segments (e.g. the Tesla S/X in the premium SUV segment)

CNG significantly overlapping ICE, although focusing on lower segments – important alternative, mainly to diesel engines

Diesel and petrol HEV used as the next step towards downsizing in premium brands to comply with European CO2 regulations

Source: Analysis by Roland-Berger

3.2.1.2 Prediction for the electric vehicle market

A new analysis of the potential sales of electric vehicles (BEV and PHEV) was prepared for the purposes of the NAP CM. Its parameters were adjusted so that its baseline scenario was based on the best available — yet deliberately conservative — assumptions for key parameters. The resulting baseline scenario serves as a starting point for further analysis.

Methodology used

The projections are based on the assumption that the acquisition of an electric vehicle by the user is influenced by the following key factors.

Table 7 Key factors influencing the demand for electric vehicles

Customer needs	Key factors	Description of the key factors
Mobility needs	Range	The current normal range of 150 km on a single charge may limit the application of all-electric vehicles. In the case of PHEV, no range disadvantages are expected compared to a vehicle with an internal combustion engine.
	Unlimited mobility	The need for flexibility (I will always get there). It is expected that an all-electric vehicle will be one of the two cars in the household, a PHEV the only one.
	Infrastructure coverage	The use of an electric vehicle is influenced by the wide availability of a safe and convenient infrastructure.
Cost (TCO)	Market factors	The key factors which will affect the attractiveness of electric vehicles will be the expected fall in the price of batteries and increases in fuel prices.
	Regulatory environment	Monetary and non-monetary incentives may make electric vehicles significantly more attractive.

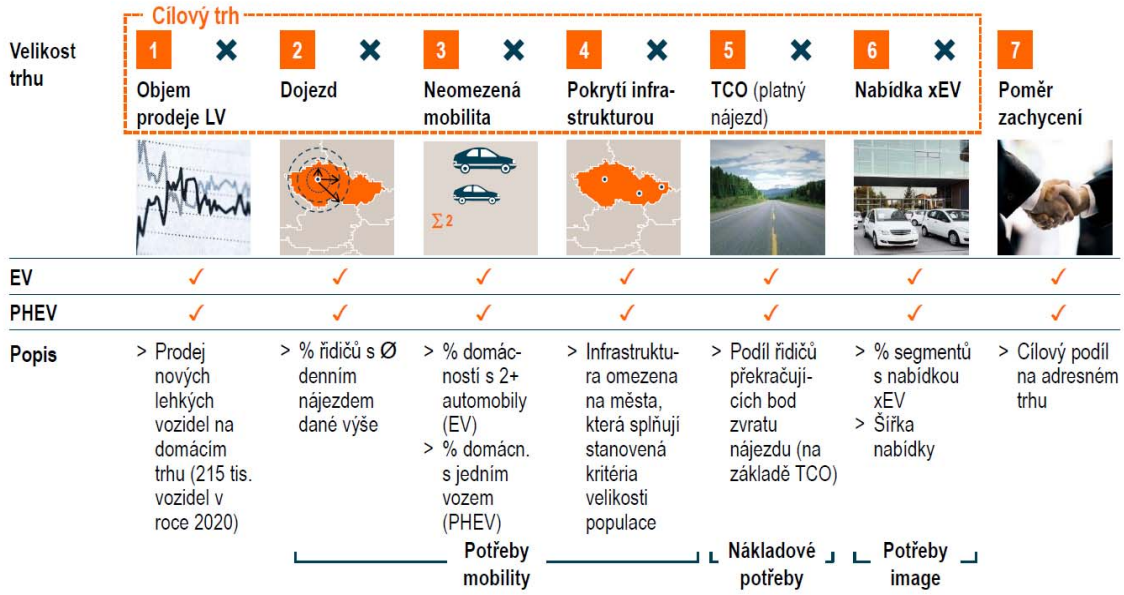
Customer needs	Key factors	Description of the key factors
Image requirements	Range of vehicles (segments, brands)	Availability of various brands across segments is essential to meet users' needs for comfort, size and performance, meeting needs relating to image.

Source: Analysis by Roland-Berger

The potential prediction methodology is therefore based on meeting key customer needs. They can be combined to reach a decision on the purchase of an electric car, or the size of the market (sales) in the Czech Republic.

The analysis arrives at an estimate of vehicle sales through successive steps - starting the expected volume of vehicle sales in the relevant segment (light vehicles) from which the percentage of drivers making an average daily drive of the given range is selected. In the case of all-electric vehicles (BEV), only their acquisition by households which also have another vehicle with a combustion engine was taken into consideration, in the case of PHEV this condition did not apply. The development of electromobility is dependent on the availability of charging infrastructure, and therefore in the medium term only population centres of a certain size were considered (where it is assumed that the infrastructure will be developed first, and also many electric car models are designed as urban electric vehicles). Other criteria are costs (based on an analysis of the total costs - TCO) and the availability of supply of different models and segments. The methodology is illustrated by the figure below.

Figure 10 Methodology for predicting potential sales of electric vehicles



Source: Analysis by Roland-Berger

Target market

Market size 1 Volume of LV sales 2 Range 3 Unlimited mobility 4 Infrastructure coverage 5 TCO 6 xEV offer 7 Success rate

Description Sale of new light vehicles in the domestic market (215 000 vehicles in 2020)

% of drivers with average daily journeys in the range above

% of households with 2+ cars (EV) % of households with one car (PHEV)

Infrastructure limited to towns meeting the criteria set for population size

Proportion of drivers passing the breakeven point (based on TCO)

% of segments with xEV offer Wide range

Target share on the market

Need for mobility Costs Image

Baseline scenario (base case)

The starting point for the analysis was a base case derived from the existing situation, i.e. zero regulation (support) for the development of electromobility. Developments in sales volumes depend on purely market factors or the development of parameters which influence decisions on car purchases. A more detailed description of these factors and their impact is shown in the figure and table below.

Figure 11 Key market factors in the electromobility sector

Source: Analysis by Roland-Berger

Key factors in the xEV market

Mobility needs Range and limited mobility Infrastructure coverage

Costs (TCO) Petrol price Electricity price Cost of batteries/car Fee for electromobility Maintenance costs Consumption

Image/comfort Global offer of xEV (coverage of segments and range of models on offer)

Table 8 Assumptions underlying electromobility scenarios

Factor	Definitions for the purposes of the projection

Range and limits on mobility	• Because of their limited range per single charge, it is expected that all-electric vehicles will be one of two cars owned by households.
	  ○ By 2020, it is expected that their actual range will be approximately 150 km/charge.
	  ○ By 2025, it is expected that their actual range will be approximately 200 km/charge.
	• In the case of PHEV, their range is expected to be theoretically unlimited, i.e. they can be used as the primary family car.
	• Progress may be advanced by extending range through increasing battery capacity (for example by doubling it), but this factor does weigh on the TCO in the analysis and emphasises the need to improve rapid charging (to keep the duration of rapid charging within acceptable limits) with consequences for the topology and connectivity needs when building a network of charging points.

Infrastructure coverage	• It is assumed that charging infrastructure will be built in stages.
	  ○ Major cities and routes will be covered by 2020 (cities with a population of over 100 000, all regional centres and motorways = 27% of the population).
	  ○ All towns with populations of over 10 000 will be covered by 2025 (131 towns, and increased density in major cities = 52% of the population).
	• Emphasis on rapid and ultra-rapid charging.

Petrol price	• It is anticipated that petrol prices will rise by 1% a year to 2020, with the main driver being the oil price according to the IEA new policy scenario (changes in VAT, consumer tax, higher margins, distribution costs, etc. are not taken into account).
Electricity price	• Only slight increases in the cost of electricity are expected to 2020 (2.9% a year).
Price of batteries/vehicles	• The price of batteries is expected to fall by about 7% as a result of economies of scale and technological progress, but the prediction does not account for revolutionary change (such as new battery technology). • In the case of PHEV, it is expected that batteries will have smaller capacity but a higher unit price as a result of the technology used (higher material demand).

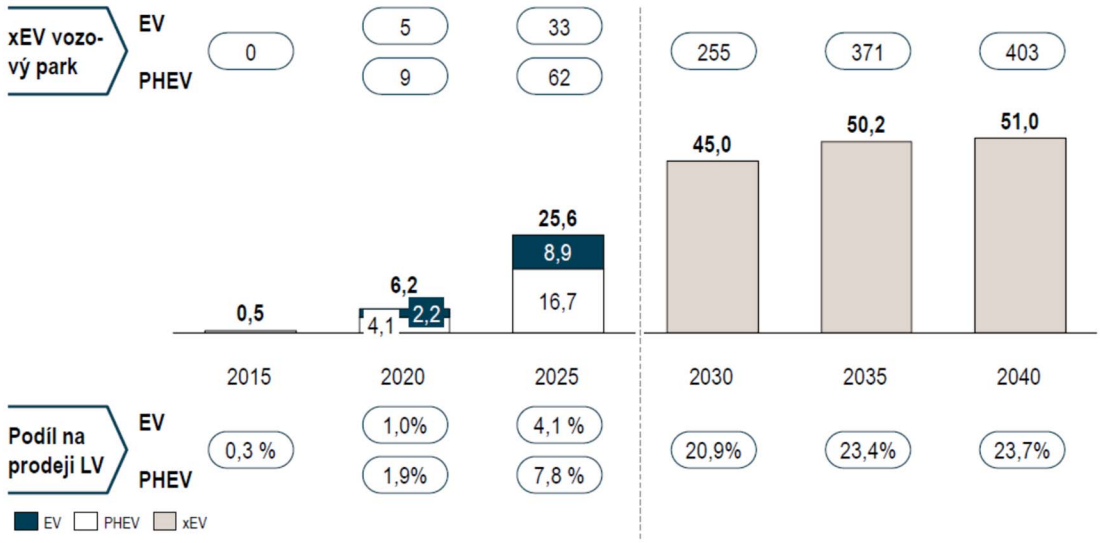
Factor	Definitions for the purposes of the projection
Costs associated with fast charging	• The payment by operators of rapid charging stations for access to the public charging infrastructure (mainly rapid charging stations). • This has been conceived as a sum that fully covers costs related to rapid charging, without the cost of the electricity itself (i.e. the user pays for being able to charge his car outside the home and faster than at home). o For all-electric cars this is expected to be CZK 500/month. o In the case of PHEV, it is not expected that a charge will be imposed (based on the assumption that PHEV can be charged at home.
Maintenance costs	• The projection calculates that maintenance costs will be loser for all-electric vehicles. o Approximately CZK 8 200 /year compared to the ICE B segment, totalling around CZK 11 800/year. • In contrast, PHEV are expected to entail higher costs (combination technology). o CZK 17 300/year compared to the ICE D segment, totalling CZK 16 500/year.
Consumption	• Stable consumption is assumed, both for vehicles with combustion engines and for electric vehicles (any reduction in consumption is compensated for by the higher costs of acquisition/maintenance in combustion engines, no further increase is calculated for electric vehicles due to the high efficiency of the electric powertrain).
Range of models	• Over recent years the range of models has significantly expanded - it now covers all the major market segments - and further expansion of the offer is expected in coming years.

Source: Analysis by Roland-Berger

As has been set out above, the baseline scenario for the development of electromobility is derived from the current state of development, where there has not yet been any commercialisation, nor is this area subject to any positive regulation at state level (with the exception of exemption from road tax). To date only sporadic activities have been implemented, particularly on the part of energy companies and vehicle manufacturers. A typical customer now is an energy company (pilot projects, PR activities) or a direct enthusiast. Interest from companies and normal users in purchasing an electric vehicle as an alternative to combustion engines is in its infancy. Regions and municipalities are also holding back (with some exceptions) and so far there have only been relatively fragmented attempts to create a motivational/support framework for clean transport. However this issue is gradually growing in importance, particularly as regards expectations from the upcoming structural fund period, during which resources should be made available to support measures involving clean transport and alternative fuels.

The scenario anticipates a gradual growth in sales of electric vehicles, with the largest share taken by PHEV, compared to all-electric vehicles.

Figure 12 Baseline scenario of the development of electromobility in the CR, in thousands of vehicles



Note: the technology breakdown is only set out to 2025, vehicles' life expectancy is assumed to be 8 years

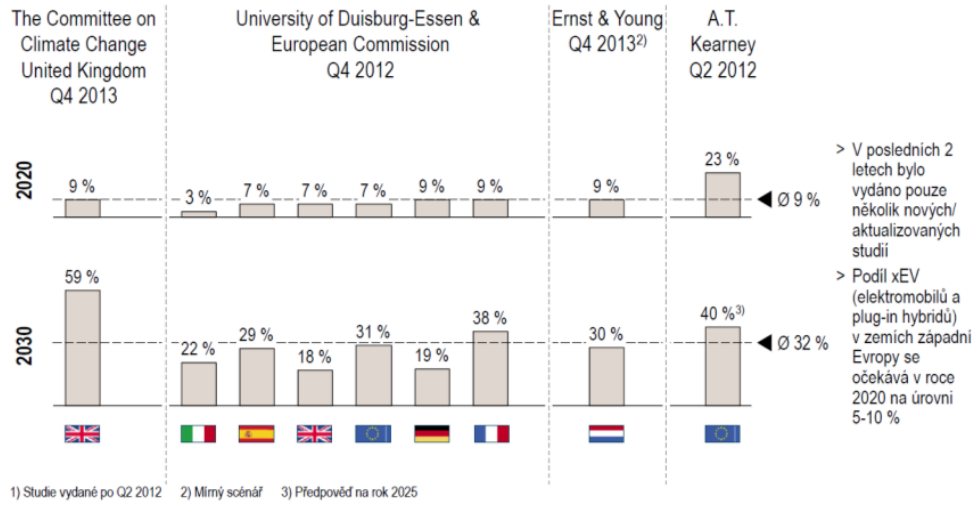
Source: Analysis by Roland-Berger

xEV vehicle fleet

Share of LV sales

While, as expected, it has been confirmed that the CR will be a few years behind western European countries in developing electromobility, it is nevertheless clear that the economic parameters (improvements in the results of TCO analyses) in particular will result in greater penetration of electric vehicles even without state aid. A comparison with read-across studies shows that although progress has been delayed in the Czech Republic, it is not exempt from the expectations in terms of the scale of penetration of electric vehicles in western countries (although different analyses show wide variations).

Figure 13 Market prediction of sales of electric vehicles (% of total annual sales of passenger cars)



Source: Analysis by Roland-Berger

Only a few new/updated studies have been issued over the past 2 years

The proportion of xEV (electric cars and plug-in hybrids) is expected to be 5-10% in western European countries by 2020

Scenario including measures and their impact

The benefits of electromobility (see the relevant chapter of the NAP CM) warrant discussion of the desirability and effectiveness of making it eligible for state aid in order to accelerate its arrival. This approach is logical in the case of a technology on the threshold of commercialisation, where efforts by the state, or the application of state aid, serves to 'kick-start' or 'accelerate' market penetration by helping to overcome initial barriers or develop a market of the necessary size. State aid is subsequently rolled back to allow further technological development to take place on an entirely commercial basis (with the exception of the area of research and development, where the role of the state and public funds is irreplaceable over the long term).

In order to assess the suitability of state aid, three areas of intervention were defined and 4 scenarios emerged from a combination of these, referred to as 'Government involvement I-IV'.

The areas of intervention include:

a) Free parking

This measure is based on the idea that electric vehicles can park for free and are allocated parking places in the centres of major cities. These vehicles are also permitted to use lanes designated for buses and taxis throughout the day.

The effect of this incentive has been calculated at about CZK 5 000/year for the driver of an electric car. This calculation is based on an estimate of the average time taken for

parking/moving and represents a certain ‘evaluation’ of this opportunity on the part of drivers. For the sake of comparison, this amount is more or less equivalent to the cost of an annual season ticket for public transport in Prague.

The costs (the part related to parking) will be borne by parking lot operators (i.e. the municipality or a private parking lot lessee, where it may be more difficult to enforce this measure) in the form of lost profit.

b) Monetary incentives

Monetary incentives are based on the principle of bringing TCO for electric vehicles to the same level of a comparable combustion engine vehicle. The aim is to remove the cost element in the customer’s decision to purchase an electric vehicle. The amount of the incentive is intended to achieve parity for different types of vehicle (BEV and PHEV) and decreases over time, so as the purchase costs of BEV and PHEV and TCO for electric and classic powertrains will naturally converge.

During the early years, this aid is expected to correspond to around CZK 200 000 for each vehicle sold (on average, gradually falling over time as the difference in the TCO decreases).

c) Accelerating the development of public infrastructure.

Lack of charging infrastructure is seen as one of the key barriers to the development of electromobility. Apart from requirements from the perspective of extending the range, it also plays an important psychological role by removing drivers’ concerns about the limited range of electric vehicles and increases the potential use of the vehicles over distances that exceed the range achievable in a single charge.

It follows from previous analyses that the key factor for publicly accessible sites is to provide rapid and ultra-rapid charging infrastructure (by type of location). This demand is also confirmed by practical experience from pilot projects.

However, investment in charging infrastructure is burdened with a high level of risk and uncertainty. Logically, it must to a certain extent ‘precede’ the market, as the existence of a basic network is enabling precondition for the commercialisation of electromobility, but at the same time, particularly at the outset, it does not offer a sufficient return on investment owing to the small number of vehicles on the streets. Charging points are gradually being built, but progress is extremely slow and is particularly limited by the volume of funding investors are willing to invest in such a high risk project. The level of risk is due to the following factors in particular:

- A major part of the investment into the charging infrastructure, particularly for rapid and ultra-rapid charging, comprises the costs of providing the necessary performance at the site. These costs are complicated by property rights, as the structure is generally built on land belonging to a third-party (complications in terms of building rights) or through investment in an existing third-party structure (technical improvement issues) with consequences in terms of accountancy and tax (the tax deductibility of funds invested in this way, depreciation period, the possibility of disposing of the property, etc.). The

charging station itself is a movable asset and in terms of the operator it is less of a risk because it remains his property and (unlike an investment into energy output) may be moved to another location if necessary.

- The owner of land or a building is generally not sufficiently motivated to build charging infrastructure (in general he is not interested in operating it) and any available stimuli are insufficient to outweigh the potential complications. Another problem is that the construction of the infrastructure, particularly at an early stage, is not commercial (profitable) in a normal time frame, so it is difficult to motivate a land owner, for example through an attractive rent from the charging station operator, or similar compensation.

One of the consequences (i.e. also of the expected development without support) of the abovementioned risks is the fact that investors, for the reasons referred to above, tend to focus on the most attractive locations (this attractiveness may be due both to the geographic location, or public expectations, or possibly the greatest potential in terms of promotion).

When building public charging infrastructure, state aid, by reducing the risk for investors, has the potential to speed up construction over time, but also (in terms of the number of charging points built and their geographic location) to ensure that the charging point network is built, at least at the beginning, in a conceptual and strategic manner. In addition to direct subsidies, aid in the form of permits to use state-owned land may be considered (e.g. sites owned by RMD, RIA, etc.), which might be allocated on a long-term basis (on a rental basis) for the purpose of building and operating charging infrastructure, thereby eliminating the risk (or part of the risk) arising from complicated ownership relations when building the charging points described above.

The cost of laying supply lines on site for a single fast charging point is estimated at approximately CZK 750 000 - 1 500 000 (although we can expect significant variations in costs at different sites due to specific local conditions). Given that there will probably be a limited number of suitable sites on which to build backbone charging points, it makes sense to install a number of charging points in a single location (which should also result in lower unit costs for laying supply lines to these points). This concept is also logical from the perspective of users who become used to site equipped for charging and will expect access to instant charging even in a situation where another user is charging an electric car (sites serving as a charging ‘hub’ for a number of separate cars). It is expected that 500 - 1 000 sites throughout the territory of the CR will be needed to create a sufficiently dense network.

The advantage of infrastructure incentives is their long-term effect (establishment of connections with lifetimes of tens of years, provided there is no risk of their fast becoming technologically obsolete or wearing out, long-term operation of charging stations on the site), i.e. this confirms the logical approach that public funds should support the commercialisation of certain technological investments through initial aid and have a long-term effect without the need for operating aid.

Incentives to build infrastructure were also supported as an effective tool to promote the development of electromobility in a survey of expert opinion on the effectiveness of various aid

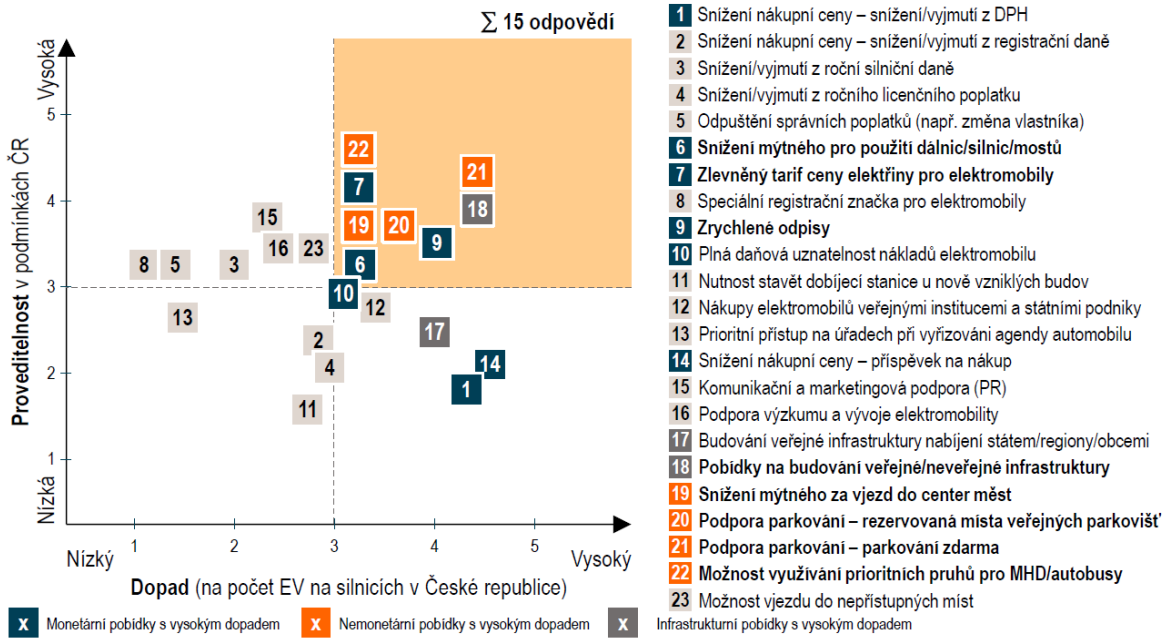
instruments in terms of their impact on increased numbers of vehicles in the streets and the feasibility of the instrument in the Czech Republic. The expert discussions laid down the prioritisation of electromobility incentives in the CR (Figure 14).

d) Tax and environmental

Following on from the growing share of electric vehicles in the car fleet in the CR, the collection of excise duty and VAT has been reduced as a result of the substitution of hydrocarbon fuels by electricity. Given the fact that the development of electromobility is in its infancy in the CR, these effects are still very small - in 2014 the cumulative shortfall in tax revenues was less than 5.5 million CZK. We can expect more significant losses at the point when a massive and commercial development of electromobility has occurred, which will, at the same time, enable the introduction of appropriate solutions to cover the shortfall in taxes for hydrocarbon fuels (one option might entail compensation in the form of a reduction in aid for biofuels). A suitable solution will be proposed in response to market developments when the NAP CM is updated. In 2020, the shortfall in the collection of excise duty may reach CZK 250 million.

In terms of emissions, we can assume that the substitution of electricity for diesel and gasoline in approximately 300 electric vehicles will result in savings in emissions from transport amounting to around 700 tonnes of CO_2. In 2020 these savings may be as much as 2 900 000 tonnes of CO_2.

Figure 14 Prioritisation of incentives: results of the expert questionnaires



1 reduced purchase price – reduction/exemption from VAT

2 reduced purchase price – reduction/exemption from registration tax

3 reduction/exemption from annual road tax

4 reduction/exemption from the annual licence fee

5 exemption from administrative fees (e.g. on changing ownership)

6 reduction of tolls for motorways/roads/bridges

7 reduced tariff electricity prices for electric cars

8 special registration labels for electric cars

9 accelerated depreciation

10 full tax relief on costs for electric cars

11 requirement to build a recharging station in new buildings

12 purchases of electric vehicles by public institutions and state companies

13 priority access to offices to deal with car-related administration

14 reduced purchase price – contribution to the purchase

15 communication and marketing support (PR)

16 support for R&D in electromobility

17 public recharging infrastructure built by the state/regions/municipalities

18 incentives to build public/private infrastructure

19 reduced tolls for trips to city centres

20 support for parking – reserved places in public parking lots

21 support for parking – free parking

22 access to priority lands reserved for public transport/buses

23 access to inaccessible areas

Impact (on the number of EV on the Czech roads)

Feasibility in the environment of the Czech Republic

Low high

High impact monetary incentives High impact non-monetary incentives

The following scenarios for government involvement, based on a combination of the areas of intervention set out above were prepared for further quantification.

Table 9 Overview of electromobility scenarios

Faktory			Výchozí scénář	Zapojení vlády (ZV): ZV I – Parkování	ZV II – Parkování & podpora koncového zákazníka	ZV III – Parkování & podpora infrastruktury	ZV IV – Parkování & podpora konc. zákaz. & podpora infrastruk.
Potřeby mobility	**Dojezd**		> Omezený dojezd u EV > Žádné nevýhody u PHEV	> Omezený dojezd u EV > Žádné nevýhody u PHEV	> Omezený dojezd u EV > Žádné nevýhody u PHEV	> Omezený dojezd u EV > Žádné nevýhody u PHEV	> Omezený dojezd u EV > Žádné nevýhody u PHEV
	Neomezená mobilita		> EV jako jedno ze dvou aut v domácnosti > PHEV jako primární auto v domácnosti	> EV jako jedno ze dvou aut v domácnosti > PHEV jako primární auto v domácnosti	> EV jako jedno ze dvou aut v domácnosti > PHEV jako primární auto v domácnosti	> EV jako jedno ze dvou aut v domácnosti > PHEV jako primární auto v domácnosti	> EV jako jedno ze dvou aut v domácnosti > PHEV jako primární auto v domácnosti
	Pokrytí infra-strukturou		> Vybudování infrastruktury ve fázích (základní bude dokončena do r. 2025)	> Vybudování infrastruktury ve fázích (základní bude dokončena do r. 2025)	> Vybudování infrastruktury ve fázích (základní bude dokončena do r. 2025)	> **Zrychlené vybudování infrastruktury (základní bude dokončena do r. 2020)**	> **Zrychlené vybudování infrastruktury (základní bude dokončena do r. 2020)**
Nákladové potřeby (TCO)	**Tržní faktory**		> Mírný růst paliv/ elektřiny > Očekávaný pokles ceny baterií	> Mírný růst paliv/ elektřiny > Očekávaný pokles ceny baterií	> Mírný růst paliv/ elektřiny > Očekávaný pokles ceny baterií	> Mírný růst paliv/ elektřiny > Očekávaný pokles ceny baterií	> Mírný růst paliv/ elektřiny > Očekávaný pokles ceny baterií
	Regulační faktory		> Žádné monetární pobídky > Žádné nemonetární pobídky	> **Nemonetární pobídky (parkování/ bus/ taxi pruhy)**	> **Nemon. pobídky (parkování/ bus/ taxi pruhy)** > **Monetární pobídky** (dorovnání rozdílu TCO)	> **Nemonetární pobídky (parkování/ bus/ taxi pruhy)**	> **Nemon. pobídky (parkování/ bus/ taxi pruhy)** > **Monetární pobídky** (dorovnání rozdílu TCO)
Potřeby image/ pohodlí	**Nabídka EV** (segmenty, značky)		> Široká nabídka: A/B/C u EV, C/D/E u PHEV > Všichni klíčoví OEM jsou aktivně zapojeni	> Široká nabídka: A/B/C u EV, C/D/E u PHEV > Všichni klíčoví OEM jsou aktivně zapojeni	> Široká nabídka: A/B/C u EV, C/D/E u PHEV > Všichni klíčoví OEM jsou aktivně zapojeni	> Široká nabídka: A/B/C u EV, C/D/E u PHEV > Všichni klíčoví OEM jsou aktivně zapojeni	> Široká nabídka: A/B/C u EV, C/D/E u PHEV > Všichni klíčoví OEM jsou aktivně zapojeni

Source: Analysis by Roland-Berger

Government involvement (GI)

Factors Mobility needs Cost (TCO) Image/comfort

Range unlimited mobility infrastructure coverage market factors regulatory factors EV offer (segments, brands)

Reference scenario Limited range for EV No advantages for PHEV EV as one of the cars in the household PHEV as the primary car in the household Infrastructure built in stages (the main stage will be completed in 2025) Slight rise in fuel/electricity costs Expected fall in battery prices No monetary incentives No non-monetary incentives Wide range: A/B/C for EV, C/D/E for PHEV All key OEM are actively involved

ZV I Parking Limited range for EV No advantages for PHEV EV as one of the cars in the household PHEV as the primary car in the household Infrastructure built in stages (the main stage will be completed in 2025) Slight rise in fuel/electricity costs Expected fall in battery prices **Non-monetary incentives (parking/bus/taxi lanes)** Wide range: A/B/C for EV, C/D/E for PHEV All key OEM are actively involved

ZV II Parking & support for the customer Limited range for EV No advantages for PHEV EV as one of the cars in the household PHEV as the primary car in the household Infrastructure built in stages (the main stage will be completed in 2025) Slight rise in fuel/electricity costs Expected fall in battery prices **Non-monetary incentives (parking/bus/taxi lanes)** **Monetary incentives** (covering the difference in TCO) Wide range: A/B/C for EV, C/D/E for PHEV All key OEM are actively involved

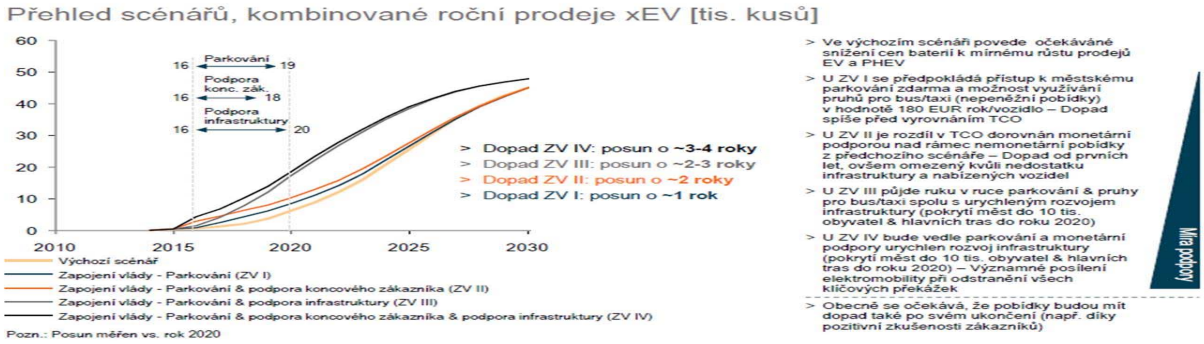
ZV III Parking & support for infrastructure Limited range for EV No advantages for PHEV EV as one of the cars in the household PHEV as the primary car in the household **Accelerated construction of infrastructure (the main stage will be completed in 2020)** Slight rise in fuel/electricity costs Expected fall in battery prices **Non-monetary incentives (parking/bus/taxi lanes)** Wide range: A/B/C for EV, C/D/E for PHEV All key OEM are actively involved

ZV IV Parking & support for the customer & support for infrastructure Limited range for EV No advantages for PHEV EV as one of the cars in the household PHEV as the primary car in the household **Accelerated construction of infrastructure (the main stage will be completed in 2020)** Slight rise in fuel/electricity costs Expected fall in battery prices **Non-monetary incentives (parking/bus/taxi**

lanes)	**Monetary incentives** (covering the difference in TCO)	Wide range: A/B/C for EV, C/D/E for PHEV
	All key OEM are actively involved	

As stated above, the scenarios are based on the assumption that support is provided for only a limited period, with the aim of accelerating the commercial take-up of electromobility. As the reasons for the support cease to apply, it will be phased out. The impact of the individual scenarios on the curve showing the penetration of electric vehicles is illustrated in the figure below.

Figure 15 Overview of scenarios, combined annual sales of electric vehicles (thousands of cars)



Overview of scenarios, combined annual sales of xEV (thousands of units)

Parking

Customer support

Infrastructure support

Impact of ZV IV: shift of 3-4 years

Impact of ZV III: shift of 2-3 years

Impact of ZV II: shift of 2 years

Impact of ZV I: shift of 1 year

Reference scenario

Government involvement – Parking (ZV I)

Government involvement – Parking & customer support (ZV II)

Government involvement – Parking & infrastructure support (ZV III)

Government involvement – Parking & customer support & infrastructure support (ZV VI)

NB the shift is measured against the 2020 situation

In the reference scenario, the expected fall in the price of batteries will result in a slight growth in sales of EV and PHEV

In ZVI free access would be provided to public parking places and to dedicated bus/taxi lanes (non-monetary incentives) valued at around EUR 180 per year/vehicle – The impact will tend to compensate TCO

In ZVII the difference in TCO is covered by monetary support exceeding the non-monetary incentives in the previous scenario – Impact from the first years, although limited due to the limited infrastructure and range of models offered

In ZV III access to parking and bus/taxi lanes will be provided alongside accelerated infrastructure development (covering cities with populations up to 10 000 and the major roadways by 2020)

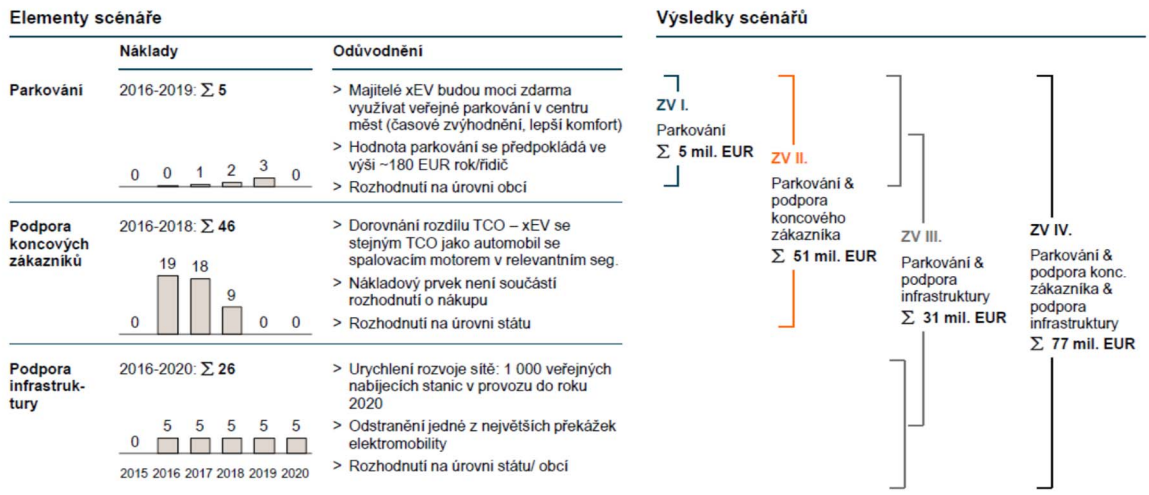
In ZV IV access to parking and monetary incentives will be accompanied by accelerated infrastructure development (covering cities with populations up to 10 000 and the major roadways by 2020) – significant progress in electromobility through eliminating all key obstacles

It is generally expected that incentives will continue to have an impact even after they are discontinued (e.g. due to positive experiences of customers)

Source: Analysis by Roland-Berger

The figure above is an illustrative example of support to the year 2020, although it is currently difficult to predict whether some form of support will be desirable/needed after 2020. Any adjustment of aid after 2020 will be addressed when the NAP CM is updated after a performance review. The individual scenarios differ in terms of the level of the aid needed, which is summarised in the figure below.

Figure 16 Overview of scenarios of 'Government involvement' and a quantification of the volume of state aid



Elements of the scenario

Costs

Parking

Customer support

Infrastructure support

Explanation

xEV owners will be able to use public parking in city centres free of charge (saving time, convenience)

The value of the parking is estimated around EUR 180 per year/driver

Decision taken at municipal level

Covering the difference in TCO – xEV with the same TCO as internal combustion engines in the relevant segment

The cost element is not part of the decision to buy

Decision taken at government level

Accelerating network development: 1 000 public recharging stations operating by 2020

Removing one of the greatest obstacles to electromobility

Decision taken at government/municipal level

Results of the scenarios

ZV I parking EUR 5 million

ZV II Parking and customer support EUR 51 million

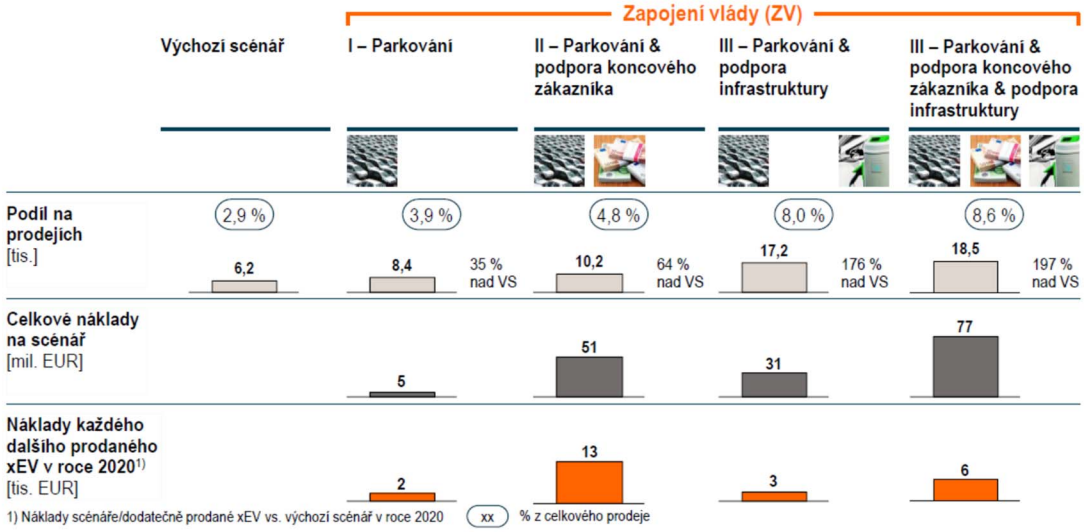
ZV III Parking and infrastructure support EUR 31 million

ZV IV Parking and infrastructure support and customer support EUR 77 million

Source: Analysis by Roland-Berger

As summarised in the figure below, comparing scenarios in terms of costs and benefits (measuring the amount of support needed to achieve the sale of an additional vehicle) is a key parameter for prioritising incentives,.

Figure 17 Comparison of scenarios – indicative calculation of costs to 2020 (million €)



Source: Analysis by Roland-Berger

Government involvement

Reference scenario I-Parking II-Parking and customer support III-Parking and infrastructure support III-Parking and customer support and infrastructure support

Share in sales (thousands)
Total cost of the scenario (EUR million)
Costs of each additional xEV sold in 2020 (EUR thousands)

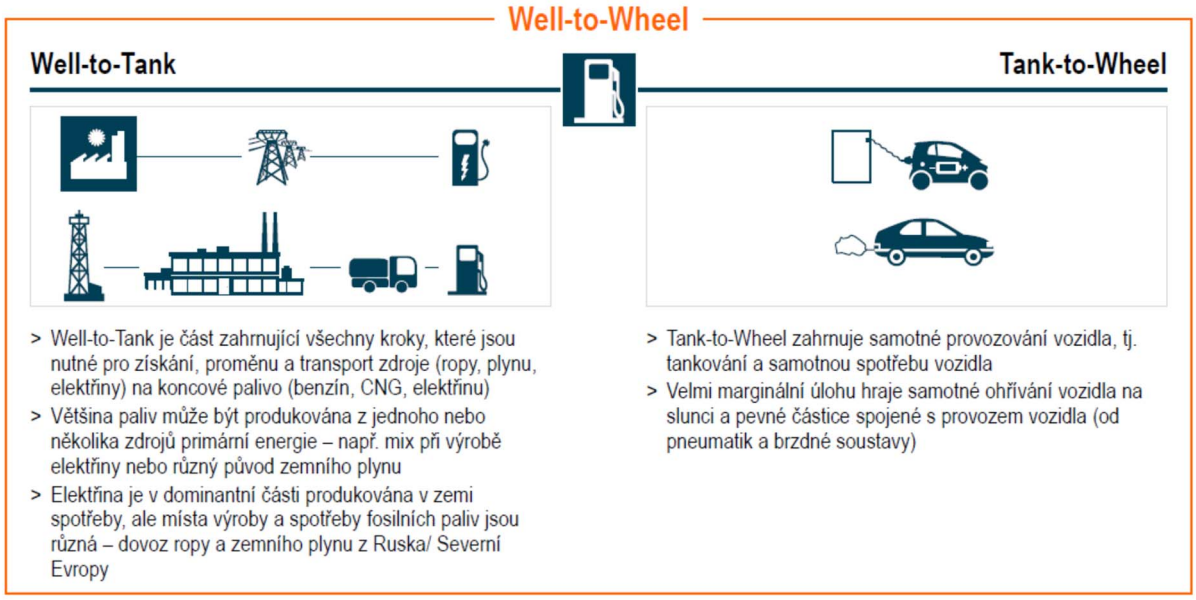
The comparison of the effectiveness of the scenarios shows that the most effective form of support is a combination of parking and support for the charging infrastructure. In addition to having a direct impact (reducing costs, facilitating access to the charging infrastructure) both instruments also have a strong psychological element, because they represent forms of motivation that users see as an extremely powerful incentive in that they remove some of the main barriers to the development of electromobility. Support for charging infrastructure is, moreover, a measure which encourages investment from private investors by reducing the risks associated with investing in a public network of charging points. In terms of comprehensive support for electromobility, we would nevertheless recommend a combination of a number of instruments, because synergy means they can achieve a stronger impact in combination than if implemented separately. A typical example is combining the construction of infrastructure with an incentive to purchase a vehicle (targeted at, for example, central or local government authorities), as this not only provides a market stimulus but also has an important promotional and educational effect (central and local governments set an example, the general public gets to see how the concept of electromobility works 'in real life', etc.).

3.2.1.3 Quantification of emission savings under different scenarios for the development of electromobility

Analysis of the potential sales of electric vehicles shows that in the reference scenario (scenario with no additional measures) we can assume that up to 7 000 electric vehicles (BEV and PHEV) will be operational in the Czech Republic by 2020, with this number increasing substantially over future years, which will have an appropriate environmental impact.

A comprehensive analysis of the overall chain, a 'Well-to-Wheel' analysis, is generally used to calculate the environmental benefits of electromobility. The concept is based on the idea that the environmental impact of running a car comprises two basic parts - the production of the fuel and the operation itself, which can be illustrated as follows. Three main pollutants were monitored - CO_2, CO and NO_x.

Figure 18 Well-to-Wheel: overview of the concept



Source: Analysis by Roland-Berger

Well-to-Tank is the part covering all the steps necessary to extract, refine and transport sources (oil, gas, electricity) to the final fuel (petrol, CNG, electricity)

Most fuels can be produced from one or more primary energy sources – e.g. a mix when generating electricity or natural gas from different sources

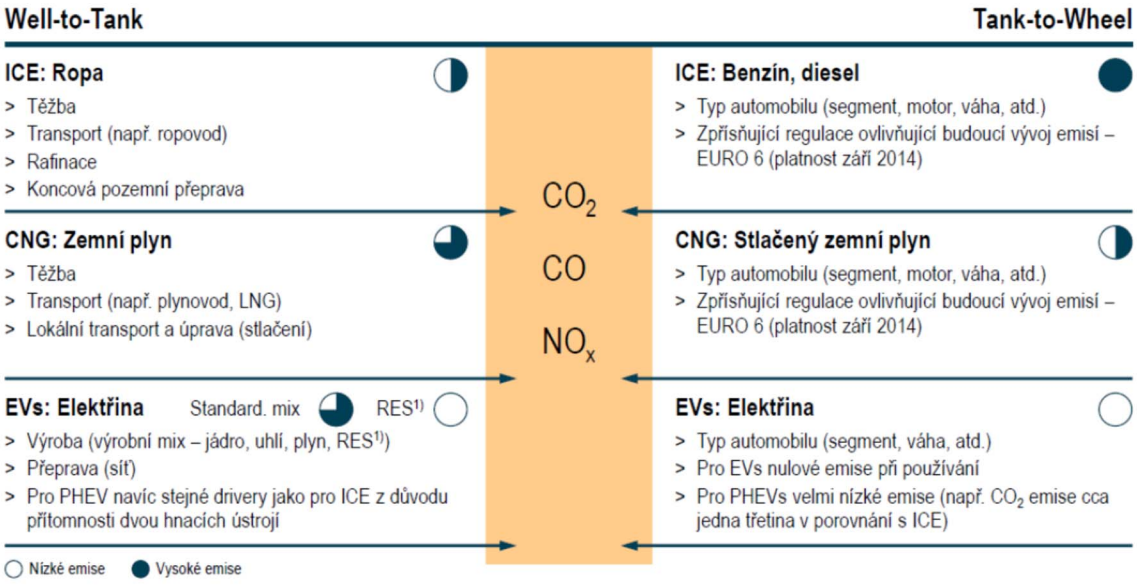
Most electricity is produced in the country in which it is consumed, but fossil fuels are produced and consumed in a variety of different places – imports of oil from Russia/Northern Europe)

Tank-to-Wheel covers the actual operation of the vehicle, i.e. filling the tank and the vehicle's actual consumption

Warming the vehicle in the sun and the fixed parts associated with the operation of the vehicle (from the tyres to the braking system) play a very marginal role

The main factors influencing changes in emissions primarily differ by type of fuel. Electric vehicles are completely emission-free in terms of their operation ('Tank to Wheel'), whereas in terms of fuel the key factor is the fuel mix used to generate the electricity (this part is emission-free in a situation where the electricity is generated from renewable sources).

Figure 19 Overview of the main emission sources in the value chain



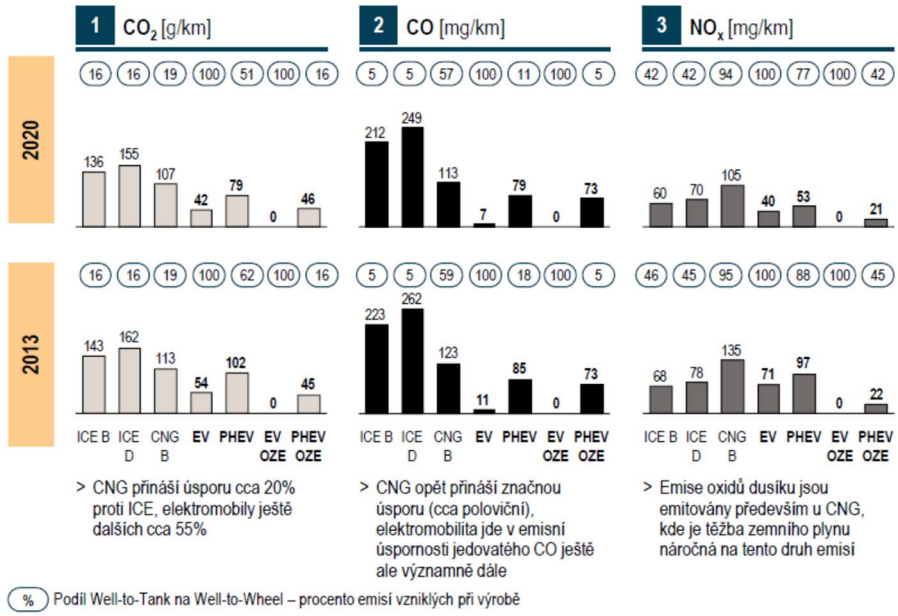
Source: Analysis by Roland-Berger

Well-to-Tank	Tank-to-Wheel
ICE:Oil	ICE: Petrol, diesel
Extraction	
Transport (e.g. pipeline)	Type of car (segment, engine, weight, etc.)
Refining	Stricter regulations affecting future emissions-
Final preparation	EURO 6 (valid from September 2014)
CNG: Natural gas	CNG: Compressed natural gas
Extraction	Type of car (segment, engine, weight, etc.)
Transport (e.g. pipeline, LNG)	Stricter regulations affecting future emissions-
Local transport and treatment (compression)	EURO 6 (valid from September 2014)
EVs: Electricity Standard mix RES	EVs: Electricity
Production (production mix – nuclear, coal, gas, RES)	Type of car (segment, engine, weight, etc.)
Preparation (network)	For EVs no emission on use
For PHEV the same drivers as for ICE due to two propulsion units	For PHEVs very low emissions (e.g. CO2 emissions around one-third in comparison with ICE)

To calculate the emission intensity of the electricity generation mode, the ČEZ emission factor for power generation was used, as sufficiently detailed data were available for the requisite period of time (i.e. not only historical, but also long-term predictions of changes in the fuel mix). For illustration, the hypothetical 'maximum' impact of savings has also been calculated for a situation where electricity is generated only from renewable sources (the 'RES' option).

The analysis shows that electric vehicles mainly benefit from major savings in emissions of carbon, oxides and nitrogen. A comparison of emissions of selected pollutants for different types of vehicles in the reference time periods of 2013 and 2020 is summarised in the graph below. For the sake of completeness, we would add that, due to the composition of the fuel mix in the CR, we do not expect electromobility to have a positive impact on SO_2 emissions (which we expect to increase by hundreds of tonnes over the short-term before gradually being eliminated by expected changes in the structure of the fuels used, and in particular by a decline in coal-fuelled power generation, the quantities at issue, however, represent only a small proportion of overall emissions in the CR).

Figure 20 Well-to-wheel, total pollutant emissions



Source: ČEZ; European Commission; U.S. Department of Energy; OEMs; Roland Berger

CNG brings savings of around 20% compared to ICE, electric vehicles a further 55%

CNG again brings significant savings (approximately 50%) but electric cars bring significant additional savings in emissions of toxic CO

Nitrogen oxide emissions are mainly produced from CNG, where the extraction of natural gas is demanding on this type of emission

% share well-to-tank to well-to-wheel – percentage of emissions from production

In the case of the baseline scenario (i.e. without government measures) the effects can be quantified as follows:

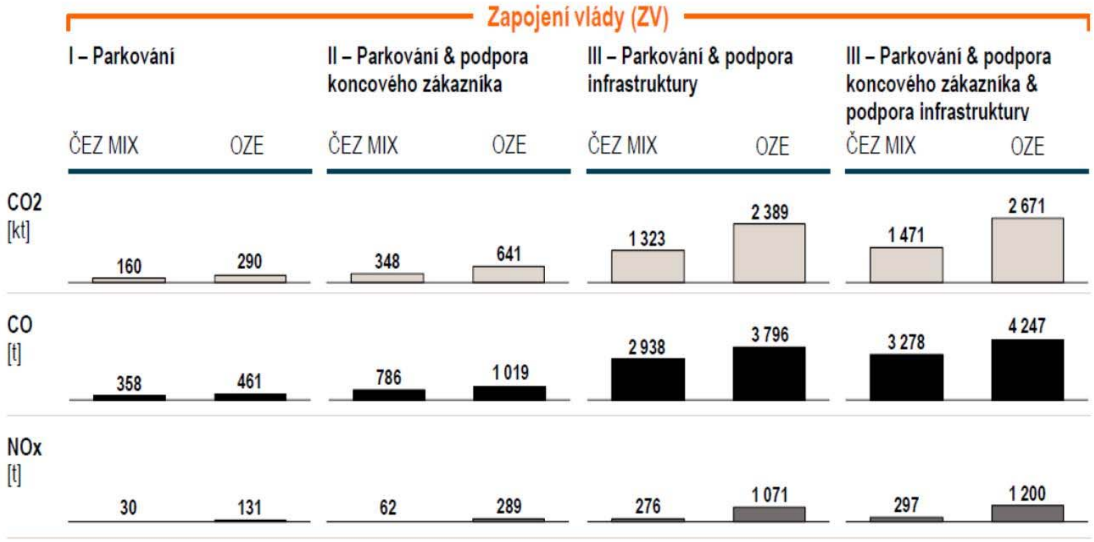
Table 10 Quantification of emission savings in the baseline scenario

	ČEZ MIX		RES	
Pollutant	2015-2020	2015-2040	2015-2020	2015-2040
CO_2 (kt)	-35	-6 041	-70	-10 867
CO (t)	-86	-13 351	-111	-17 271
NO_x (t)	-1	-1 317	-32	-4 865

Source: Analysis by Roland-Berger

The benefit under the different scenarios with government involvement, which are described in detail in the previous part of the Action Plan, can be quantified in the same way. Their effects, as compared to the baseline scenario, are described in the figure below.

Figure 21 Comparison of scenarios - quantification of emissions saved, 2015-2040



Source: Analysis by Roland-Berger

Government Involvement (GI)

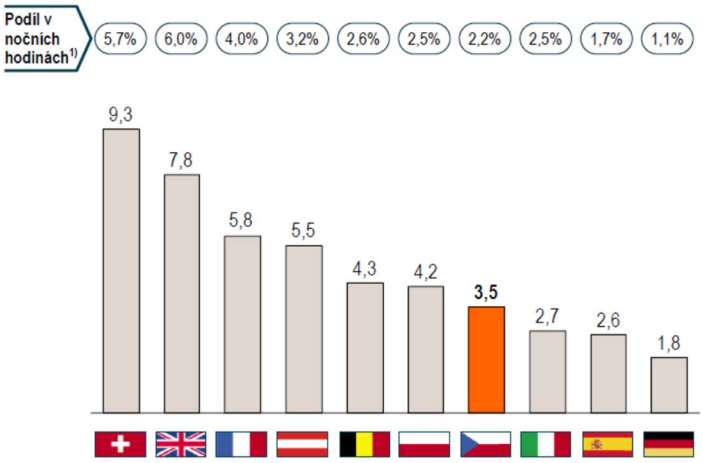
I-Parking II-Parking and customer support III-Parking and infrastructure support III-Parking and customer support and infrastructure support

3.2.1.4 Noise reduction

Noise emissions are another transport-related problem, particularly in built-up areas. A number of areas have already implemented local measures to reduce noise. Being significantly quieter than vehicles with combustion engines, electric vehicles can make an important contribution to reducing noise pollution.

Within Europe, the Czech Republic is one of the countries most affected by noise, as is illustrated below.

Figure 22 Proportion of the population exposed to noise greater than 55 dB during the daytime [%]



[1)] Proportion of the population exposed to noise greater than 40 dB during the night
Source: European Commission, Roland Berger
Night-time share

From a medical perspective, long-term exposure to excessive noise can cause stress, neuroses and high blood pressure. In terms of the weight of traffic through the main arteries of densely populated areas, Prague has long been one of the worst affected cities in the Czech Republic, as shown in the figure below.

Figure 23 Noise map of the centre of Prague

Source: Strategic noise map of Prague (Ministry of Health)

Electromobility goes a long way to addressing the issue of noise in cities, particularly at low speeds of up to 30 and 50 km/h. At higher speeds, when tyre/aerodynamic noise increases significantly, the advantage given by electromobility diminishes. Paradoxically, it is a disadvantage of electric vehicles that their quiet engines may, in turn, present a problem for other road users, which is why the European Union has presented new legislation requiring all manufacturers of electric vehicles to install for safety reasons an audible warning system (AVAS) in their vehicles from 2019.

3.2.2 Road vehicles powered by natural gas and other types of gas

Natural gas (CNG/LNG)

Strategic documents and completed analyses show that natural gas, in the form of CNG or LNG is (at least in the medium-term) the best prepared alternative fuel for transport. This fact is confirmed, for example, by the feasibility study conducted by CDV, v.v.i., Brno (Dopady plynofikace MHD - Impacts of the gasification of the public transport system), or European projects such as: INGAS (Integrated GAS Powertrain Collaborative Project), the GasHighWay project or the HELIOS research project. A significant advantage of using natural gas in transport is its long-term availability, because the world's natural gas reserves will be exhausted roughly 50 to 100 years later than the world's oil reserves.

This is also the reason why the State Energy Policy identifies natural gas for use in transport as one of the segments of future higher natural gas consumption, so we can expect interest in natural gas in transport continue growing steadily in the CR, over the coming years (to 2040 at least).

The Czech Republic already has a relatively long experience of using natural gas in transport, and it is among those European countries (Italy, Germany, Austria, Sweden, Spain, France, etc.) that are intensively developing this form of alternative fuel for use in road transport. This involves the further development of its infrastructure of compressed natural gas filling stations (more than 8 companies are active in this area in the CR), an increase in the number of cars, buses and off-road vehicles powered by NG (with a total of almost 9 000 at the end of 2014) and a wide range of over 60 models of mass-produced vehicles on offer from different manufacturers.

Further progress in the gasification of transport in the CR requires the completion of a stable legislative environment covering all aspects of the use of gas in transport. This entails completing the revision of technical regulations and standards, including amending decrees and laws in order to remove barriers and improve conditions for traffic, parking, garaging and maintenance of gas-powered cars, thereby gradually improving the appeal of this type of alternative transport for the general public. One advantage for the future successful development of gas-powered cars is (from a safety perspective) is the fact that the technology for CNG vehicle fuel delivery system has now been mastered, including safe and reliable filling systems. This is attributable to the fact that self-service CNG refuelling points have been in operation in the CR for 8 years now.

LPG

As regards the use of other types of gas in transport in the CR, the market segment covering LPG vehicles should not be ignored, as the number of filling stations and the number of vehicles powered by LPG currently considerably outstrips today's CNG infrastructure. However, in the Czech Republic LPG is almost exclusively a petroleum product, since its production during gas extraction is practically non-existent in the CR. At the same time, any transport of LPG obtained from the parallel extraction of natural gas is difficult - particularly given the huge distance of the transport fuel market in the CR from the point of extraction of natural gas (where higher hydrocarbons are also extracted in extremely limited quantities - generally for local use). It is also expected - with regard to the expected gradual decline in the share of conventional fuels on the transport market in the CR - that the production of LPG (as a product of refining) will gradually decline in a similar way, thereby rendering any support for its future development meaningless.

Dieselgas

This is a technology based on the principle of mixing two different fuels. It works by injecting a reduced amount of diesel into the engine's working space and compensating for the difference by delivering gas (generally LPG, but some applications also use CNG). The result is higher engine performance, traction even at lower speeds, reduced operating costs and, most importantly, reduced pollutant emissions.

This type of powertrain has a long history (for example, in Australia, Canada and the USA). Over recent years, as discussions on reducing emissions and making driving more economical have intensified, it has also found its way to Europe. Vehicles with dieselgas powertrains are available directly from the manufacturers, and a number of companies also offer them as add-ons.

Biomethane

As far as biomethane is concerned, its development will mainly depend on the level of state aid for renewable sources and, in terms of its use in transport, the same applies to biomethane as to CNG, because biomethane is de facto a replacement for natural gas as concerns delivery to the gas supply network, so its use in transport is extremely positive both in terms of recoverability and in terms of emissions, as can be seen in figure 7.

In contrast, biogas - as the basis for biomethane - will probably be used in transport only locally and on a small scale, as it contains around 50% ballast (100% biogas produces only about a half of the volume of biomethane) and the size of the gas tanks means that it is not worthwhile to carry 50% ballast.

In 2012, the Government approved the Biomass Action Plan in the CR for the period 2012-2020, managed by the MA. In this Action Plan, biomethane is seen as an alternative output for biogas plants, with its production also having to be assessed in terms of food and energy outputs, which may have certain negative associations, particularly in crop production from the

perspective of soil protection (intensive cultivation of corn and oilseed rape). There is potential for biogas plants to be developed in the agricultural sector, on livestock farms. This production can be used as heat output and also solves waste management problems. Although it can be used at the point of production as gaseous fuel for motor vehicles, it is more often supplied to the gas network.

The Biogas Action Plan in the CR recommends establishing suitable conditions for the use of biogas/biomethane as engine fuel for mobile vehicles, which at the same time helps meet obligations in the field of renewable energy in transport. The plan assumes that biogas will play a more important role in the decentralised production of power and heat, while predicting a smaller role for its use in transport. Finally, we can find recommendations for further research into biogas plants and adjustments to biomethane production technology. Industrial engines used in cogeneration units are better able to cope with variable gas mixtures and multiple undesirable substances than normal natural gas-powered car engines, provided they are properly designed and adjusted. The advantage of internal combustion engines is instant power regulation, which compensates for a momentary shortage or surplus of electricity in the grid; we would expect the further development of renewable energy sources, distributed power generation and the development of high performance charging points to create a need for this type of compensation.

Summary

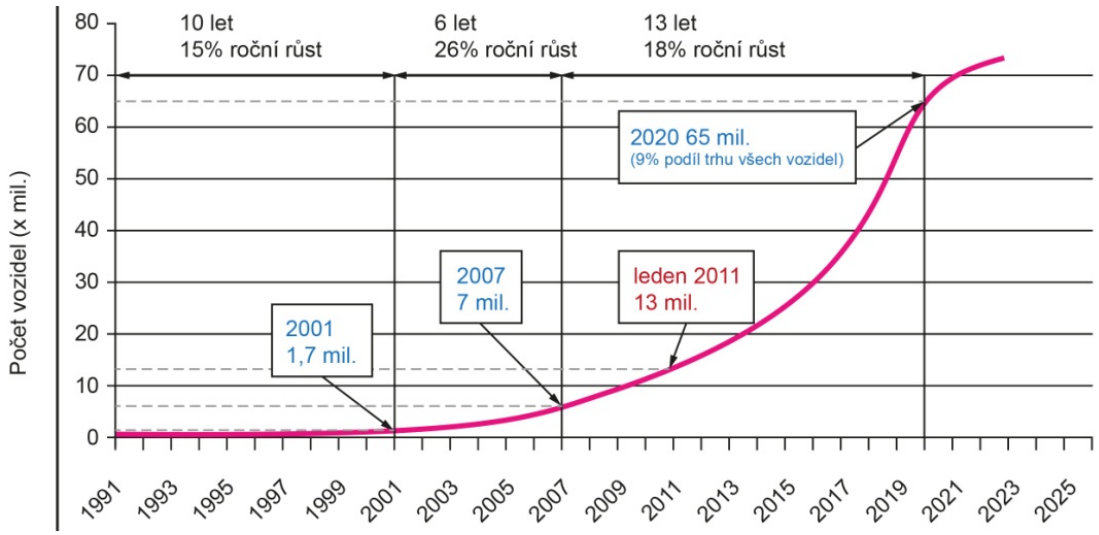
With regard to the overview presented above, and in connection with the introduction of alternative gas-based fuels, the main focus of the NAP CM is on CNG, given that - in terms of infrastructure and the number of vehicles - the development of LNG is lagging behind by about five years. LNG is expected to be applied in particular in long-distance freight transport and, for the CR, as a transit country, the initial projections (before 2020) are probably for one to two LNG filling stations to meet the requirements of Directive 2014/94/EU concerning a minimum distance of 400 km between individual LNG stations within the TEN-T network.

3.2.2.1 Predicted development of CNG in the CR (in comparison to European and global developments in the use of gas in transport)

In Europe, the historical growth in the number of CNG vehicles shows a steep increase from 500 000 units (in 2003 and 2004) to 1 848 550 units in 2013. This growth trend will continue in future years, as the ENGVA states that the share of CNG vehicles will account for up to 5% of the market in 2025 and is projected to grow to 9% by 2040.

This means that the European market for gas-powered vehicles will - despite this steep increase - lag slightly behind the global growth in the use of gas in transport because, according to documents issued by NGVA Europe and NGV Global, gas-powered vehicles will have a 9% share of the global market as soon as 2020, when the worldwide fleet of vehicles powered by natural gas is expected to total 65 million vehicles.

Figure 24 Expected trends in the global market for natural gas-powered vehicles



Source: NGVA Europe

10 years	6 years	13 years
15% annual growth	26% annual growth	18% annual growth
2020 65 million (9% share of the market for all vehicles)		
2001	2007	January 2011
1.7 million	7 million	13 million

The total fleet of CNG vehicles in the Czech Republic has grown by an average of 41% a year over the past decade. For CNG buses, the average annual increase was 15%. The fleet of freight vehicles has grown significantly only over the past 6 years, increasing by more than 35% annually. The following factors contributed to this growth:

- A grant programme launched by the MT CR to replace public transport buses, amounting to up to CZK 500 000 for a new CNG bus (in 2010 alone, 22 new CNG buses were purchased using these funds). This grant programme was ended in 2010.
- The ME, in the form of the 57th Call under the OPE 2007-2013; in 2014 approximately CZK 1.5 billion went to subsidise the purchase of 300 CNG buses and 4 CNG filling stations.
- An aid programme to purchase new CNG buses funded by gas companies (CZK 200 000 per bus). This programme still exists.
- Tax relief for CNG - a zero and subsequently discounted rate of excise duty until 2020, a zero rate of road tax for clean vehicles from 2009 (for categories M1, M2, M3 and N1 and N2).
- Sales of CNG vehicles have grown by an average of 27% a year over the past decade. Infrastructure - the network of public CNG filling stations in the CR - has long been

considered inadequate, even though it has expanded by an average of 22% a year over the past decade. In February 2015, drivers already had access to 80 CNG supply points in over 40 towns and this number continues to grow. We can expect to have 150 public CNG supply points in operation by the end of 2016. Alongside the growth in the numbers of public CNG filling stations, there are currently more than 30 private (corporate) filling stations operating in the CR and about 130 'domestic' vehicle refuelling appliances (VRA). These are generally low-output stations used by companies to serve their in-house fleet.

The graphs below show the expected growth in the use of natural gas in transport, where the forecast is based on subsequent assumptions of the average annual growth of CNG vehicles, average consumption and average mileage in km/year:

Category M2, M3, N3 (buses and freight vehicles, municipal vehicles):

- 120 CNG vehicles/year from 2015 - 2025.
- Forecast mileage 60 000 km/year, consumption 50 m^3 CNG/100 km.

Category M1, M2 and N1, N2 (company cars - taxis, post, bakers):

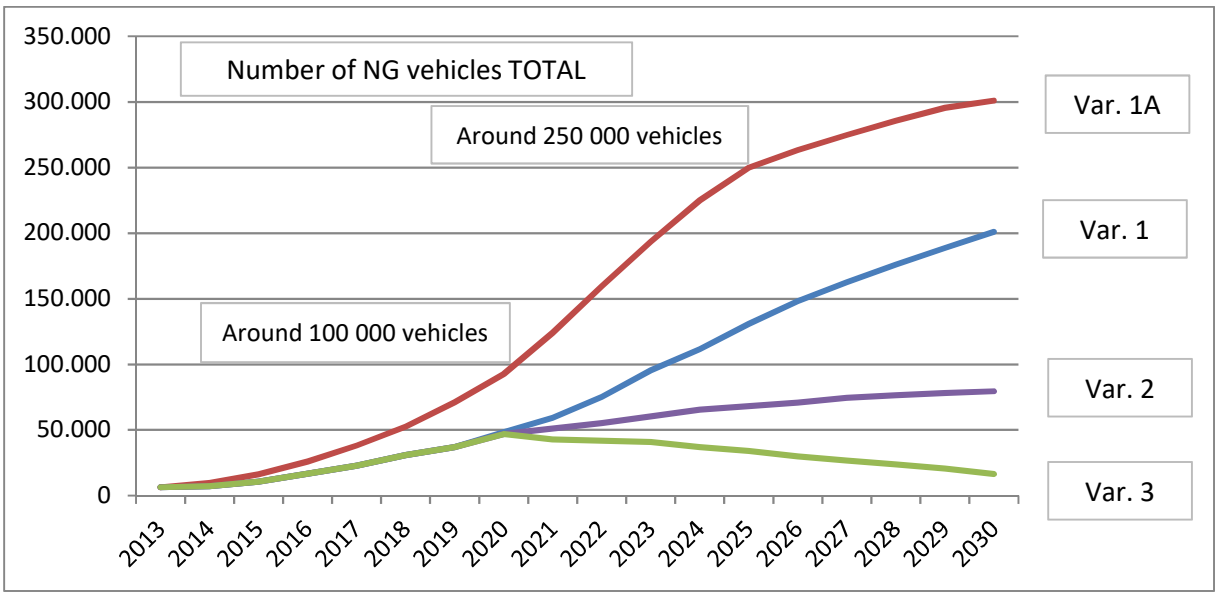
- 5 000 CNG vehicles/year from 2015 - 2025.
- Forecast mileage 30 000 km/year, consumption 8 m^3 CNG/100 km.

Category M1, N1 (individual - passenger cars):

- 7 000 CNG vehicles/year from 2015 - 2025.
- Forecast mileage 15 000 km/year, consumption 6 m^3 CNG/100 km.

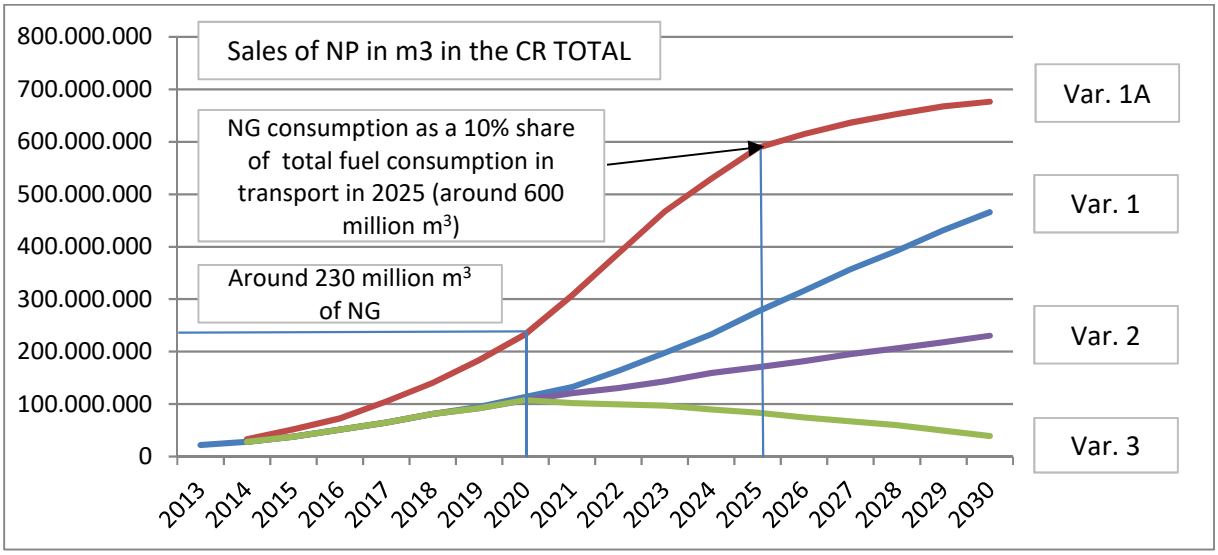
To create the scenarios, account was taken of factors including the attractiveness and capacity of the Czech market for natural gas vehicles and its possible saturation. Variants 1 and 1A are closely dependent on the existence of support from the government and the EU and the popularity of natural gas-powered vehicles (i.e. positive driving experience) with users, drivers and companies, who will continue to purchase new NG cars when renewing their fleet.

Graph 6 Scenario showing the growth in numbers of NG-powered vehicles in the CR



Source: CGA

Graph 7 Scenario showing the growth in sales of natural gas for transport in the CR



Source: CGA

Graphs 6 and 7 show four different scenarios:

Variant 1A – the ideal (optimistic) scenario entails:

- as an indispensable condition, support from the government, particularly in terms of tax and grants to purchase vehicles for operators,
- maintaining reduced excise duty for transport (CZK 3 355/t) until consumption of natural gas has achieved a 10% share of total fuel consumption in transport in 2025 (about 600 000 m^3 NG),
- maintaining zero rate road tax for NG vehicles,
- support for the purchase of natural gas-powered buses for urban and suburban transport (subsidies for regions and towns),
- strong support for the purchase of natural gas-powered vehicles for central and local government, including municipal companies and technical services,
- benefits for low CO_2 emission vehicles in urban agglomerations (establishing low-emission zones, free parking for clean vehicles, dedicated lanes for clean vehicles),
- promotion of education in natural gas-powered vehicles (explanations, media support, training, conferences),
- removing barriers (particularly legislative, possibly also technical) in the area of garages for and maintenance of NG vehicles,
- support for the development of the infrastructure,
- introducing measures in the field of gas-fuelled vehicles,
- maximum use of EU grants in projects to purchase CNG buses and to build the infrastructure.

Variant 1 – the moderately optimistic scenario entails:

- maintaining support for 2020 until such time as consumption of natural gas has achieved a 10% share of total fuel consumption (currently less than 1%),
- maintaining zero rate road tax for NG vehicles.

Variant 2 - **the pessimistic scenario** entails:

- maintaining preferential excise duty on NG in transport after 2020 at a level of only around 50% of the excise duty on conventional fuels,
- maintaining zero rate road tax for NG vehicles,
- support for the purchase of vehicles for central and local government fleets.

Variant 3 - **the pessimistic scenario** entails:

- excise duty for NG in 2020 equals 100% of that for liquid fuel,
- no support from central and local government (removal of grants for the purchase of vehicles) and the introduction of road tax for NG vehicles.

Variant 1 assumes that the current rate of growth will be maintained until around 2025, when it is widely expected that interest in vehicles with natural gas powertrains will increase, primarily on the part of companies and state supported organisations and that the experience and associated benefits gained will gradually be transferred to individual drivers. This trend will be greatly assisted by adequate infrastructure, because the number of CNG filling stations should reach a total of around 300 units (i.e. a situation where there is a 'minimum of one filling station in each major town') and reducing the distances between them will automatically improve conditions for further growth in the sales of new models of CNG cars of all categories. An indispensable condition for this forecast is support from the government, particularly in terms of tax and grants to purchase vehicles for the government and government supported organisations. As is clear from Graph 7, CNG sales are expected to continue growing at practically the same rate as in previous years until 2025, when, provided the same rate of growth is maintained, CNG should reach a volume of around 270 million m^3 with approximately 130 000 CNG cars on Czech roads.

After 2030 we can expect (according to CGA) slightly slower growth, especially in CNG buses (the number of buses operating in the CR is around 20 ,000 over the long term, with an average age of 14.76 years in 2013) because the replacement of the fleet with vehicles complying with EURO 6 will have gradually been completed and operators will purchase new CNG vehicles as part of the regular upgrade of their fleet. The prediction assumes that in 2040 gas-powered buses will account for 30% (i.e. approximately 6 000) of the total number of buses in the CR. A similar prediction of growth of the vehicle fleet can also be applied to developments in corporate fleets after 2030.

The reduced growth in the number of buses and company cars after 2030 will gradually be offset by the growth in individual passenger cars. The assumption is that awareness of the benefits of CNG and the popularity of CNG cars among the general public will have stabilised by then, resulting in the purchase of 6 000 to 7 000 new CNG cars a year until 2040. According to the above scenario, the number of CNG vehicles could reach 300 000 in 2040, which, provided the forecast vehicle mileage and consumption parameters are met, is equivalent to sales of around 700 million m^3 of natural gas in the transport sector.

Variant 2 shows the adverse impact that any increase in excise duty on NG in transport after 2020 (to approximately 50% of the tax rate for conventional fuels) would have on the growth of clean transport fuelled by natural gas, because under this pessimistic scenario this alternative fuel would achieve a penetration of only around 4%, which would also mean a failure to comply with obligations relating to the production of pollutants (see Table 15 below and Graphs 10-13). Moreover, the aims of the State Energy Policy would be far from being achieved.

Variant 3 describes a catastrophic scenario in the event that of the end of the Voluntary Agreement between the Government of the CR and the gas companies in 2020 is not followed by new rules (e.g. through the NAP CM) on support for clean transport.

Table 11 Expected growth in the number of NG filling stations

	2014	2015	2016	2017	2018	2019	2020	2025	2030
Public CNG (Variant 1A)	70	90	110	135	160	185	210	310	345
Private CNG	35	40	50	60	75	90	100	150	200
VRA	123	145	175	200	235	270	400	2,000	2,230
LNG	0	0	0	1	1	1	2	5	14

Source: CGA Note: VRA (Vehicle Refuelling Appliances) - 'home' CNG filling points - slow filling devices

3.2.2.2 Forecast growth in the number of LNG vehicles in Europe and the Czech Republic

According to current opinion among the NGV community, confirmed by a survey of 3 000 experts conducted by an engineering and marketing company, the top priority at the present time is LNG and heavy vehicles. This is confirmed by the current rapid growth in numbers of LNG tractor units and, to a lesser extent, buses.

The table below illustrates these trends and is based on the target volume for natural gas consumption in Europe for 2020 set by the European Commission in its 2010 White Paper on European Transport Policy.

Under this policy document, 20% of conventional petroleum-based liquid fuels were to be replaced by alternative fuels by 2020. Half of this volume was to be accounted for by natural gas, with the other half being made up of bioalcohol and a small proportion of hydrogen.

It now seems that only natural gas has lived up to its potential in practice and rapeseed oil has taken over the role of ethyl alcohol. Nonetheless, the aforementioned 10% for natural gas means the consumption of 47 billion m^3 of natural gas in transport. On the basis of present day developments, we can assume that at least 10% of this volume will be liquid natural gas, or 4.7 billion m^3 in liquid form. The table below converts these data into other practical parameters:

Table 12 Expected use of LNG in European transport in 2020

LNG in European transport 2020		
Average consumption of a tractor unit/bus	180	m^3/day
Total LNG consumption in relation to EC targets	4 700 000 000	m^3/year
	12 876 712	m^3/day
Number of heavy LNG vehicles	71 537	units
Life expectancy	8	years
	8 942	units/year

Rate of vehicle production simply to maintain the	24	units/day

Source: NGVA Europe

The production rate of around 9 000 vehicles a year can be compared with the current production rate for Tatra, which produces 780 vehicles a year. For the purpose of forecasting the operation of LNG vehicles on the territory of the Czech Republic, we can estimate the population of the CR as 2% of the population of the European Union, which, calculated as a proportion, gives us a total number of vehicles in 2020 of 1 473 units. However, we have to take into account the fact that the eastern half of the EU is lagging behind in the launch of LNG vehicles, so a rational estimate would appear to be the initial operation of 70 vehicles, which can comfortably be serviced by one LNG station from the end of 2017, when LNG corridors will already have been built in the western part of the EU and the achievement of 5% of total gas consumption for transport in the CR in 2020. Applying suitably selected coefficients for annual growth, we arrive at 15% of total natural gas consumption in transport by 2030.

Table 13 Expected coefficient for the increase in LNG vehicles in the periods under review

Annual growth in the number of LNG vehicles in Europe	
2014 – 2020	37%
2012 – 2025	25%
2025 – 2030	20%

Source: NGVA Europe

Applying these coefficients, we can forecast the number of vehicles operating on the territory of the Czech Republic in terms of traffic density and fuel consumption (regardless of whether the vehicle is registered in the CR or simply transiting. For example, the Dutch company Roland expects to operate its LNG tractor units to transport goods from Dutch ports across Europe to Romania. In each case, the density of operation of LNG vehicles replacing diesel vehicles will have a positive impact on the environment in the CR in the transport segment, which for technical reasons is difficult to cover using CNG fuel. Within Europe as a whole, the CR is a relatively well developed industrial country, so it is well-placed to initiate a positive trend in Czech industry's development and application of one of the few expanding sectors of new technology.

The table below sets out, inter alia, a calculation of fuel consumption and the required number of LNG filling stations, assuming 100 vehicles with the possibility of up to 150 daily refills for each station.

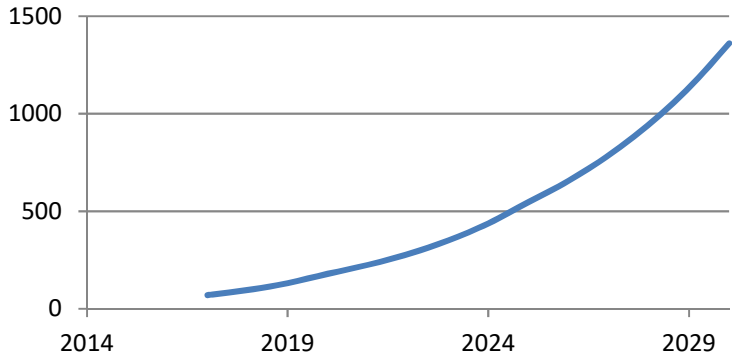
Table 14 Predicted developments for LNG in transport in the CR

	2015	2016	2017	2018	2019	2020	2021	2022
Number of LNG vehicles			70	95	131	179	224	280
Number of LNG filling stations			1	1	1	2	2	3
LNG consumption (million m³/year)			4.6	6.3	8.6	11.8	14.7	18.4
	2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Number of LNG vehicles	350	437	547	656	787	945	1 134	1 361
Number of LNG filling stations	3	4	5	7	8	9	11	14
LNG consumption (million m³/year)	13.0	28.7	35.9	43.1	51.7	62.1	74.5	89.4

Source: CGA

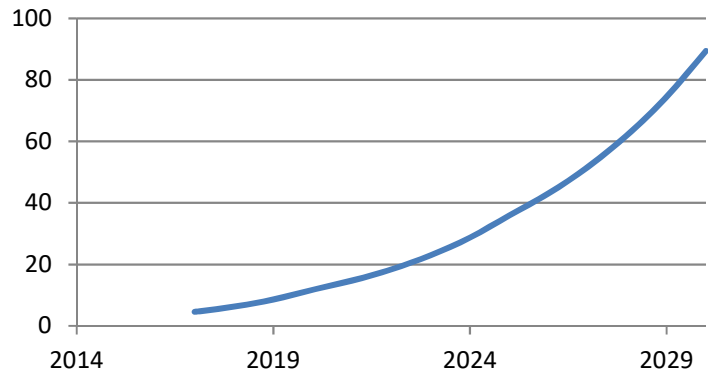
To ensure the full development of LNG technology, the requirement for the construction of 10 LNG stations within the CR must be met.

Graph 8 Predicted number of LNG vehicles operating on the territory of the CR



Source: CGA

Graph 9 Predicted consumption of LNG in transport in the CR (million m^3/year)



Source: CGA

3.2.2.3 Predicted pollutant emissions produced by the use of gas in the transport sector

Reducing emissions from transport is a strategic objective of the European Union, to which vehicle manufacturers are currently responding by developing more advanced engines. Alongside increasingly efficient diesel and petrol engines, CNG is experiencing rapid growth in the automotive industry. New EURO VI CNG engines are currently the most economical alternative powertrain, guaranteeing compliance with strict CO_2 limits (CNG combustion releases 25% less CO_2 than petrol; when compared with diesel engines, the benefit is even greater). Technology developed by FPT with an original (OEM) CNG engine delivers adequate performance parameters with excellent consumption figures and emissions well below the prescribed limits. The EURO VI standard guarantees compliance with emission limits throughout the vehicle's lifetime.

To establish a prognosis of the possible changes in the emission load from transport in the CR to 2030, we start from the prediction set out in Chapter 3.2.2.1, i.e. with developments in the 4 variants described (V1, V1A, V2 and V3). Our reasoning is based on predictions of the number of vehicles, traffic performance, energy consumption and the vehicle's emission factors and the graphs and tables below set out a comparison of emission levels when vehicles powered by conventional (liquid) fuels are gradually replaced by vehicles using natural gas. The progressive increase in differences in emissions in individual years is caused by a gradual increase in the number of gas-powered vehicles (according to the scenario in Graph 4), with this change in emissions also being offset by the expected reduction in emissions from more modern vehicles fuelled by conventional fuels.

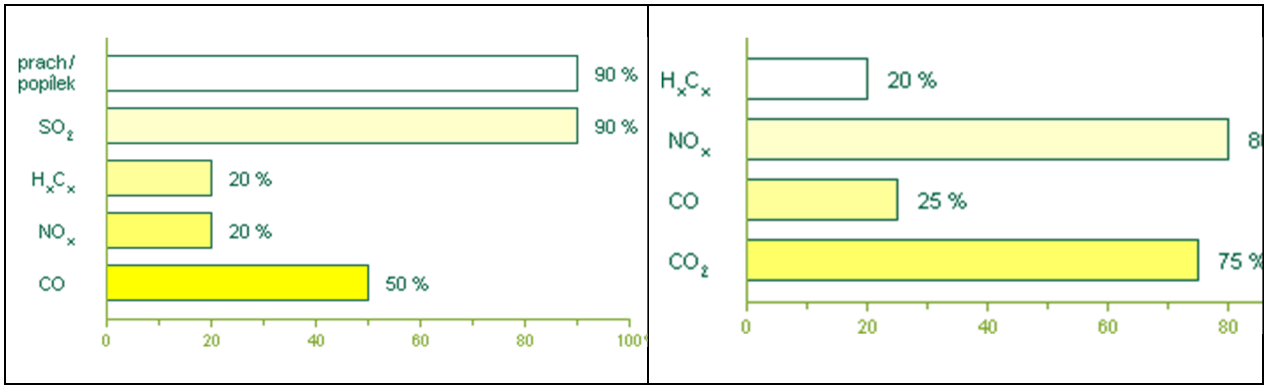
During the period to 2025 (to 2030) we can assume that the fleet in the CR will be gradually 'rejuvenated', primarily the bus fleet (under Czech Government Regulation No 63/2011 and Regulation (EC) No 1370/2007 of the European Parliament and of the Council, the average age of the bus fleet must not exceed 9 years and individual vehicles must not be more than 20

years old). EURO I to IV standard buses will gradually be taken out of service and most public transport contracts will be for the purchase of buses complying with EURO VI standards.

Experience with the practical use of vehicles with CNG powertrains has shown that the operation of these vehicles, compared to the operation of vehicles with diesel engines, has the follow advantages in terms of the environment:

- Significant reduction of up to 90% of particulate emissions, which are considered to be the most harmful emissions from diesel engines because of their mutagenic and carcinogenic effects.
- Compared with diesel engines, gas powertrains emit almost no smoke.
- Reduction of other emission compounds currently monitored – nitrogen oxide (NOx) and carbon monoxide (CO) emissions.
- Reduction of CO_2 emissions (greenhouse gas) by approximately 10 -15%.

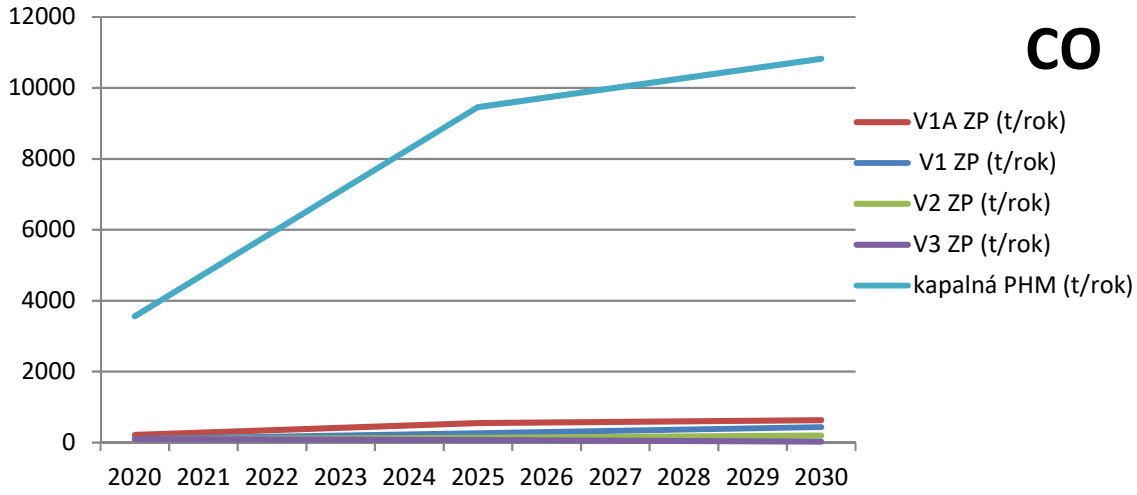
Figure 25 Reduction of emissions (g/km) from passenger cars with natural gas powertrains, compared to those with diesel and petrol powertrains (100%)



Source: CGA

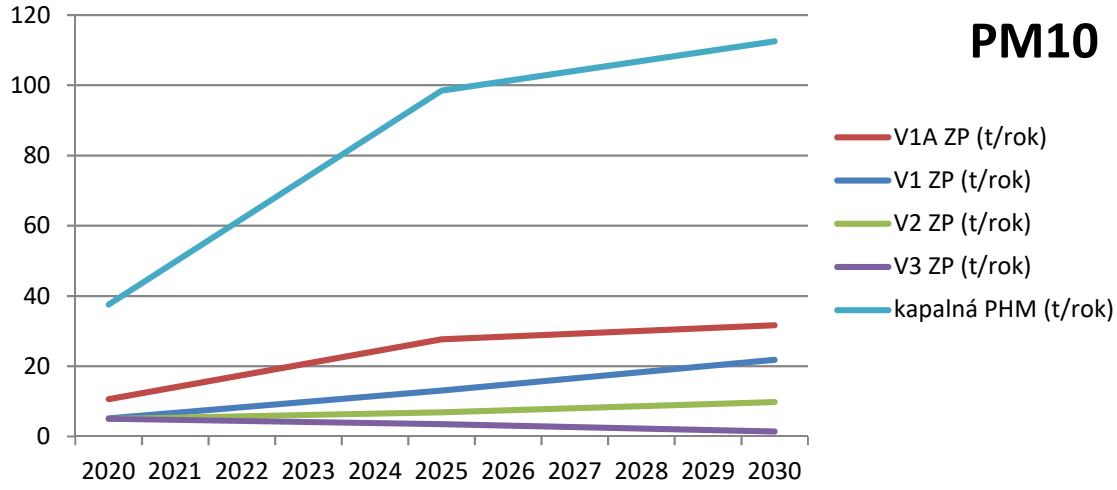
The use of LNG in transport leads to reductions in emissions equal to the values for CNG provided above. However, compared to CNG it has the advantage of allowing vehicles to travel further and the fuel system is lighter.

Graph 10 Total savings in CO emission volumes during the period from 2020 to 2030



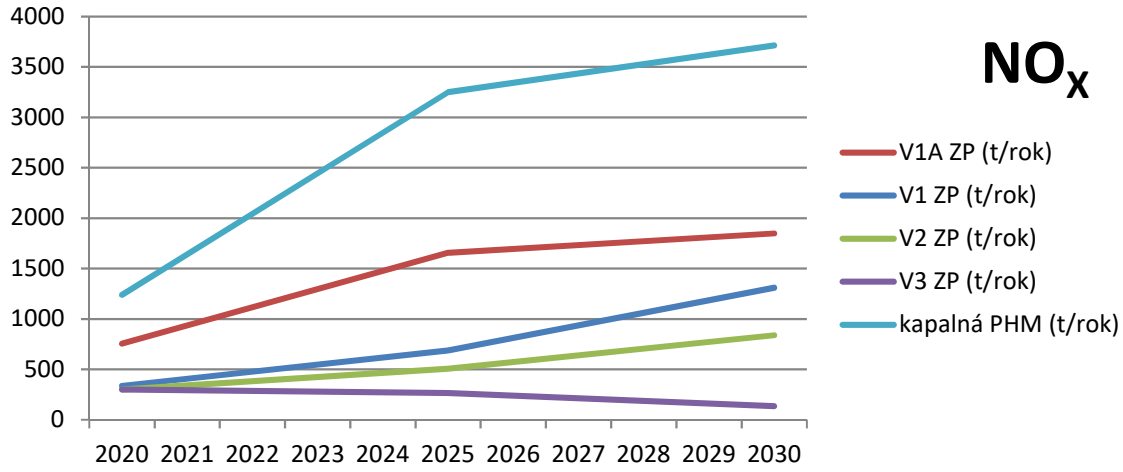
Source: CGA

Graph 11 Total savings in PM10 emission volumes during the period from 2020 to 2030



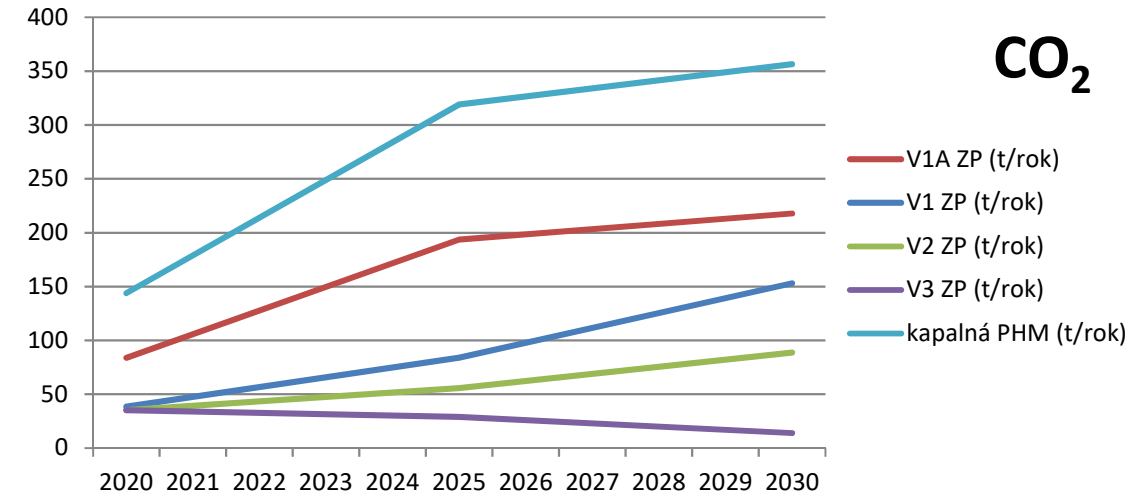
Source: CGA

Graph 12 Total savings in NOx emission volumes during the period from 2020 to 2030



Source: CGA

Graph 13 Total savings in CO_2 emission volumes during the period from 2020 to 2030



Source: CGA

O1A NG (t/year)

O1A NG (t/year)

O2 NG (t/year)

Liquid fuel (t/year)

Table 15 Emission savings in the optimal scenario (O1A) compared to liquid fuels (t/year)

Year	2020	2025	2030
CO	3 350	8 906	10 188
PM	27	70	80
NOx	484	1 595	1 865
CO_2	60	126	140

Source: CGA

3.2.3 Hydrogen technology in road transport

Hydrogen is a highly mediatised energy source for transport from a medium and, primarily, long-term perspective. It is not a fuel based on a natural resource, since hydrogen only occurs on Earth in compounds from which energy cannot be obtained. Its potential use lies in its function as a transport energy medium. The process of production, storage, transport and use of this source is covered by the term 'hydrogen management'.

Hydrogen can be produced using fossil fuels, nuclear energy, renewable organic sources, sunlight and water. The most common methods include:

- steam reforming (using fossil fuels such as methane),
- electrolysis (decomposition of water using an electric current).

Other possible methods of producing hydrogen are:

- thermo-chemical decomposition of water,
- photo-conversion,
- phyto-biological processes (analogue photosynthesis), or
- the use of biomass.

These methods tend, however, to be experimental. Electrolysis is energy-intensive, but the rapid expansion of electricity generation from clean, although inconstant sources (solar plants, windmills) has resulted in discussion of whether this would not actually be a viable way to store and to transport energy. In the event of a sudden electricity surplus, its cost would immediately fall to zero (some economists, who consider externalities, even talk about negative prices), so the energy intensity of electrolysis need not always be an impediment.

The storage and transport properties of hydrogen are adversely affected by its low bulk energy density, both in a compressed state (up to 700 bars) and liquefied at 20 K (approximately 6 or 10 MJ/l.). In contrast, its mass energy density is highly favourable, over 140 MJ/kg. It can be stored in pressure or cryogenic tanks and can also be transported in tanks or special gas pipelines. Such equipment is currently expensive. As an alternative, tests are being carried out on the efficiency of the option of hydrogen bonding in hybrid engines, which might result in an

increase in the bulk density of the stored energy but is technologically (much more) complicated.

3.2.3.1 Description of current trends in the use of hydrogen in transport (particularly road transport)

In principle, hydrogen can be used in all forms of transport (land, water, air and space), as demonstrated by the boats, submarines, aircraft, space shuttles and other types of means of transport powered by hydrogen. However, the main focus is on land vehicles, in particular passenger cars and buses, owing to the need to reduce emissions from road transport. Dozens of projects focusing on hydrogen technology are already under way in Europe.

Hydrogen can be used in transport either through

- combustion in an internal combustion engine, or
- the use of a fuel cell (in some cases in conjunction with an electric engine - particularly in buses).

Hydrogen combustion engines can achieve a level of efficiency comparable to ignition engines powered by natural gas or petrol, and, just like the latter, they produce (unless they are running on a very weak mixture) nitrogen oxides which have to be processed in a catalyser. The highest level of efficiency that can be expected is around 40%, which is only slightly less than the efficiency of fuel cells. Compared to fuel cells, combustion engines are more complex and noisier and have significantly lower efficiency levels at very low loads, but they are considerably cheaper and far less demanding in the matter of fuel purity.

In the case of fuel cells (FC), an electrochemical reaction between the input mixture (fuel - hydrogen and an oxidant) and electrodes immersed in an electrolyte converts chemical energy into electrical energy. This electrochemical reaction produces absolutely no harmful emissions, the only waste product being steam or water. At the same time, noise emissions are extremely low and are produced only by the cooling of the fuel cell. In the case of buses (fc-bus), fuel cells are generally used in combination with other energy sources, namely traction batteries. This is why the term ‘hybrid fuel cell buses’ is sometimes used. Other than hydrogen, methane (as well as biogas), methanol, ethanol and sugar can also be used as fuel for fuel cells. These have not yet been extensively developed, but advances in technology could make at least some of them promising.

Among the basic technological properties of hydrogen-powered vehicles, the most noteworthy is their range, which varies between 400 and 600 km, and refuelling time, which is 3-4 minutes for passenger cars and around 20 minutes for buses. Recent years have seen a fall in the price of ’hydrogen‘ vehicles (in the case of passenger cars from EUR 1 million to approximately half that amount) and an increase in their life expectancy (from a few hundred hours of operation to several thousand).

The motor industry is slowly starting to react to this situation. In 2013, the Hyundai motor company launched small-scale production of its i35 FCEV model. At the end of 2014, Toyota

started mass-producing the Mirai model, for which it guarantees the fuel cell up to 200 000 km, and is currently producing around 60 cars of this type each month, with production expected to rise gradually to 10 000 cars a year by 2020 at the latest. In the case of hydrogen-powered buses, the Canadian company, Ballard, is currently offering hydrogen fuel cells for e-buses with an output of 75-150 kw, a life expectancy of up to 20 000 hours and a guarantee of 12 000 hours (this has been increased to 15 000 hours in the latest model) or five years of operation. There are now 41 buses operating in Europe with Ballard fuel units and a further 21 are expected to be added in 2015.

One of the major obstacles to the development of the hydrogen economy is the lack of hydrogen-refuelling infrastructure. On a global scale, California boasts the highest quality hydrogen infrastructure (around 50 filling stations, out of a total of about 300). A coordinated network of filling stations is very slowly emerging in Europe, mainly in Germany, Austria and Great Britain. Only around 100 hydrogen filling stations are currently operating in the EU as a whole. There is, however, no doubt that the establishment of an adequate infrastructure of hydrogen filling stations is (as in the case, for example, of electromobility) an essential requirement for the wider application of hydrogen-powered vehicles. This conclusion is endorsed in Directive 2014/94/EU, which requires Member States that decide to include hydrogen refuelling stations accessible to the public in their national policy frameworks to ensure that, by 31 December 2025, an appropriate number of such points are available to ensure the circulation of hydrogen-powered motor vehicles. The Directive also obliges Member States to ensure that hydrogen refuelling stations accessible to the public deployed or renewed as from 20 October 2017 comply with the technical specifications set out in the Annex[4].

Despite the above, some positive developments are also occurring in this area. Following on from expected market developments (e.g. launching deliveries of mass-produced Toyota Mirai hydrogen-powered electric cars to Germany from autumn 2015), mass production of hydrogen refuelling stations was initiated in June 2014 in Vienna by Linde. The entire appliance fits in a small 14' container and can be used at existing conventional petrol stations. It allows a car to be refuelled in only three minutes. The annual production capacity in the Linde manufacturing plant is currently up to 50 of these refuelling points. The cost of a single refuelling point has fallen from the previous approximately EUR 1.5 million to around EUR 1 million and will continue to fall. This is an important requirement for the gradual deployment of a pan-European network of hydrogen refuelling stations. There are currently around 100, but the requirement arising from Directive 2014/94/EU on the deployment of alternative fuels infrastructure means that their number should increase rapidly over the next 10 years.

An important factor for the further development of hydrogen technology is cooperation between the private and the public sector. At EU level, this role is met by the Fuel Cells and Hydrogen Joint Undertaking (FCHJU), established in 2008 to place Europe 'at the forefront of fuel cell and hydrogen technologies worldwide,' and to enable the 'market breakthrough of fuel cell and

[4] It refers to the following standards: ISO/TS 20100, ISO 14687-2 and ISO 17268.

hydrogen technologies'[5]. As the activities developed within the framework of this platform have demonstrated the 'potential of hydrogen as an energy carrier, and of fuel cells as energy converters', this Joint Undertaking was last year extended until 2024[6]. The financial contribution from the EU for the activities of the Joint Undertaking (under the Horizon 2020 programme) is EUR 665 million.

3.2.3.2 Description of the current situation in the Czech Republic

Technological development

Among research and development activities in the CR relating to the deployment of hydrogen technology in transport, the TriHyBus project should be mentioned in particular. During the period from 2008-2009, under the initiative of ÚJV Řež, a prototype based on a 12-metre Irisbus Citelis city bus with a triple hybrid powertrain (fuel cell, traction batteries and super-capacitors) was created in order to demonstrate hydrogen transport technology. The triple hybrid construction uses energy from a fuel cell with a low dynamic response for the base load and for charging the traction batteries and capacitors. Energy from the capacitors is mainly used to start the bus and for acceleration and they are immediately recharged through energy recovery. Total project costs were CZK 83.6 million (CZK 25 million for the hydrogen infrastructure and CZK 58.6 million for the development and delivery of the vehicle). 75% of project funding was co-financed from EU sources (OPT I). During the period from 2009 to 2014, this bus operated on the public bus service in Neratovice. The decision on whether to extend these operations will be taken during 2015 and depend on whether it is included in a European project for local production of hydrogen using electrolysis.

Other activities in the field of hydrogen technology in the CR are coordinated by the Czech Hydrogen Technology Platform, which includes representatives from universities (Czech Technical University in Prague/Technical University of Liberec/ICT), research institutes (CV Řež, RTI Pilsen) and industry. In February 2012, this platform presented the Implementation Action Plan for the Development of Hydrogen Management.

3.2.3.3 Prognosis for the development of hydrogen/fuel cell technologies in Europe

Positive trends in the development of hydrogen technology on a global and a European scale are borne out by an initiative launched by five major European bus manufacturers (Daimler Buses-Evobus, MAN, Solaris, Van Hool and VDL Bus&Coach), which signed a 'Letter of Understanding' at the FCHJU meeting at the end of 2014. The Letter confirms their joint commitment to working towards the commercialisation and deployment of electric buses with hydrogen fuel cells in urban public transport. They confirmed hydrogen technologies to be crucial to the strategic development of public transport. The Letter of Understanding was symbolically presented to representatives from London and Hamburg, two cities pioneering clean public transport. Hamburg has decided to purchase only zero-emission buses from 2020.

[5] See Article 2 of Regulation 521/2008 setting up the Fuel Cells and Hydrogen Joint Undertaking.

[6] See Regulation 559/2014 setting up the Fuel Cells and Hydrogen Joint Undertaking 2 (quote from recital 6 to the Regulation).

The FCHJU initiative is aimed at deploying 500-1000 electric buses with hydrogen fuel cells in Europe by 2020. Over 30 European towns and regions have already expressed an interest in taking part in the commercialisation study initiated by the FCHJU.

As for the prognosis for future developments in hydrogen technology, the data in the FCHJU Multi-Annual Work Plan should definitely be taken into account. The Work Plan contains specific objectives for individual aspects of hydrogen technology, which will be targeted by all FCHJU support activities.

Table 16 Emission savings under the optimal scenario (O1A) for liquid fuels (t/year)

Vehicle type/hydrogen supply	Parameter	2012	2017	2030	2030
Fuel cell electric passenger car	Vehicle cost (in EUR '000)	200	70	50	30
	Vehicle lifetime (h)	2 500	5 000	6 000	7 000
Fuel cell electric bus	Bus cost (EUR '000)	1 300	700	650	500
	Bus lifetime (h)	10 000	15 000 2x 8 000	20 000 2x 10 000	25 000 2x 12 500
Hydrogen supply	Cost of the hydrogen (EUR/kg)	5.0 - >13	5.0- 11	5.0 – 9.0	4.5 – 7.0
	Cost of the hydrogen refuelling station (EUR million)	1.5 -3.5	1.0-2.5	0.8-2.1	0.6 – 1.6

Source: FCHJU Multi-Annual Work Programme 2014-2020

Summary

The principal advantage of hydrogen vehicles over, say, electric vehicles is their long range (600-700 km) and short refuelling times, which is the same as for conventional fuels, whereas it takes a number of hours to recharge accumulators. The main problems at present are a lack of infrastructure in the form of hydrogen refuelling stations, the high cost of hydrogen vehicles and certain legislative and administrative barriers.

Although the NAP CM focuses mainly devoted on technologies that are already or about to become commercially available, we should already be paying a certain amount of attention to the issue of developing hydrogen technology. As the use of hydrogen in transport is currently at the stage of R&D and initial testing in the CR (i.e. approximately at the stage electromobility was 5-10 years ago), it is time to start addressing the application of hydrogen in transport d through R&D support programmes and on the basis of pilot projects supported from the CEF fund, or other European sources. Although certain steps relating to hydrogen infrastructure

can be taken before the NAP CM is updated in 2018 (including possible support from the OPT), this must, however, be preceded by a thorough feasibility study to assess the potential for the use of hydrogen power in the Czech Republic.

3.2.4 Liquid biofuels

Biofuels are currently the most widely used type of alternative fuel. They accounted for 4.4% of the energy consumed in the European Union in 2010. In the Czech Republic, biofuels currently account for about 4.2% of energy consumption in transport. According to Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, energy from renewable sources should account for at least 10% of final energy consumption in transport by 2020 in every Member State. Moreover, Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels (revised in 2009) requires fuel suppliers to gradually reduce life cycle greenhouse gas emissions from fuel and energy supplied by 6% by 2020, compared to the EU-average level from fossil fuels. Most of these objectives are expected to be met by biofuels.

If biofuels are produced in a sustainable manner, i.e. the demand for biofuels does not lead to the destruction of rare ecosystems (cutting down forests, draining wetlands, etc.), they can contribute to a substantial reduction in CO_2 emissions from transport. Growing crops for biofuel production can also be a way to use previously uncultivated land and help maintain jobs in the agricultural sector. Biofuels can be used as a substitute for fossil fuels in all types of transport (road, rail, water and air).

With the help of technologies that are constantly developing, biofuels can be produced from a wide range of raw materials and used either on their own or mixed with traditional fossil fuels. They include bioethanol, biomethanol and higher bioalcohols, biodiesel (fatty acid methylester, FAME), refined vegetable oils, hydrotreated vegetable oils, dimethyl ether (DME) and other organic compounds.

The main liquid biofuels available on the market in the EU are first generation biofuels (biofuels produced from food biomass). Low percentage blends of biofuels with traditional fossil fuels are compatible with the existing fuel infrastructure and most vehicles and boats are compatible with the low percentage blends currently available on the market (E10 – petrol with up to a 10% share of bioethanol and diesel with up to a 7% share of FAME biodiesel).

Biofuels are also sold in concentrated form in the CR: pure biodiesel (B100), a blend of 30% biodiesel and 70% petroleum diesel (SMN – diesel blend, B30) and ethanol (E85, a 70-85% blend of ethanol with petrol and additives) at filling stations and vegetable oils sold and purchased as foodstuffs are also used for engine fuel, as are waste vegetable oils and fats. According to Customs Administration statistics, 6 658 million litres of engine fuels were sold in the CR in 2012, of which 366 million litres were biofuels, comprising 63 million litres of pure biodiesel, 209 million litres of biodiesel for blending with normal diesel and 83 million litres of ethanol. The existing infrastructure for E85 and biodiesel is already relatively extensive, and these fuels are commercially available at a number of filling stations. Because the volumes of fuels sold clearly do not reflect the small number of vehicles approved for this type of fuel, it is

obvious that concentrated biofuels are being used in the existing vehicle fleet as a substitute for conventional petroleum fuels (‘drop-in fuels’). The use of ethanol and biodiesel significantly reduces particulate and greenhouse gas emissions, the disadvantage being a slight increase in nitrogen oxide emissions. As the impact of these fuels depends on construction parameters, settings, the technical and operating conditions of the engine, studies that rely on measuring a small number of engines give varying results.

Certain biofuels, such as hydrotreated vegetable oils, can be blended with traditional fuels in any ratio and are compatible with the existing filling station infrastructure for road vehicles, boats, locomotives and aircraft.

According to the latest European Commission requirements, Member States are to promote the use of advanced biofuels, which are produced from non-food biomass and waste (straw, algae, glycerine and biomethane). The production of these biofuels does not involve demand for land, thereby avoiding the risk of emissions from indirect changes in land use (‘ILUC emissions’). However, these biofuels are currently at the R&D or pre-commercialisation stage.

Further to Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, an update of the National Action Plan of the Czech Republic for Energy from Renewable Sources was prepared and approved in August 2012. This National Action Plan set national targets for each Member State covering the share of energy from RES in 2020, in three areas:

1. Heating and cooling
2. Electricity generation
3. Transport.

As biofuels can be used as an additive for traditional fossil fuels, no new filling station infrastructure needs to be built. For this reason the NAP CM addresses biofuels only briefly, requiring support for R&D relating to advanced biofuels or for pilot projects for the production of advanced biofuels. The updated version of the National Action Plan of the CR for Energy from Renewable Sources will deal with these fuels in more detail.

3.2.5 Alternative fuels for non-road types of transport

Although the NAP CM primarily targets road transport, in the interests of meeting the requirements of Directive 2014/94/EU on the deployment of alternative fuels infrastructure, a basic analysis of the current situation and future developments in relation to non-road types of transport, which are the subject of that Directive is provided below, and in the case of natural gas, the same applies to rail transport.

3.2.5.1 Use of electricity in inland waterway transport

Article 4 of Directive 2014/94/EU also includes a requirement for Member States to ensure that the need for shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports is assessed in their national policy frameworks. Under the Directive,

such shore-side electricity supply shall 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 and the costs are disproportionate to the benefits, including environmental benefits.

As far as electrical powertrains for waterway vessels are concerned, their use in cargo boats is rare not only in the CR but throughout Europe and there is nothing in current trends to suggest that any significant increase is likely in the near future. Electric engines tend to be used more for certain passenger vessels, primarily on isolated waterways (lakes, reservoirs, etc.). One example of this in the CR is the Brno dam, where the Brno City Transport Company operates electric boats. Electric engines might be a future option for cruise ships in the capital city of Prague, where large quantities of pollutants are currently being emitted from diesel engines.

Given the above, it does not seem effective to consider the installation of charging points at public ports in the CR in the near future or to lay down any goals concerning infrastructure for electricity supplies in inland ports under the National Action Plan for Clean Mobility. However, in view of the requirement set out in the Directive, this issue will have to be re-examined during the next revision of this Action Plan, to reassess whether the exemption contained in the relevant provisions of the Directive should continue to apply to this issue.

3.2.5.2 Use of electricity at airports

Article 3 of Directive 2014/94/EU also contains a requirement for Member States to ensure that, during the preparation of the national policy framework for the development of the market as regards alternative fuels in the transport sector, they consider the need to install electricity supply at airports for use by stationary airplanes.

Within the Czech Republic, it is relevant to analyse this issue primarily in relation to the Václav Havel Prague airport, which is the only one in the CR to qualify as a 'major airports' under EU legislation[7]. The airport is currently equipped with electricity connections (400 Hz) to all 31 parking spots served by boarding bridges. The option of equipping each newly built boarding bridge with a backup power source for all parking spots in future is also under consideration.

Remote hardstands do not have any stable electrical connection and no connections are planned. However, handling companies can use mobile ground electricity sources (GPU), to which aircraft can be connected even in the remote hardstands.

The use of electricity as an alternative 'green' fuel for stationary aircraft at airports is directly required under the provisions of the Aeronautical Information Publication (AIP CR), which restricts the use of backup energy sources (APU) burning jet fuel. At the latest 5 minutes after the aircraft has come to a halt at the parking spot, it must be connected to an external 400 Hz power source and the APU unit disabled. An APU unit may be switched on no more than 20 minutes before the scheduled departure time (ETD). The APU may only be used during the

[7] See in particular Directive 2002/30/EC, which defines a 'major airport' as one with more than 50 000 take offs and landings per year. The special status of Prague airport compared with others in the Czech Republic is borne out by the fact that it is the only one to which Directive 2009/12/EC on airport fees applies.

entire time the aircraft is stationary if no external power source is available. If no external air-conditioning unit is available, the APU unit may also be used, provided the aircraft has been stationary for longer than 1 hour. A favourable fee policy for providing this service, which is included in the parking fee, also motivates carriers to connect to an external source of electricity.

The other international airports included in the main, global TEN-T network, i.e. the Ostrava/Mošnov and Brno/Tuřany airports, are not yet equipped with stable electricity connections, generally using mobile GPU in place of APU units.

In view of the above, there does not currently seem to be anything to gain by laying down objectives in the NAP CM for infrastructure to supply electricity to stationary aircraft at airports.

3.2.5.3 Use of LNG for inland waterway transport

Directive 2014/94/EU also contains requirements for the establishment of refuelling points for LNG-fuelled vessels in relation to internal waterway transport. Article 6(3) requires Member States to designate in their national policy frameworks the inland ports that are to provide access to the refuelling points for LNG, also taking into consideration actual market needs.

With respect to the use of LNG as fuel for internal waterway vessels, the first thing to mention are the preparations under way at EU level for an ‘LNG Masterplan‘, which is aimed at analysing the procedures necessary to introduce LNG as a fuel, including the development of additional procedures for the professional training of crew members, the necessary technical standards and the establishment of all related procedures. The abovementioned activity is organised under an agreement concluded with the European Commission by the Austrian company Pro Danube, Gmbh, and involving a number of other partners from various EU countries. The Masterplan should be completed in 2015, and its outputs will then be used to prepare additional stages in this project.

At the same time we should mention steps to introduce LNG as a fuel for inland waterway vessels being taken by the Central Commission for Navigation on the Rhine in cooperation with the European Commission and EU Member States. During 2014 and 2015 a number of workshops were planned on the basis of discussions between the relevant technical groups, which would also involve representatives of operators of inland navigation companies and the professional public. During the final stage, these outputs would be incorporated into the relevant Rhine regulations and used to prepare EU legislation on this issue, which would be issued in accordance with the Communication issued by the European Commission on reducing emissions in the inland navigation sector with the aim of implementing the planned measures by 2030.

Although a number of activities are under way at various levels in relation to the use of LNG as a fuel in inland navigation, converting vessels to this power source presents a number of and technological challenges. At the same time, from an operational perspective, these conversions are far more effective for large vessels, which operate on a higher class of waterway - particularly in the Rhine region, on certain manmade canals in the Netherlands,

Belgium or Germany, or on certain stretches of the Danube. The deployment of such modified vessels on the Elbe-Vltava waterway is expected to be very limited, at least during the initial phase (to 2030).

In view of the above, and particularly with reference to the requirement set out in Directive 2014/94/EU for actual market needs to be taken into consideration when designating the number of LNG refuelling stations at inland ports, it does not appear effective, in the near future, to build refuelling stations at public ports in the CR for vessels using LNG as a fuel. The reason is the operating costs of this type of facility, when there is no demand for it in this market segment.

However, developing trends in this area will have to be monitored to ensure that there is sufficient time to respond to the emergence of a sufficiently high level of market demand. Given that Article 6(2) of Directive 2014/94/EU sets 2030 as the deadline for meeting the relevant national objective in relation to LNG refuelling points at inland ports, the CR has sufficient time to return to this issue during the next revision of the NAP CM.

3.2.5.4 Use of CNG/LNG in railways

Although Directive 2014/94/EU does not lay down requirements for the creation of an infrastructure of CNG/LNG filling stations for rail transport, it is still worth monitoring developments in this market segment and, inter alia, with regard to the Directive's requirement for Member States to ensure that national framework policies 'take into account the needs of the different transport modes existing on their territory', i.e. which includes rail transport in the case of the CR.

Within the segment of potential CNG/LNG powered vehicles, the area of rail transport has been somewhat neglected in the past. Rail vehicle engines comply with emission limits for the year of manufacture and are gradually being replaced by more modern engines with lower emissions. Operational measurements indicate that emissions from railway engines are substantially lower than from road transport when calculated in terms of output. In 2010, a CNG engine was presented in the CR for the first time: it had with an output of 180 kW and was intended mainly for light shunting service. That same year stronger, 600 kW diesel engines began to be converted to CNG. This level is sufficient to perform moderately heavy shunting work and light track services. The development of these engines has now been completed and the CNG powertrain has become competitive with conventional diesel engines. Operating CNG-powered locomotives achieved fuel savings in the order of 20-40% compared with the original diesel engines, and the noise level of the locomotives was also reduced. In January 2015, the locomotives started trial operations.

Thanks to the work done over recent years, the CR is set to become a major player in Europe in the conversion of locomotives to CNG. An important prerequisite for the use of CNG in rail transport and its subsequent expansion to the continuation of development work aimed at achieving the highest possible output in relation to the optimal positioning of the CNG cylinders. It is important to find ways to promote the purchase of these types of rail vehicle (including possible investment aid from the EU funds). Mention should also be made of the fact that

Czech industry is involved in the development and manufacture of an entirely new concept for railway wagons to transport LNG, which will in future permit the diversification of natural gas suppliers.

3.2.6 Smart Cities

In July 2012, the European Commission published the communication 'Smart Cities and Communities - European Innovation Partnership'. The aim of the initiative is to find a solution that combines energy, transport and information and communication technologies (ICT) on a commercial scale, bringing reductions in carbon emissions, using renewable sources of energy and improving energy efficiency by the end of 2020. The Smart Cities and Communities initiative goes beyond the mere coordination of research and innovation projects and will address demand-side measures, such as fostering new business models in energy, transport and information and communication services and public procurement, favouring initiatives that also enhance resource efficiency and energy savings. A chapter entitled 'Sustainable Urban Mobility' deals with transport, which should include, for example:

- smart electrical vehicle charging systems and smart electricity grid networks, controlled by ICT,
- electric public transport vehicles that are able to exchange surplus energy (braking and accelerating energy) with the energy system - using ICT to manage energy flows,
- balancing large surpluses and shortages in the energy network through suitable settings for electric vehicles and the grid (the capacity of batteries, electric batteries and hybrid vehicles will be used, an arrangement already catered for by the legislation laid down by the state of Delaware (USA)).
- Using hydrogen as an energy carrier for storing energy and balancing demand at city level for energy.

3.2.7 Sustainable Urban Mobility Plans

If cities want to draw on EU funds during the 2014-2020 programming period, they are required to submit a sustainable urban mobility plan (SUMF - Sustainable Urban Mobility Framework). As well as a city's priorities in the areas of transport and transport services, SUMFs will set out the wider context, including addressing issues associated with alternative sources of fuel in transport.

Both of the aforementioned concepts or plans can contain binding/strategic/other measures for the introduction of clean mobility, particularly in major cities. It is up to the individual cities what decisions they take and what measures they choose to promote the development of low-emission transport in a given agglomeration.

3.3 Strategic and legislative framework of the EU and CR for alternative fuels

3.3.1 EU strategic and legislative framework for alternative fuels

At the very highest level, the alternative fuel sector is addressed by the EU through the overarching **Europe 2020 Strategy** adopted in 2010, which highlights the need to decouple economic growth from resource use, to promote the transition to a low carbon economy, to increase the use of renewable energy sources and to promote energy efficiency. In relation to the transport sector, this strategy primarily emphasises the need to modernise transport and to reduce carbon production in this sector (the so-called decarbonisation of transport).

In order to meet this requirement, the European Commission (EC) submitted **a white paper on European transport policy**[8] in 2011, followed in 2013 by a **European alternative fuels strategy**[9]. In the **White Paper**, the Commission proposes the long-term objective of a 60% reduction in CO_2 emissions by 2050, followed by a gradual reduction in the number of vehicles with internal combustion engines powered by conventional fuel, with a vision for their total exclusion in cities by 2050. In the subsequent **EU alternative fuels strategy**, the European Commission emphasises the need to avoid favouring any specific fuel in order to maintain technology neutrality. Over the long term, the Commission considers it necessary to ensure access to all these alternative fuels throughout the EU. LPG, natural gas (CNG and LNG), electricity, (liquid) biofuels and hydrogen. Support should cover not only CNG, LNG, hydrogen and electricity, but also various types and generations of liquid biofuels, with conventional biofuels from food sources gradually being replaced by biofuels from sources that do not compete with food production and are produced with minimum greenhouse gas and pollutant emissions.

From a long-term perspective, the introduction of alternative fuels in the CR is an important starting point for the **EU climate-energy framework** to 2030, approved in 2014. The first objective is to reduce CO_2 emissions by 40% by 2030 compared to 1990. The second is to increase the share of renewable energy sources, which will represent 27% of the total energy mix by 2030. The third undertaking is to increase energy efficiency to 27% by 2030. In relation to the transport sector, the Commission has reiterated the need to gradually the entire transport system, inter alia through extensive innovation and the introduction of new propulsion technologies and alternative fuels.

3.3.2 CR strategic framework for alternative fuels

In the case of natural gas, the introduction of this alternative fuel in the CR through the **aid programme for natural gas as an alternative fuel**, adopted in 2005 on the basis of **Government of Czech Republic Resolution No 563 of 11 May 2005** and the subsequent signature of a **voluntary agreement between the MIT and the gas companies**[10] can be seen

[8] White Paper - Roadmap to a Single European Transport Area: creating a competitive and resource efficient transport system (COM (2011) 144).

[9] European Commission communication - Clean Power for Transport: A European alternative fuels strategy' (COM/2013/017 final).

[10] RWE Transgas, a. s., Jihočeská plynárenská, a. s., Pražská plynárenská, a. s., Severočeská plynárenská, a. s., Severomoravská plynárenská, a. s., Středočeská plynárenská, a. s., Východočeská plynárenská, a. s. a Západočeská plynárenská, a. s.

as an important incentive. The programme lays down indicative targets for the share of natural gas consumption to total fuel consumption in transport to 2020 at a level of 10% and charges the deputy prime minister and minister for finance with stabilising the amount of excise duty on compressed natural gas and liquefied natural gas for transport at the level of the minimum excise duty set by EU Directives for the period to 2020.

Clean mobility has been mainstreamed in all the Czech government's basic energy, transport and environmental strategy documents. In the energy sector, this is the Updated State Energy Policy (USEP), which lays down the strategic priorities for this sector of the national economy[11] as well as formulating strategies to the year 2040. The sub-priorities that directly relate to clean mobility include:

- Priority I.10. A gradual decline in the consumption of liquid fuels, particularly given their increasing efficiency of use, the increase in the share of electrified public transport systems (rail transport, possibly trolleybuses), as well as an increasing share of LNG and CNG in transport and, later, also a gradual increase in electromobility.
- Priority II.12. To increase the efficiency of energy conversion in internal combustion engines with a concomitant effect and to reduce specific emissions from transport, using fiscal instruments (graduated road tax, fees for using the infrastructure/tolls).
- Priority III.15. To increase the use of alternative fuels - CNG and electromobility.

Within the framework of the concept for the development of important areas of energy and areas relating to energy, the State Energy Policy has formulated a vision for transport: 'In the future there is a need to reduce our dependence on oil in transport, or on fuels made from oil, and increase the proportion of alternative fuels used in transport, build adequate infrastructure for vehicles with alternative powertrains (natural gas, electricity). This will reduce the environmental impacts arising in relation to this sector (emissions). Maintain or improve public mobility, not only within the framework of large cities, but also at the regional, national and international level'.

The **State Environmental Policy of the Czech Republic for the period 2012-2020** and the **Czech Republic Transport Policy for 2014-2020 with a view to 2050** are basically established on these same principles. Both documents also require a reduction in emissions of nitrogen oxides (NO_x), volatile organic compounds (VOC) and fine particulate matter ($PM_{2.5}$) from the road transport sector, a renewal of the vehicle fleet in the CR and an increase in the share of alternative powertrains, while increasing the proportion of renewable sources in total energy consumption in transport to a level of 10% by 2020. **The State Environment Policy of the Czech Republic** also emphasises the need to reduce emissions of sulphur dioxide (SO_2) by 82% to EU levels, NO_x emissions of by 60%, VOC emissions of by 51%, ammonia emissions of by 27% and emissions of primary $PM_{2.5}$ by 59% compared to 2000 by 2020 and to improve air quality in places where the emission limits are exceeded while maintaining quality in areas where emission limits are not exceeded. The **Czech Republic Transport**

[11] These priorities are: a balanced energy mix, savings and efficiency, infrastructure and international cooperation, knowledge and innovation, energy security.

Policy, like the follow-up strategic document for the transport infrastructure, **Transport Sectoral Strategy, 2nd Phase**, not only emphasises the need to create conditions to equip transport infrastructure with charging and refuelling stations for alternative energy sources but also to encourage the private sector to provide infrastructure for alternative fuels.

3.3.3 EU legislative framework for alternative fuels

The key document in the EU legislative framework is **Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure**, which lays down minimum requirements for the establishment of an infrastructure for alternative fuels and common technical specifications for charging stations for electric vehicles and refuelling stations for natural gas (LNG and CNG).

As was explained in the introduction to this document, one of the goals of the NAP CM is to ensure the transposition of Directive 2014/94/EU into the Czech legislation and to comply with the requirement under Directive 2014/94/EU for Member States to prepare a national policy framework for the development of a market for alternative fuels in the transport sector and the introduction of the necessary infrastructure, which should lay down objectives for building a minimum infrastructure for different types of alternative fuels. For this reason we should reflect in particular on the Directive's requirements in relation to the content of this national policy framework for the market development of infrastructure for alternative fuels.

The legislative impact of this Directive require the amendment of a number of Czech legal regulations. The most important is the Directive's requirements in relation to public recharging points for electric vehicles (see Article 4). In terms of these recharging points, Member States must ensure that:

- operators of recharging points accessible to the public are free to purchase electricity from any Union electricity supplier, subject to the supplier's agreement,
- all recharging stations accessible to the public shall also provide for the possibility for electric vehicle users to recharge on an ad hoc basis without entering into a contract with the electricity supplier or operator concerned,
- the prices charged by the operators of recharging points accessible to the public are reasonable, easily and clearly comparable, transparent and non-discriminatory,
- distribution system operators cooperate on a non-discriminatory basis with any person establishing or operating recharging stations accessible to the public,
- 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.

The operator of a recharging station must meet legal requirements on road safety and also, when selling electricity, is subject to the Energy Act and other related legislation associated with the distribution and sale of electricity.

An important starting point for the National Action Plan for clean mobility is **EU legislation covering CO_2 emission standards for passenger cars[12] and light commercial vehicles[13]**, which largely determines future production policy for all European car manufacturers. The limits for 2020 represent a one-third reduction on the current situation, while car manufacturers are threatened with high fines, which could put them out of business, if they exceed these limits. However, the two Regulations referred to above also contain important incentives for car manufacturers to include vehicles with low/ultra-low emissions (CNG, electricity, including hybrids) in their fleets by 2020 (or by 2017 in the case of light commercial vehicles). This relates to a 'super-credit' system, which allows vehicle manufacturers to substantially reduce the calculation of average emissions for new vehicles.

Permitted pollutant emission levels have long been regulated in the EU by the EURO system of emission standards. EURO emission standards for passenger cars are currently imposed by **Regulation (EC) No 715/2007 of the European Parliament and of the Council on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6).** EURO emission standards for freight vehicles and buses are currently laid down in **Regulation (EC) No 595/2009 of the European Parliament and of the Council on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI)** and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC, as amended.

With respect to the future introduction of hydrogen-powered vehicles, mention should be made of Regulation (EC) No 79/2009 on type-approval of hydrogen-powered motor vehicles and amending Directive 2007/46/EC, and UNECE Regulation 134 on the approval of motor vehicles and their components with regard to the safety-related performance of hydrogen-fuelled vehicles, which establish an adequate legal framework for the approval of these vehicles.

Another document setting a target of replacing at least 10% of energy for transport by renewable sources by 2020 is Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources. On 29 April 2015, the European Parliament approved an amendment to this Directive, which limited the requirement to meet the goal for the proportion of energy used for transport using biofuels produced from raw food materials to a maximum of 7%. A further 0.5% should come from advanced biofuels and biowastes as a non-binding target.

[12] Regulation No 443/2009, setting emission performance standards for new passenger cars (PC) as part of the Community's integrated approach to reduce CO_2 emissions from light commercial vehicles, 100% of new PC registered in the EU must meet the emission limit of 130 g CO_2/km from 2015. Regulation No 333/2014 reduces this limit from 2020 to 95 g CO_2/km.

[13] In the case of light commercial vehicles (LCV), CO_2 emission standards are set by Regulation No 510/2011, setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO_2 emissions from light-duty vehicles. This Regulation imposes a requirement on car manufacturers to ensure that average emissions from these vehicles do not exceed 175 g CO_2/km by 2017. Regulation No 253/2014 sets emission limits for LCV from 2020 at 147 g CO_2/km.

During the analysis of existing EU legislation **Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles** was identified as an instrument that could, under certain circumstances, promote the development of the market for clean vehicles. The **Directive** requires public contracting authorities and public transport operators to take in to account, when purchasing road vehicles, the energy and environmental impacts for the operational lifetime of the vehicle in the contract for public service, including energy consumption, CO_2 emissions and emissions of certain pollutants.

When transposing the Directive, the CR (unlike most Member States) did not exploit all the options offered by the Directive in terms of promoting clean vehicles. Criteria for assessing the performance of vehicles in terms of the energy and environmental impacts derived from the vehicle's emission class (EURO V or EURO IV) were implemented in the CR. They were also based on the vehicle's consumption and possibly its age. However, none of these criteria has a direct impact on promoting vehicles powered by alternative fuels.

However, the Directive also allows Member States, in addition to the criteria mentioned above, other options for implementation - to use energy and environmental impacts as criteria for granting contracts while relying on EC methodology (see Article 6 of the Directive), which calculates a vehicle's operational costs for energy consumption, CO_2 emissions and pollutant emissions for its entire lifetime. One possible solution would therefore be to use the options for implementing the Directive outlined above.

The issue of clean mobility is also affected, to a certain extent, by **Directive 2000/53/EC on end-of-life vehicles**, which aims to limit the production of waste from vehicles and to promote reuse, recycling and other forms of recovery of end-of-life vehicles and their parts. That Directive requires European vehicle manufacturers to limit the use of hazardous materials in new vehicles and design and build new vehicles which make reuse and recovery easier and develop the use of recycled materials.

3.3.4 CR legislative framework for alternative fuels

The legislative framework for the operation of vehicles powered by alternative fuels is primarily based on **Act No 56/2001 on the conditions for operating vehicles on roads.** The Act lays down the conditions for registering vehicles, technical requirements for the operation of road vehicles and the approval of their roadworthiness and the rights and obligations of those who manufacture, import and market vehicles, owners and operators of vehicles, as well as technical inspection centres and emission measuring stations and roadworthiness inspections for vehicles in operation.

The rules for approving the roadworthiness and the technical requirements for operating vehicles on the road network are laid down by **Decree No 341/ on roadworthiness approval and on technical conditions for the operation of vehicles on the road network. The methodology for assessing the true consumption of utility vehicles was developed by the Transport Research Centre as part of a project funded by the TACR.**

In terms of the development of alternative fuels, important legislation is contained in **Act of the Czech National Council No 16/1993 on road tax,** which sets the minimum rates of this tax for the individual types of vehicle, as well as **Act No 261/2007 on the stabilisation of public budgets.** Both of these Acts address tax issues.

Act No 261/2007 lays down the rates of excise duty on natural gas intended for vehicle propulsion[14] and the rates for tax on electricity[15].

As regards the operation of natural gas-powered vehicles, reference should be made to **Act No 311/2006 on fuels and filling stations and amending certain related Acts (the Fuel Act).** This Act governs CNG and LNG at a general level (see the definition of the term 'fuel' in Section 2 of the Act), but it does not apply to provisions defining the requirements for CNG/LNG refuelling (filling) stations[16]. In contrast, the aforementioned Act does not include hydrogen as a fuel.

3.4 EU and CR grant programmes to promote the development of alternative fuels in transport

3.4.1 Operational Programme Transport II

Under the Operational Programme Transport (OPT) for the period from 2014-2020, specific objective 2.2 (Creating conditions for the wider use of vehicles powered by alternative fuels on the road network') under investment priority 2, priority axis 2 focuses specifically on support for alternative fuels.

The aim of the proposed intervention is:

[14] Rates of tax on natural gas for vehicle propulsion (see Section 4(a)) and indicative conversion to other units.

Period	CZK/kg	CZK/m³	CZK/MWh	CZK/GJ
2012 - 2014	0.50	0.36	34.20	**9.50**
2015 - 2017	1.00	0.72	68.40	19.00
2018 - 2019	2.00	1.40	136.80	38.00
2020	3.36	2.39	233.50	64.90

Source: Act No 261/2007.

[15] Under Section 6 of Part Forty Seven of the Act on the stabilisation of public budgets, the taxable basis is the quantity of elektricity consumed in MWh and the rate of tax is CZK 28.30/MWh. Tax is chargeable at the moment of the supply of the electricity for final consumption. Liability for tax does not therefore apply to economic operators generating, trading in or distributing electricity, unless that operator consumes the electricity itself. The Act exempts from tax electricity produced in an environment-friendly way. Electricity produced in means of transport is also exempt if used by them.

[16] The issue of refuelling stations is currently regulated by Act No 311/2006. Section 5 – sale and delivery of motor fuels. That Section refers to technical standard ČSN 73 6060, which does not apply to filling stations of this kind. Section 5(4) explicitly states that the requirements laid down for filling stations in that Section do not apply to the sale of delivery of compressed natural gas.

- to establish conditions for broader use of vehicles with alternative powertrains on the road network, particularly in cities and on the main TEN-T network, where greater use of these vehicles is anticipated,
- to contribute to meeting the goals of the Europe 2020 strategy in accordance with the requirements of the draft Directive on the deployment of infrastructure for alternative fuels.

The supported activities under Specific objective 2.2 of the OPT include equipping public transport infrastructure with recharging and refuelling points for alternative powertrains, including in existing 'park and ride' carparks and paid parking places.

Although using a certain proportion of the aid for innovative financial instruments during the 2014-2020 programming period is under consideration, such instruments are not considered appropriate for the construction of infrastructure for electromobility. As a rule, innovative financial instruments make sense in areas where the measure being implemented is nearing commercial operation and not too far from achieving profitability. Given the lack of a developed electromobility market, investment in recharging infrastructure is expected to yield a return after around 10 years, possibly even longer. Incentives in the form of innovative financial instruments do not make this area sufficiently attractive for private investors, so traditional aid instruments such as grants are more suitable for this area.

Innovative financial instruments may, however, in certain circumstances, be an alternative means of financing the purchase of vehicles (possibly in combination with grant programmes) or private recharging infrastructure, where, for example, businesses are probably better placed than the public sector to use financial aid through innovative financial instruments. The specific details of these instruments, taking into account the nature of the potential aid applicants, will be included in an ex-ante analysis of the use of financial instruments for OPT 2.

Table 17 Specific programme indicators for OPT

ID	Indicator	Unit of measurement	Default value	Reference year	Target value (2023)	Data source	Reporting frequency
75310	Capacity of the facilities designated for recharging	kWh	1 164	2013	16 300	Statistics	Once a year
75300	Number of newly purchased or upgraded facilities in the technical infrastructure for ecological vehicles	facilities		2011	1 000	Statistics	Once a year

Na Františku 32, 110 15 Prague 1
+420 224 851 111
posta@mpo.cz, www.mpo.cz

3.4.2 Integrated Regional Operational Programme

The draft Integrated Regional Operational Programme (IROP) makes clean mobility the focus of Specific Objective 1.2 'Increasing the share of sustainable forms of transport', which includes a sub-objective of developing a fleet of public transport vehicles with alternative powertrains (buses and traction vehicles).

Activities supported include the purchase of low- and zero-emission vehicles for passenger transport and the construction of refuelling and recharging points for low- and zero-emission passenger transport vehicles in order to reduce negative impacts from transport. The main target groups are residents, visitors, people travelling for work and services and public transport users. The types of beneficiaries include regions, municipalities, voluntary associations of municipalities, organisations established by regions, organisations established by municipalities, organisations established by voluntary associations of municipalities and carriers operating scheduled public transport services pursuant to Act No 111/1994 on road transport, under a contract for public passenger transport services.

Aid is targeted on all regions of the CR other than the capital city of Prague, and on areas defined in the integrated strategies for Integrated Territorial Investment and the Integrated Area Development Plan.

Table 18 Specific programme indicators for the IROP in relation to specific objective 1.2

ID	Indicator	Unit of measurement	Default value	Reference year	Target value (2023)	Data source	Reporting frequency
7 51 20	Share of public passenger transport to total passenger transport	%	30	2011	35	Statistics	Once a year

3.4.3 Operational Programme Enterprise and Innovation for Competitiveness

The OP EIC focuses on introducing innovative low-carbon technologies in the field of low-carbon transport in enterprises. It covers Priority Axis 1 'Promotion of research and development for innovation intended to support research, innovation' and Priority Axis 2 (Investment Priority 4, Priority Axis 3) 'Adoption of low-carbon technologies'. One of the activities supported is 'Deploying innovative technologies in the field of low-carbon transport (electromobility of road vehicles)'.

To avoid any overlaps with the OPT and IROP, projects in the area of introducing low-carbon transport will typically be pilot projects aimed at introducing electromobility for enterprises.

Eligible expenditure will cover the purchase of related technologies, recharging points, possibly the option of covering some or all of the difference between the purchase price of an electric car and the average price of cars with internal combustion engines. The project output will be the territory in which basic infrastructure for electromobility is installed and the acquisition of vehicles; the results will be reflected in the acceleration of the process of introducing electromobility.

Table 19 Specific programme indicators for OP EIC in relation to the specific objectives

ID	Indicator	Unit of measurement	Default value	Reference year	Target value (2023)	Data source	Reporting frequency
21710	Applied Innovative low-carbon technologies	units	0	2014	70	MA	Annually

3.4.4 The Connecting Europe Facility (CEF)

The Connecting Europe Facility (CEF), established by Regulation 1316/2013, also offers opportunities for financial aid in the field of alternative fuels. The CEF is directly managed by the European Commission. The Commission has delegated the implementation of this facility to the Innovation and Networks Executive Agency (INEA). Support for alternative fuels and clean mobility is treated as an objective of the cross-cutting priority of new technologies and innovation. The EU co-financing rate for all types of project in this area is 20%.

3.4.5 Aid programme for municipalities located in national parks

A call for aid for municipalities in national parks was completed in September 2015, where, under sub-programme IV. 5. Promoting environmentally-friendly transport in national parks, with an allocation of CZK 10 million, municipalities located in national parks could apply for a grant to purchase environmentally friendly vehicles for public administration in the national park. The purpose of the measure is to support environmentally-friendly operation of public administration on the territory of the national parks. The implementation of this measure also helps to promote the influence of environmentally-friendly transport on the quality of life and the environment.

The aid applies to the purchase of:

a) passenger cars (electric car or car with CNG powertrain) – a maximum of 1 car per municipality;

b) electric bicycle or electric scooter – a maximum of 2 units per municipality.

The aid is limited to a maximum of 50% of eligible expenditure (electric car - CZK 200 000; car with CNG powertrain – CZK 80 000; electric scooter – CZK 20 000; electric bicycle - CZK 15 000).

3.4.6 Raising awareness of clean mobility

Under the 'Environment' national programme, a call was announced in 2015 for aid for projects to raise awareness-of clean mobility. The campaign will run primarily during 2016 and the first half of 2017. The allocation for the call amounts to CZK 20 million and the campaign is targeted towards statute towns. The objective is to support projects aimed at raising awareness of urban and suburban mobility issues and possible solutions which will ultimately lead to improvements in the quality of air and of life, particularly in cities.
In addition, during October 2015 OPE technical assistance funds were used to launch a campaign to raise awareness of the positive impacts of the 57th OPE call –'Support for the replacement of buses by CNG-powered buses and refuelling infrastructure for 3 regions' (the Ústí region, the Moravia Silesia region and the Brno agglomeration).

3.4.7 National science and research programmes

All programmes to support science, research and innovation in the CR are based on the strategic objectives defined at EU level in the programme 'Horizon 2020 - the framework programme for research and innovation'. Horizon 2020 is a basic, strategic programme, funding science, research and innovation at a European level during the period from 2014-2020. The Horizon 2020 programme follows on from the framework programmes for research, announced by the EU since 1980, specifically from the Seventh framework programme of the European Community for research, technological development and demonstration activities (2007 to 2013). The target group for the Horizon 2020 programme encompasses both researchers (at universities, in research institutes or industrial companies) and undertakings and firms, which can use the Horizon 2020 programme to help finance activities in the field of research and new technologies.

To prepare and implement applied research, experimental development and innovation programmes, including programmes for the state administration, public research, experimental development and innovation competitions for the targeted support of research projects under research development and innovation programmes (hereinafter referred to as 'support') and public procurement in the fields of research, development and innovation, the Technology Agency of the Czech Republic ('TA CR') was established.

The TA CR is a state-subsidised organisation and administrator of a budget chapter pursuant to Section 36a of Act No 130/2002 on support for research, experimental development and innovation from public funds and amending certain related Acts (Act on support for research, experimental development and innovation), as amended. The TA CR is a separate accounting

unit and independently manages targeted and institutional funds allocated under the State Budget Act of the Czech Republic.

It currently manages seven active programmes. Most are aimed at promoting cooperation between research organisations and application sectors (enterprises). The following programmes are relevant for the purposes of the NAP CM,:

- **Competence Centre Programme** - focusing on support for the establishment and activities of R&D&I centres in cutting-edge fields with high application and innovative potential and a promising outlook for significant contributions to the growth of competitiveness of the CR,
- **ALFA Programme** - a search for 'smart solutions' for cutting-edge technologies, transport sustainability and environmental protection,
- **BETA Programme** - a public procurement programme in research, experimental development and innovation for the state administration,
- **EPSILON Programme** - support for projects whose results show potential for rapid application in new products, production processes and services,
- **GAMMA Programme** - the programme's main goal is to support the practical results of research and development and significantly increase their effectiveness,
- **DELTA Programme** - focused on promoting cooperation in applied research and experimental development through joint projects with enterprises and research organisations supported by the TA CR and leading foreign technological and innovation agencies (or similar institutions) with which the TA CR cooperates.

Links to the issue of clean mobility can be found, under certain conditions, in all the above programmes. The most relevant is the **EPSILON Programme,** or its **Energy and Materials sub-programme**, which focuses on achieving a long-term sustainable energy mix based on a wide portfolio of resources, prioritising the use of all available domestic energy sources and increasing the energy independence and energy security of the Czech Republic.

The research objectives of this sub-programme, in the area of 'energy in transport' include:

a) increasing the share of liquid biofuels as a substitute for fossil fuels (R&D&I objective 1.6.1),

b) increasing the share of electricity for powertrains as a substitute for fossil sources of liquid biofuels (R&D&I objective 1.6.2),

c) the prospective introduction of the use of hydrogen as a propulsive energy source in transport (R&D&I objective 1.6.3).

In addition to research projects funded from the state budget through the programmes listed above, corporate projects are also implemented, which address the problem of reducing emissions in transport, not only through the operation of the vehicles themselves, but also by

using intelligent transport systems and other methods of reducing the environmental impact of the transport sector.

3.5 Summary of aid mechanisms for alternative fuels abroad

The forms of support for electric vehicles in European countries can be categorised as follows:

- Subsidies for the purchase of vehicles.
- Subsidies for the purchase and installation of recharging points.
- Free charging of electric vehicles.
- Tax breaks for ULEV (Ultra-low emission vehicles).
- Obligation to install recharging points in new administrative buildings and shopping centres.
- Dedicated parking places.
- Dedicated lanes on highways.
- Support for research and development.
- Education, media campaigns.
- Funding for pilot projects.
- Preference for low-emission vehicles in the public administration, public transport.

The vast majority of European countries focus their national strategies only on electromobility or plug-in hybrids and, marginally, on hydrogen-powered vehicles.

Some European countries have national platforms, which are primarily established by the government (e.g. Germany's Nationale Plattform Elektromobilität (NPE)). In other countries, these national platforms operate on the initiative of the industrial sector, working in coalition with key stakeholders (e.g. the electrified Mobility Platform in Italy, which was established by Italian industries in cooperation with research organisations and scientists). The establishment of national electromobility platforms is aimed at bringing all the relevant key players together and launching effective cooperation. In some countries, electromobility receives strong support through the regulation of the number of cars with internal combustion engines. This can be done by high taxation (Norway) or even by restricting the number of vehicles registered (Singapore).

The forms of support for gas-powered vehicles in European countries can be categorised as follows:

- Gasification of the transport sector is part of transport and environmental policies.

- Programmes for the gasification of the transport sector are initiated and supported by the government. Most of these programmes are included in systemic support for the development of the urban public transport system.
- Demonstration projects are implemented in locations that are the most exposed in environmental terms (spas, recreational areas, protected areas, national parks, etc.).
- Tax breaks are granted for natural gas as a fuel for a longer period of time.
- Subsidies for developing the infrastructure.
- Direct subsidies for additional costs incurred by the operation of gas-powered buses.
- Direct subsidies for the purchase of all gas-powered vehicles less than 3 years old.
- Legislative support for gasification.
- Support for research and development.
- In city centres, the use of gas-powered vehicles for deliveries, taxies, etc. is promoted (through parking spaces, access to the centre, etc.).

  In certain countries, activities to support the introduction of hydrogen have also been developed. The clearest example of this is Germany, where, under the 'Nationales Innovationsprogramm Wasserstoff und Wasserstofftechnologie' (National innovation programme for hydrogen and hydrogen technologies) investments of public funds amounting to a total of EUR 1.6 billion into the research and development of hydrogen technologies are planned to 2016. It is expected that a similar sum will be invested in this programme by the German industrial sector.

4. Strategic and specific objectives of the NAP CM

4.1.1 Strategic objective No 1: Development of electromobility

The vision for the development of electromobility in the CR, on which the individual strategic objectives and measures described below in the NAP CM are based, is to achieve a situation where 250 000 electric vehicles are operating in the CR by 2030.

The gradual introduction of these vehicles over time is explained in Chapter 3. During the process of revising the NAP CM, as anticipated in Chapter 6, the fulfilment of this vision will be monitored on an ongoing basis using the number of vehicles expected by the deadline for the revision of the NAP CM as the benchmark.

Strategic objective 1.1 Facilitating the construction of recharging infrastructure for electromobility

> All-electric vehicles (BEV) have limited range. A sufficiently dense recharging infrastructure can help to eliminate this barrier. The current density of the recharging network is low compared with the network of petrol stations, which makes it impossible to offer the same operating conditions as those enjoyed by users of conventional cars.

The following measures have been proposed in order to meet this strategic objective:

- Investment aid for the construction of a public recharging infrastructure.
- Investment aid for the construction of a recharging infrastructure for public transport systems (private).
- Investment aid for the construction of corporate recharging infrastructure (private).
- A uniform approach to approving the construction of recharging point infrastructure.
- Increasing the rate of depreciation for the 1st year of recharging infrastructure's depreciation.
- Mandatory quotas for developers to provide connectivity for the recharging infrastructure.

Strategic objective 1.2 Stimulating demand for electric cars

One of the main obstacles to the development of electromobility is the cost of electric vehicles, which affects an electric vehicle's total costs of ownership (TCO) compared to vehicles with internal combustion engines powered by conventional fuels. Measures that either directly target reductions in the purchase price or influence other operating expenses may accelerate returns on higher input costs. In future, the TCO of an electric car will converge on that of vehicles with conventional powertrains, and temporary measures that aim to reduce these costs may contribute to the greater presence of electric vehicles on the market today.

The following measures have been proposed in order to meet this strategic objective:

- Increasing the rate of depreciation for the 1st year of an electric vehicle's depreciation.
- Introducing an option allowing public contracting authorities purchasing vehicles to apply a methodology for calculating operational lifetime costs, as provided for in Directive 2009/33/EC.
- Support for the purchase of electric vehicles by central and regional government agencies and organisations subsidiary to them, managed by them or founded by them.
- Support for the purchase of electric vehicles for entrepreneurs.
- The use of innovative financial instruments to promote the purchase of vehicles powered by alternative fuels for natural persons not engaged in business.
- Support for the acquisition of vehicles powered by alternative fuels for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services.
- Relief from the payment of motorway vignettes for vehicles powered by alternative fuels.
- Adjusting systems and rates of road tax for vehicles powered by CNG/LNG and electric vehicles over 12 tonnes and introducing tax relief for LNG and hydrogen-powered vehicles.

Strategic objective 1.3 Creating conditions for increasing potential customers' acceptance of electromobility

Only the very limited number of actual users have so far had experience of electromobility, while a number of potential customers have concerns, for example, concerning battery life. Electromobility is still considered a technology that is still remote from most potential customers. The current lack of interest in buying electric vehicles on the part of customers also affects the limited range of electric vehicles on offer. It is therefore appropriate to take inspiration from measures adopted by other countries, which have introduced certain preferential rights for drivers of electric vehicles, which can improve potential customers' acceptance of electromobility.

More also needs to be done to inform the professional and general public in the area of electromobility and increase the level of comfort when recharging electric vehicles, which may also be facilitated by adopting some of the specific requirements contained in Directive 2014/93/EU.

Finally, a greater share of the fleets of central and local government agencies by electric vehicles would also help to increase public acceptance of electromobility, which is mainly addressed under strategic objective 1.2.

The following measures have been proposed in order to meet this strategic objective:

- The use of bus and taxi lanes by electric vehicles.

- Free parking in public carparks.
- Free parking in other designated places (blue zones).
- Dedicated traffic signs for electric vehicles.
- Labelling of electric vehicles.
- Compliance with the requirements of Directive 2014/94/EU concerning standards for the recharging points of infrastructure.
- Compliance with the requirements of Directive 2014/94/EC affecting businesses operating public recharging points.
- Compliance with the requirements of Directive 2014/94/EU in relation to operators of public recharging points.
- Targeted education for the professional and general public on alternative fuels.
- Providing information to road users on the location, the type and the equipment available in recharging and refuelling stations though ITS systems.

Strategic objective 1.4 Improving conditions for businesses in areas relating to electromobility

In the interests of developing electromobility in the CR, efforts should be made to ensure existing national legislation does not create unnecessary obstacles to business development in this area and, where these obstacles are identified, their speedy removal should be sought. From this perspective, it is important that the state administration receive a certain level of feedback from stakeholders in electromobility, which would provide it with an overview of potential problems encountered by the affected businesses during their operations. Technological platforms for electromobility may be used for this purpose, the emergence of these is proposed as part of the implementation of strategic objective 4 (R&D).

One obstacle that has already been identified is the current CR regulations relating to requirements for electrical engineering qualifications, which are extremely strict for this area compared to regulations in neighbouring countries (e.g. in Germany - see VDA AK 4.14). Whereas workers in Germany are not required to have electrical engineering training to carry out precisely defined tasks (eFKffT) and are able to carry out precisely defined activities (in the case of electromobility, connecting and disconnecting ‘high voltage’ batteries, for example) after self-study and completion of a training course, the Czech Decree No 50/1978 on professional competence in electrical engineering excludes that option. This is because such activities are treated as work with, or in the vicinity of, high-tension devices, for which Decree No 50/1978 lays down the relevant educational and exam requirements, As things stand in the CR, this leads to higher requirements for qualifications from staff with the necessary education and experience, which raises the costs associated with the overall period for staff training for enterprises in the electromobility sector. The scope of the activities that can be carried out on an electric car by a worker without an electrical engineering qualification must be defined.

The following measures have been proposed in order to meet this strategic objective:

- An amendment to Decree No 50/1978 on professional competence in electrical engineering.
- Compliance with the requirements of Directive 2014/94/EC affecting businesses operating public recharging points.

Strategic objective 1.5 Coordinating the development of the recharging infrastructure and the distribution system

Alongside the development of electromobility and a denser network of recharging points, problems are very likely to arise with the distribution of electricity, particularly at low voltage. Major overlaps in recharging points may create major problems and lead to a need for investment. When planning the development of recharging infrastructure, the distribution system's capacity also needs to be taken into account (especially where a high density of recharging points is expected). Insufficient distribution system capacity may also limit the development of recharging infrastructure, particularly in locations with high population density.

No specific measures have yet been proposed under this strategic objective (other than one related measure under Priority No 4: Research and Development in alternative fuels). In terms of connection and assessing the impact of recharging points on the distribution system, we can proceed in the same way as for any other supply facility. Should significant progress be made in the construction of new recharging points, we can expect to see requirements for new supply points or an increase in the voltage of the main circuit breakers. Pursuant to Act No 458/2000 (the Energy Act), the operator of a distribution system is required to lay down conditions and deadlines for connection and to allow electricity to be distributed to anyone who requests it. According to the DSOR, the operator of a distribution system is entitled to reject a request by an applicant to connect to the distribution system in the event that the capacity of the distribution network is insufficient at the site of the requested connection, with respect to the requested quality of the supplied power (voltage, imbalances and dynamic shocks). The rejection of a request to connect to the distribution system must contain a technical proposal for an alternative method of resolving the connection (connection at another site, connection at another voltage level, time out to reinforce the network).

The development plan for the distribution system must also be prepared with respect to additional expansion of the recharging infrastructure. The preparation of measures to spread charging times or to enable charging during downtimes in offtake can have a significant impact on eliminating peak supply times. This also relates to the development of smart grids, or to the gradual introduction of new elements and technologies to the distribution system and its management. This area is regulated by a separate Action Plan (the Smart Grids National Action Plan) and its fulfilment and any potential revision will be coordinated with the NAP CM so that both action plans complement each other. Smart grids help compensate for fluctuations in electricity supply. Electric cars will act as a large battery, which can be used to supply electricity to the network when needed or to store electricity when there is a surplus.

4.1.2 Strategic objective No 2: Development of CNG-powered vehicles.

The vision for the development of CNG-powered vehicles in the CR, on which the individual strategic objectives and measures described below in the NAP CM are based, is to achieve a situation where, at the latest by 2030 in the ideal (optimistic scenario (O1A) the share of total fuel consumption accounted for by natural gas consumption is 10%, which would correspond to around 250 000 vehicles fuelled by CNG. Under this scenario, the volume of natural gas consumption could reach up to 600 million m^3.

The gradual increase in the volume of natural gas consumption and in the number of CNG-powered vehicles over time is shown in Chapter 6. During the process of revising the NAP CM, as anticipated in Chapter 6, fulfilment of this vision will be monitored on an ongoing basis using the volume of natural gas consumption and the expected number of vehicles at the deadline for the revision of the NAP CM as a benchmark.

Strategic objective 2.1 Facilitating the construction of an infrastructure of refuelling stations

Despite relatively rapid growth in the segment of vehicles fuelled by natural gas, another factor hindering the expansion of the market for CNG-powered vehicles is the slow growth of the infrastructure of refuelling stations and their cost. The low share of vehicles powered by natural gas in fleets run by central and local government, transport companies and enterprises (and the directly related lower demand for an expansion of the infrastructure), which are further addressed under strategic objective 2.2, the high costs associated with the construction of this infrastructure and the different approaches adopted by the individual agencies/authorities are just some of the reasons for this slow development. Here the current practice highlights the inconsistent approach of individual building and other authorities, which require additional documents that are not always generally needed (e.g. EIA requirements for increased fire resistance, etc.). Depending on the location, there are different requirements for documents and various statements, starting from the land owner, through the utility provider (water, gas, telecommunications, electricity) to institutions dealing with environmental impact and safety (in the case of CNG this mainly concerns the Czech fire brigade). This all leads to unnecessary delays in the construction of CNG stations (each additional request or question delays the issue of a building permit by approximately one month).

A number of measures have been proposed to meet this strategic objective, which will result in an acceleration of the construction of the refuelling station infrastructure, in particular:

- Investment support for the construction of a public infrastructure of CNG refuelling stations.
- Investment support for the construction of an infrastructure of CNG refuelling stations for public transport and rail transport.
- A unified methodology during the process of approving the construction of recharging and refuelling station infrastructure.
- Increasing the rate of depreciation for the 1st year for the CNG refuelling station infrastructure.

Strategic objective 2.2 Stimulating demand for CNG-powered vehicles

Past experience shows that one of the most important impulses/factors influencing demand for CNG-fuelled vehicles is a cut in the rate of excise duty on natural gas, which beings significant savings in running costs to operators of vehicles powered by natural gas.

The present level of taxation on CNG/LNG in the CR is based on a Voluntary Agreement concluded in 2006 between the Czech Government and gas companies, which applies to 2020 (see also Act No 261/2007.) Under this Agreement and the Act, the level of excise duty for CNG/LNG is stabilised to ensure that the duty is gradually increased in order to reach the minimum level of excise duty set by EU directives to 2020. In terms of further development, it is important that the increase in the rate of excise duty to 2020 should be set now. In the event that the preferential excise duty is increased significantly after 2020 and this important tool to stimulate demand for CNG-fuelled vehicles ceases to exist, developments would probably follow the scenario set out under Option 3, meaning the CR would fail to meet its obligations in terms of reducing emission levels.

Demand for CNG-fuelled vehicles is currently also positively affected by the zero rate of road tax, which applies to vehicles up to 12 tonnes, and also to public transport vehicles. In the interest of further developing this market sector, it is important to find a way of also stimulating demand for vehicles over 12 tonnes, thereby encouraging heavy freight transport to become more environmentally-friendly.

Despite all the existing measures listed above, the fact remains that the share of vehicles powered by natural gas in fleets run by transport companies and enterprises remains extremely low. This closely relates to the issue of higher purchase costs for these vehicles in comparison with vehicles with conventional powertrains (which is particularly pronounced in the case of buses).

These measures have been proposed in order to meet this strategic objective:

- Maintaining the reduced rate of excise duty on CNG at a certain level even after 2020.
- Setting a lower rate of road tax for CNG-powered vehicles weighing more than 12 tonnes.
- Introducing an option for public applicants to apply a methodology to calculate operating costs using lifetime costs when purchasing vehicles, pursuant to Directive 2009/33/EC.
- Grants for the purchase of vehicles with CNG powertrains by central and regional government agencies and organisations subsidiary to them, managed by them or founded by them.
- Support for the acquisition of vehicles powered by alternative fuels for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services.
- Relief from the payment of motorway vignettes for CNG-powered vehicles.

<u>Strategic objective 2.3 Creating conditions for increasing potential customers' acceptance of CNG-powered vehicles</u>

If natural gas is to be accepted as a standard fuel by the general public, and therefore by potential customers, efforts must be made to remove any obstacles preventing such acceptance while, at the same time, raising potential customers' awareness of the benefits of using gas-powered vehicles. As in the case of electric vehicles, preferential rights must be introduced for these vehicles, for example in parking, which may also increase potential customers' acceptance of this type of vehicle.

One of the main obstacles to the development of CNG-powered vehicles is a legislative requirement in the current text of MI Decree No 268/2011 on technical conditions for fire protection in buildings, which refers to ČSN 73 6058. This regulates the equipment for separate, serial and collective garages in such a way that CNG-powered vehicles are seen as representing a greater fire risk for garages than petrol-powered vehicles. Because of this, a number of operators of collective garages in the Czech Republic prefer to fit signs at entrances to these garages prohibiting the entry of CNG-powered vehicles. The failure to remove these barriers would mean a slower increase in the number of vehicles with alternative powertrains than set out in the vision for the development of the market for CNG-powered vehicles, so this is a totally undesirable situation.

The following measures have been proposed in order to meet this strategic objective:

- Setting up a working group from the CD FRS/Škoda Auto/CGA in order to find a consensual solution to the problem of garages (e.g. by carrying out tests of gas-powered vehicles) and subsequently adopting the relevant legislation (particularly in relation to MI CR Decree No 268/2011.).
- Targeted training events for the professional and general public (communicating the advantages of driving gas-powered vehicles/refuting the 'myths' surrounding these vehicles).

4.1.3 Strategic objective No 3: Development of LNG-powered vehicles.

The vision for the development of LNG-powered vehicles in the CR, on which the individual strategic objectives and measures described below in the NAP CM are based, is to achieve a situation by 2030 where natural gas consumption stands at about 90 million m^3 and where the number of registered LNG-powered vehicles totals around 1 300.

The gradual increase in the volume of natural gas consumption and in the number of LNG-powered vehicles over time is shown in Chapter 6. During the process of revising the NAP CM, as anticipated in Chapter 6, the fulfilment of this vision will be monitored on an ongoing basis using the expected volume of consumption of natural gas (LNG) and the number of vehicles at the deadline for revising the NAP CM as a benchmark.

<u>Strategic objective 3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles</u>

Although, on the basis of the above forecasts of the development of the market for LNG-powered vehicles we expect this market segment to grow at a far slower rate than the market for CNG-powered vehicles, the Czech government's policy in this area cannot be completely passive. It must, in particular, take steps to encourage domestic and foreign LNG-fuelled freight vehicles and semi-trailers to cross the Czech Republic and promote the development of the first LGN refuelling stations and, in accordance with the requirements of Article 6 of Directive 2014/94/EU, address the issue of the distribution of liquefied natural gas in the Czech Republic.

In order to achieve this global objective, it is expected that the following measures will be implemented during the period to 2020:

- Support for passage through the Czech Republic by domestic and foreign LNG-fuelled freight vehicles and semi-trailers.
- Investment support for the development of LNG-refuelling points.
- Increasing the rate of depreciation for the 1st year of the depreciation of LNG refuelling point infrastructure.

Strategic objective 3.2 Adding to the current legislative framework covering LNG-fuelled vehicles

In order to create a basic legislative framework for the development of LNG-powered vehicles, an amendment to Decree No 341/2014., which regulates the approval of vehicles, was recently adopted. However, in terms of the future development of this market segment, it is important that this legislative framework be complemented in a suitable manner, to enable LNG to be accepted as a standard alternative fuel, subject to procedures similar to CNG and for a certain level of tax relief to be applied to vehicles powered by this fuel, at least partially based on the tax relief applied to CNG-fuelled vehicles.

Based on the example of the requirements for servicing of CNG-powered vehicles, which were incorporated in the normative Czech Gas Association document TPG 982 02 - Conditions for the operation, repair, maintenance, inspection, display and sale of motor vehicles with a CNG propulsion system (valid from 1 September 2015), it would be desirable to prepare a regulatory base with special requirements solely for the servicing of LNG-powered vehicles.

Proposed measures to meet this strategic objective include:

- Amending the legislation covering fuels to cater for LNG-powered vehicles.
- Removing barriers in the area of servicing LNG-powered vehicles.
- Introducing relief from road tax for LNG-powered vehicles.

4.1.4 Strategic objective No 4: Initiating the development of hydrogen technology in transport

As is apparent from Chapter 3, although hydrogen propulsion is still only at a demonstration stage in the CR, global and European trends show that this sector may move on to an initial stage of commercialisation over the next 8-10 years. Although developments in this technology

will still primarily take place in R&D activities during the period to the next revision of the NAP CM, the CR should nevertheless develop some support activities, aimed for example at an increase in reliability, a reduction in the purchase price and integration with other types of alternative fuels and overall commercialisation. As an example, the deployment of a fleet of hydrogen-powered buses or light freight vehicles for the centres of major cities might be considered. However, this must be preceded by a detailed feasibility study to assess the potential for the use of hydrogen power in the Czech Republic.

As in the case of LNG-powered vehicles, the lack of a regulatory base should also be highlighted in the case of vehicles based on hydrogen technologies, with special requirements for the servicing of these vehicles.

Within the framework of this objective, the following activities are currently being proposed:

- Compliance with the requirements of Directive 2014/94/EU concerning standards for hydrogen refuelling stations.
- Introducing tax relief from road tax for hydrogen-powered vehicles.
- Removing barriers in the area of servicing hydrogen-powered vehicles.
- Assessing the potential for the use of hydrogen propulsion in the CR.
- Aid for research and development in the hydrogen sector, based on pilot projects.

Given the close links between the development of electromobility and fuel cell technologies, certain measures primarily designed for developing electromobility should also apply to vehicles powered by fuel cells.

- Support for the purchase of electric vehicles for entrepreneurs (for business purposes).
- Investment aid for the construction of corporate infrastructure for electric vehicles.
- The use of bus and taxi lanes by electric vehicles.

Following on from the aforementioned study, which should also confirm or correct the specific objective for public hydrogen refuelling stations set out below, it is assumed that measure S11 will subsequently be implemented to promote the construction of an infrastructure for alternative fuels to cover hydrogen refuelling stations.

4.1.5 Strategic objective No 5: Research and development in the area of alternative fuels

The administrative burden for beneficiaries receiving grants and implementing projects under co-financed by Czech programmes remains greater than for EU programmes. Even though steps have been adopted to simplify this, the rules for grant applications, implementation and evaluation are still far simpler under EU programmes (an example from the past would be the 7th Framework Programme/Horizon 2020),. Both the amount and the intensity of aid makes EU programmes more to applicants (from the private sector) than Czech programmes. It is important that cooperation between the academic and private sectors should be supported

during the upcoming programming period in the CR. One solution might be to create separate electromobility technological platforms, if sufficient interest in its establishment could be found among stakeholders and if the issue cannot be sufficiently effectively addressed using existing platforms.

The following measures are proposed within the framework of strategic objectives to support research and development in the area of alternative fuels:

- Proactive approach to developments in the area of electromobility and other alternative fuels (CNG/LNG and advanced biofuels).
- Research and development in technologies for vehicles powered by electricity, recharging infrastructure and links between electromobility and the distribution system/Smart Grids.
- Including problems relating to alternative fuels in transport in the curricula of secondary schools and universities.
- Strengthening cooperation between universities, research organisations and industry in the development of electromobility in the CR and other modern development trends in the field of alternative fuels.
- Research into the impact of new fuels and technologies on emissions in actual traffic during normal use, including emissions of hazardous substances that have not yet been restricted or monitored, and the impact of these emissions on human health.

4.2 Specific objectives in relation to Directive 2014/94/EU

Following on from the requirements of Articles 4 and 6 of Directive 2014/94/EU on the deployment of alternative fuels infrastructure, specific objectives relating to this area are described in this chapter:

- Development of public recharging stations for motor vehicles.
- Development of public CNG refuelling stations for motor vehicles.
- Development of public LNG refuelling stations for motor vehicles.
- Development of public hydrogen refuelling stations for motor vehicles.

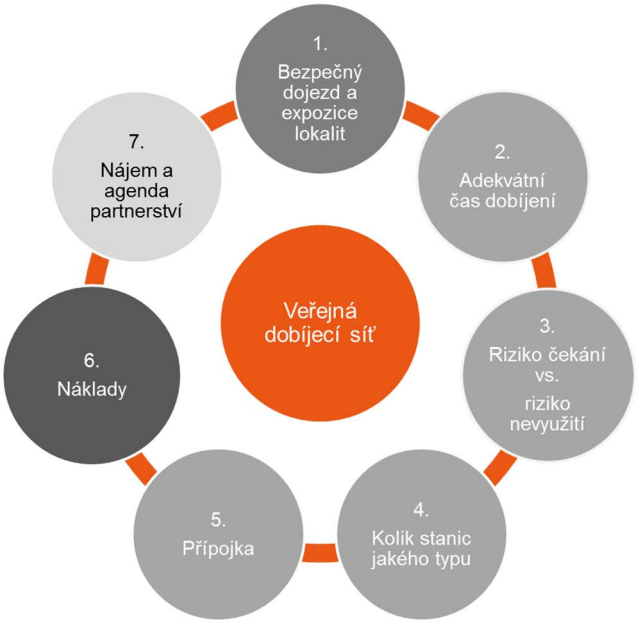
No objectives in the field of alternative fuels for inland waterway transport have been defined at this stage of preparation of the NAP CM, because, on the basis of the analysis contained in part 3.2.3, they do not yet appear to be cost-effective for this given area. The issue will be further analysed when this document is next revised.

4.2.1 Specific objective No 1: Development of public recharging stations for motor vehicles.

When designing a strategy to develop a network of public recharging stations, a number of factors, which relate not only to the geographical coverage of the recharging infrastructure, but

also with its use, the type of stations in terms of location and other factors, must be taken into account. These factors can be summarised as follows:

Figure 26 Key factors for consideration concerning the strategy for developing a public network of recharging stations



1. Safe range and location exposure 2. Sufficient recharging time 3. Risk of waiting vs. risk of not being used 4. How many stations and what type 5. Connection 6. Costs 7. Lease and partnership arrangement

Pursuant to Directive 2014/94/EU, the basic starting point for determining the desired number of public recharging stations is the expected number of electric vehicles that can be charged by this infrastructure (i.e. relating to BEV and PHEV) to the end of 2020. Here, the NAP CM is working with the assumption of 17 000 electric vehicles, of which 6 000 should be BEV and 11 000 PHEV.

Like the projection itself, the estimate of this number is subject to a number of uncertainties or based on assumptions that may change, depending on developments in the electromobility market. It is, for example, extremely difficult to anticipate the behaviour of users of these cars in terms of their interest in using the public recharging infrastructure. This applies in particular to users of PHEV, where the question is whether they will actually use this infrastructure to the same extent as BEV drivers (which will depend in particular to what extent PHEV will be allowed to recharge from higher voltage AC points, or from DC points, which will form the basis of the public recharging network - restrictions in the form of slower charging will significantly reduce the attractiveness of the public network for PHEV drivers). It is therefore assumed that the national target will be subject to evaluation and, possibly, revision during the regular review of this Action Plan.

The determination of national targets for numbers of recharging stations is based on the following assumptions:

- In accordance with the previous text, the objective is defined as being to ensure that the number of recharging points precedes the market in all-electric vehicles (BEV), enabling recharging stations to accommodate the number of electric vehicles expected on the roads by 2020 (e.g. at least to 2025).
- In order to ascertain whether there are sufficient numbers of recharging stations, the following assumptions have been developed (which will be further refined on the basis of empirical evidence):
    - 80% of BEV are recharged at home or at work (i.e. privately), which means only 20% of vehicles are recharged at public recharging stations (for PHEV the estimate is even lower – at around 5 -10%, or even less).
    - The average range for an electric vehicle per charge is 120 km.
    - On average, an electric car travels around 50 km per day.
    - The average capacity of the vehicle battery is 20 kWh.

In terms of the number of recharging stations/points, it is also important to distinguish between the location (several recharging stations can be located at a single site) and the type of station, because a DC fast-charging station can only charge 1 vehicle and is therefore considered to be 1 fast-charging point, while in the case of AC recharging stations, it is assumed that this type of charging station enables two vehicles to be charged independently of each other, i.e. one station = two recharging points for normal charging. With regard to the definition of the term ‘recharging station’ in Directive 2014/94/EU, the specific objective is defined on the basis of the number of recharging points.

In this respect, it should also be pointed out that the terminology used in the NAP CM differs slightly from the definitions used in Directive 2014/94/EU. The main difference is that the Directive defines stations primarily in terms of output (normal power/high power) and not according to the charging method (AC/DC), or rather it only distinguishes the method of charging for high-power stations. The text of the Action Plan uses the terminology employed locally, to avoid any misunderstanding or confusion with existing stations. When defining objectives in the Action Plan, the following definitions were used:

- ‘Recharging point’ = interface that allows the charging of one vehicle (in this case the Directive uses the term ‘recharging station’).
- ‘Recharging station’ = appliance servicing one or more recharging points operating independently of each other.
- ‘DC recharging station’ = direct current recharging station (the Directive uses the term high power recharging station using direct current).

- ‘AC recharging station’ = alternating current recharging station (the Directive uses the term normal recharging station using alternating current for output up to 22 kW or high power recharging station using alternating current for output above 22 kW.

Given that, from the perspective of the Czech Republic, there are a limited number of key locations for the construction of the recharging infrastructure, we can assume that the development of the recharging infrastructure will focus on the concept of a ‘charging hub’, i.e. a site where a number of recharging stations are installed (starting with a smaller number, with others added subsequently), which will increase the demand for electricity output at the site but simplify the process of building and installing recharging stations, as the complicated process of laying the necessary lines can be implemented once, permitting the subsequent expansion of the site to include additional stations without further construction work.

Table 20 Number of public recharging stations

	2020
Number of recharging stations accessible to the public for motor vehicles.	1 300 public recharging points

If public recharging stations are truly to play the role of a national network ensuring accessibility to recharging throughout the territory of the CR, in addition to determining their number, a strategy for their location and the selection of the type (types) of recharging stations for specific locations must also be defined. Given the small number of electric vehicles on the roads, the concept for a network of public recharging stations cannot be based on current demand for public recharging points, which may change significantly with growing numbers of sales. Looking at the experience of other countries, we can, however, assume that electromobility will naturally develop first in larger cities and their surroundings before gradually expanding to other parts of the CR. From a design perspective, the construction of a basic network of public recharging stations can focus on the following two areas (which will be mutually combined or supplemented in practice).

a) Coverage of the main motorways and roads, major cities and regional centres with fast-charging infrastructure consisting of high-power DC recharging stations (stations equipped with a DC recharging point with a minimum output of 40 kW) allowing their mutual connection. This will entail building stations both within cities and on motorway and road lay-bys, or at locations allowing convenient charging for transit traffic. In certain specific locations (e.g. larger retail and entertainment centres in major cities) these types of recharging stations can be replaced by normal DC recharging stations (stations equipped with a DC recharging point with an output of 15-22 kW), where total aggregate power will be maintained (i.e. for example a DC recharging point with an output of 40 kW can be replaced by two DC recharging points with an output of 20 kW).

b) Building normal recharging stations on sites used for parking (including retail and leisure centres, parking garages, holding car parks, public parking spaces, particularly by public transport stations), which naturally complement the network of fast-re charging stations.

The construction of recharging stations will obviously take into account the specific needs of particular regions or locations (e.g. important tourist sites, national parks, areas with substantial cross-border tourism, areas supporting the development of zero-emission transport, etc.).

It follows from the description above that a strategic and conceptual approach will be required to achieve the objective of building a national network of public recharging stations (different locations have different potential over the short and medium term) and, if the aim is to ensure equitable coverage of the entire CR, its implementation will need to be coordinated not only at government level, but also at the level of individual regions and, possibly, municipalities authorities. From this perspective it would be desirable to avoid any unnecessary fragmentation of the construction work in the form of isolated networks with a few units or a

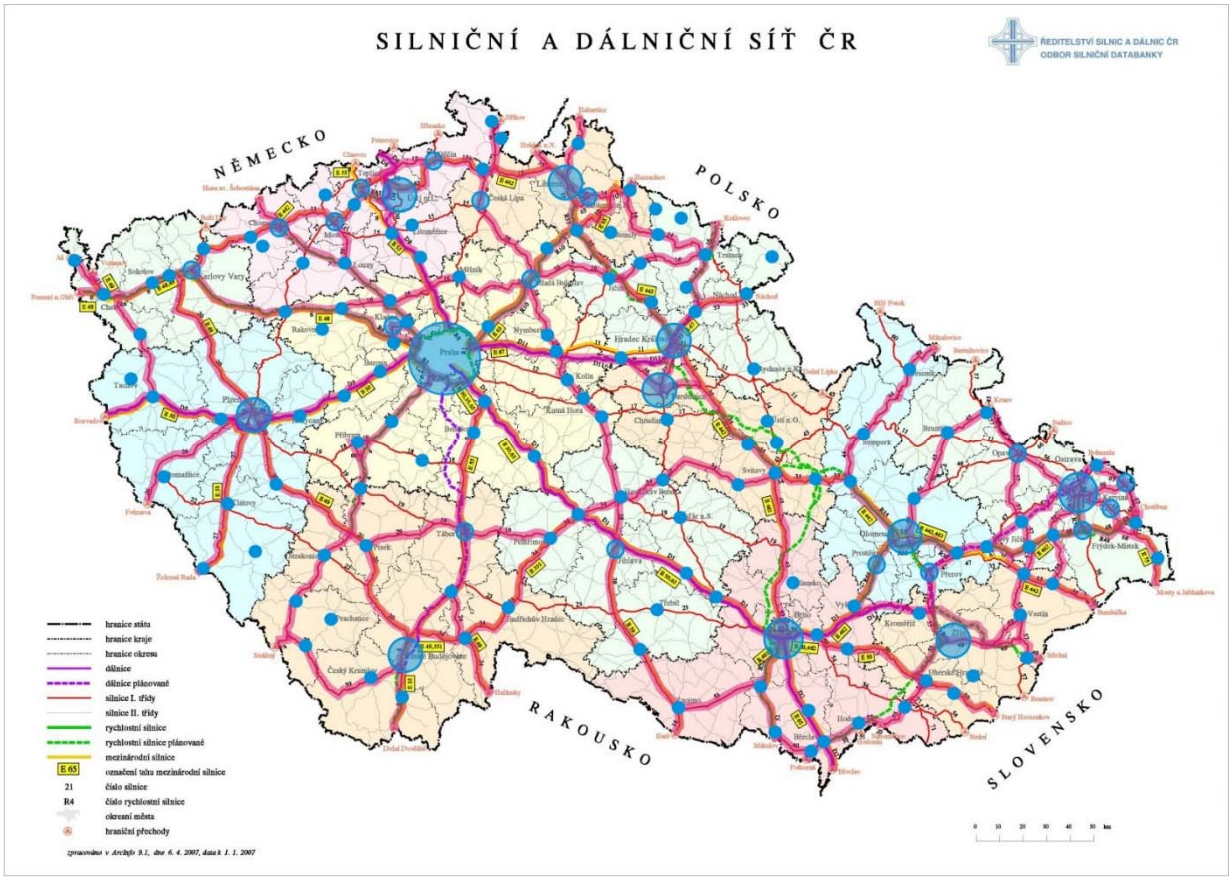
few dozen stations run by different operators, but this will increase the risk that the network will be developed in a non-systematic way, with potential negative consequences for the users themselves (heterogeneous technologies and standards, conditions for accessing the recharging networks, payment methods, etc.).

In this sense, the objectives for 2020 can be divided into two basic parts:

1) A backbone network of recharging stations aiming for strategic equitable coverage of the CR with a basic recharging infrastructure, primarily fast-charging. The target is for this base to cover a total of 500 DC high performance recharging points. In specific cases (see above) the high power DC recharging points can be replaced by a number of normal DC recharging points, provided the same overall level of output is achieved.
2) An additional backbone network comprising 800 normal recharging points with alternating (AC) or direct current charging (DC), which can both respond to the construction of the basic network and its capacity and also to demand from different regions.

With regard to the requirement set out in Article 3 of Directive 2014/94/EU for the national policy framework for the development of the market as regards alternative fuels in the transport sector to designate urban/suburban agglomerations, or other densely populated areas and networks which, subject to market needs, are to be equipped with recharging points accessible to the public, the locations of the backbone network of stations can be determined as follows.

Figure 27 Definition of locations of the backbone network of recharging stations



Road and motorway system in the CR

In accordance with the requirements of the abovementioned Directive, this proposal should ensure coverage of major urban and suburban agglomerations and all towns with a population over 15 000. As far as coverage of the road network is concerned, the proposal aims to provide adequate coverage of the TEN-T network defined in Regulation 1315/2013 and other major roads (motorways outside the TEN-T network and major A roads). In this respect, the proposal is based on the road classification contained in the Transport Sectoral Strategy document. In the case of the proposed locations on the road network, this proposal does not prejudge future decisions concerning the exact location of recharging points.

4.2.2 Specific objective No 2: Development of public CNG refuelling stations for motor vehicles

When expanding the network of CNG refuelling stations to individual towns, we have to start from the assumption that there must be geographically uniform coverage (at least at the level of all former 77 district towns) as well as coverage of all major routes.

This also relates to the need to identify suitable sites on the relevant motorways and A roads, where these new stations can be built. Coverage will be provided at least for all towns with over 10 000 inhabitants. When deciding on locations for new refuelling stations, it is advantageous to make maximum use of current filling stations (there are around 3 000 public filling stations in the CR) because this allows a reduction in the investment costs of building refuelling stations through the use of the existing infrastructure (access roads, sanitary facilities, shops, car wash, possibly connection to power lines, etc.). Gas will obviously have to be brought to the station, a compressor station will have to be built, the power connection may have to be reinforced as the demands on the electric power feeder are far higher than in a conventional petrol station.

Taking into account the framework requirements of Directive 2014/94/EU on the deployment of alternative fuels infrastructure and the other factors listed above, under the conditions existing in the Czech Republic (allowing for a distance of 150 km between stations) the approximate numbers of CNG stations is set out below:

- For the total length of the motorway and road network (A and B roads) 141 stations
- For the total length of the motorway and road network (A, B and C roads) 369 stations
- For CNG stations and 10% of multi-function fuel stations 276 stations
- For CNG stations and 15% of multi-function fuel stations 414 stations
- For one CNG station ‘in each district town (including Prague)’ 72 stations

When taking account of the number of existing CNG stations (as at 28 February 2015 there are 80, of which in Prague along there are already 8) and the desirable distance between the individual refuelling stations, we can conclude that the optimum number of CNG stations in the CR to ensure the operation of CNG-fuelled motor vehicles in urban and suburban areas and throughout the road network varies at around 300 public CNG stations (including those already existing). Pursuant to Article 6 paragraphs 7 and 8 of the aforementioned Directive, these can be put in place in two stages, with the main focus on refuelling stations in urban and suburban areas during the period to 2020, whereas during the period to 2025, greater focus should be placed on the motorway network (including TEN-T).

With regard to the requirement set out in Article 3 of Directive 2014/94/EU for the national policy framework for the development of the market as regards alternative fuels in the transport sector to designate urban/suburban agglomerations, or other densely populated areas and networks which, subject to market needs, are to be equipped with CNG refuelling stations accessible to the public, the locations of the backbone network of stations can be illustrated as follows (simplified).

Figure 28 CNG refuelling stations – target state

CNG refuelling stations – target state **Czech Republic**

Existing public station

Planned public station

Table 21 Number of public CNG refuelling stations

	2020	2025
Total number of public CNG refuelling stations for motor vehicles.	200 public CNG stations (the existence of a further 100 private CNG stations is also assumed)	300

4.2.3 Specific objective No 3: Development of public LNG refuelling stations for motor vehicles

Although there are no LNG-powered vehicles currently registered in the CR, it seems important, for reasons including the geographical position of the Czech Republic, to ensure continuity with the LNG Blue Corridors system, developed in western Europe, to the Czech Republic and on to the east 'from the 14th meridian – plus'. During the first stage (to 2020) the construction of 1-2 LNG refuelling stations should be sufficient to cover the passage through the Czech Republic to its eastern border and back, thereby complying with the aforementioned requirement of Directive 2014/94/EU, for example at intersections of motorways near Prague. Given that semi- trailers have a range of 1 000 km per refuelling, this solution would allow them, after refuelling in Prague, to arrive at the eastern border and return to the refuelling station. The arrows on the map show the main directions taken by transit traffic. However, it should be interpreted as showing that each point in the CR is accessible by LNG transport trailer from one refuelling station to another. Any subsequent increase in the number of stations (during the period after 2025) will depend on the rate of increase in numbers of LNG-powered vehicles.

The actual timing of the construction of LNG stations should be coordinated with projects developed by neighbouring countries, to ensure that the given infrastructure can be used to the maximum by carriers operating international freight transport vehicles. In order to fully extend the Blue Corridors system in the territory of the Visegrad countries to their eastern border, at least five additional LNG refuelling stations should be built in future. However, the construction of an LNG station near Prague does not necessarily have to be explicitly linked to the implementation of projects in these countries. The decisive factor will be the deadline for the implementation of the Blue Corridors in Germany or Austria, and based on this the Czech Republic can open up to environmentally friendly LNG-powered freight transport.

Table 22 Number of public LNG refuelling stations

	2025
Number of public LNG refuelling stations for motor vehicles	5 public LNG stations

4.2.4 Specific objective No 4: Development of public hydrogen refuelling stations for motor vehicles

Although no hydrogen-powered vehicles are currently registered in the CR, we should not conclude on the basis of this that there is no reason to address the issue of building an appropriate infrastructure of hydrogen refuelling stations (see the conclusion contained in Chapter 3.2.3).

Figure 29 Hydrogen refuelling stations – target state in Germany

Source: The Hydrogen and Fuel Cell Letter, Vol XX, No.

We should first (as in the case of LNG) start from the geographical position of the Czech Republic and take into account the fact that one of our neighbours (Germany) is engaging in relatively significant activities in the hydrogen technology sector (see the plan of the German Hydrogen Highway below).

From this perspective, it is worth considering connecting to this network in Germany (the closest hydrogen station to the Czech-German border is in Dresden and then in Munich), for example by building a station in the area of Ústí nad Labem or Pilsen. Another idea might focus on building stations in two or three of the largest cities in the CR (Prague/Ostrava/Brno), which have the greatest potential in terms of the deployment of hydrogen-powered buses. However, all these considerations must be confirmed on the basis of a detailed feasibility study (see above). The target for the CR given below, as it relates to Directive 2014/94/EU, is therefore purely indicative and we can assume that it will be revised on the basis of the study mentioned above. Directive 2014/94/EU allows for this type of approach and, therefore, nothing stands in the way of setting a particular target for the development of an infrastructure for hydrogen propulsion in this document. The CR hereby declares its openness to modern and innovative technologies, while not prejudging the results of further analysis, which is, in this case, absolutely essential.

Table 23 Number of public hydrogen refuelling stations

	2025
Number of public hydrogen refuelling stations for motor vehicles	3-5 public hydrogen refuelling stations

5. Timetable and Implementation Plan for the NAP CM

This section contains a sequential list of basic targets/expectations in the area of clean mobility for different periods.

Period to 2020

Legislation and allocation of aid

- Transposition of Directive 2014/94/EU on the deployment of alternative fuels infrastructure (by October 2016 at the latest).
- Revision of the transposition of Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles (public procurement).
- Resolving the issue of garaging CNG/LNG vehicles.
- Finalising the process of developing a legislative framework for embedding LNG in the legislation (fuel, taxes, vehicles, etc.).
- Implementation of an updated aid programme for the purchase of environmentally-friendly vehicles.
- Use of operational programmes to support the objectives of the NAP CM.
- Improving the public perception of alternative technologies.
- The NAP CM will be updated in 2018; pilot projects have been completed and implemented.

Electromobility:

- Standard range for electric cars 150-200 km/charge.
- Cities with populations of over 100 000, all the regional centres and motorway routes will be covered by the recharging infrastructure (over ¼ of the population of the CR will have regular access to electric recharging points).
- The principal service will be fast charging at public stations.
- In the area of passenger transport, the most common will be PHEV (plug-in hybrid) vehicles, all-electric vehicles (electric buses) will first be introduced in public transport.
- By the end of this period, annual sales will reach around 7 000 electric vehicles and a total of 6 000 BEV vehicles will be in operation, along with 11 000 PHEV.
- In relation to Directive 2014/94/EU on the deployment of alternative fuels infrastructure, the number of public recharging points will reach 1 300 by the end of the period (of which 500 will be DC recharging stations and 800 AC recharging points).
- The development of electromobility can be accelerated during this period through measures which may be designed to be temporary (i.e. at the point the reason for the

existence of the measure ceases to exist, the measure is cancelled, as described in the previous section).

- A business model and the role of participants in the electricity market will be defined.

Natural gas in the transport sector

- The current rates of excise duty on natural gas in the transport sector will be maintained to 2020 (corresponding to the existing Excise Duties Act).
- Increased use of various types of vehicle powered by natural gas will be promoted, as well as the development of infrastructure by the Government.
- The number of vehicles is approaching 50 000 (of which a total of 180 are fuelled by LNG).
- In relation to Directive 2014/94/EU on the deployment of alternative fuels infrastructure, the number of refuelling stations will reach around 300 CNG stations by the end of the period (200 public and 100 private).
- The volume of natural gas consumed by the transport sector will reach around 200 million m^3 CNG and about 12 million m^3 LNG.

Period from 2021 – 2025

Legislation and allocation of aid

The 'Policy framework on climate and energy for the period 2020-2030' will apply for the period from 2020-2030.

- The NAP CM will be updated.

Electromobility:

- Increasing the standard range for electric cars to over 200 km/charge.
- Further development of the recharging infrastructure will depend on market needs (we can expect further expansion to smaller towns with populations over 10 000).
- By the end of this period, annual sales will reach around 25 000 electric vehicles and a total of 35 000 BEV vehicles will be in operation, along with 66 000 PHEV.
- By the end of the period, more BEV vehicles will begin to be used in passenger transport.

Natural gas in the transport sector:

- During this period the level of excise duty will remain at a level that guarantees a stable investment environment to achieve a 10% share of the fuel market.
- Support for increasing the use of natural gas in the transport sector and the development of the infrastructure by the Government will be maintained, which will contribute to maintaining the current rate of growth.
- In the area of LNG, there will be a 25% annual increase in the number of vehicles, refuelling stations and consumption of LNG.

- The number of vehicles will range around 130 000 CNG vehicles and 500 LNG vehicles.
- By the end of the period, the number of CNG refuelling stations will increase to 450 (300 public and 150 private).
- In relation to Directive 2014/94/EU on the deployment of alternative fuels infrastructure, the number of refuelling stations will reach 5 LNG stations by the end of the period.
- The volume of natural gas consumed by the transport sector will reach around 600 million m^3 CNG and about 5 million m^3 LNG.

Period from 2026 – 2030

Legislation and allocation of aid:

- Implementation of dynamic tariffs for recharging electric cars.
- After reaching the projected market shares, aid for CNG and electric cars will gradually be removed.
- The NAP CM will be updated.

Electromobility:

- The penetration of the recharging infrastructure will expand further.
- By the end of this period, annual sales will reach around 44 000 electric vehicles and a total of 250 000 vehicles with this type of propulsion will be in operation.

Natural gas in the transport sector:

- A share of 10% of the fuel market will be achieved during this period.
- The infrastructure for CNG will have been sufficiently developed, the rate of increase in sales of CNG will remain practically the same.
- The overall rate of development of LNG will continue at 20% annually.
- The number of vehicles will reach around 200 000 CNG vehicles and around 1 300 LNG vehicles.
- By the end of the period, the number of refuelling stations will exceed 500 CNG stations (340 public and 160 private) and 14 LNG stations.
- The volume of natural gas consumed by the transport sector will reach up to 700 million m^3 CNG and about 90 million m^3 LNG.

Period after 2030

Legislation and allocation of aid

- The projected market share will have been achieved, aid for CNG and electric cars will be terminated.
- The NAP CM will be updated.

Electromobility:

- The recharging infrastructure will be as widespread as filling stations for petroleum products are currently.
- Electromobility will be perceived to be standard technology.
- Annual sales will gradually increase to around 50 000 electric vehicles and the total number of vehicles operating with this powertrain will rise to around 400 000.

Natural gas in the transport sector:

- There will be a slight slowdown in growth due to the gradual completion of the replacement of the vehicle fleet with vehicles complying with EURO 6 standards.
- Natural gas will be treated as a standard fuel, further expansion of the infrastructure will no longer be restricted.
- Around 2040, the number of CNG-powered vehicles may total 300 000 (corresponding to a consumption of approximately 700 million m^3).

6. Cards for measures

The table below provides a general overview of the prepared measures. The letter in the measure number determines whether it is a Common, Electric, Gas or Hydrogen measure. For each measure, the type, agency responsible and timetable is provided. The specific focus and additional information on the individual measures are provided below.

In accordance with the annex to Directive 2014/94/EU, the cards for measures are broken down into:

- Legal/legislative
- Direct incentives for the purchase of means of transport using alternative fuels
- Direct incentives for building the infrastructure.
- Tax incentives.
- Demand-side non-financial incentives.
- Research, technological development and demonstration.

Beyond this breakdown, the following measures are also included in the NAP CM:

- Other measures.
- Measures having a wider impact to support the renewal of the vehicle fleet.
- Measures intended to implement the NAP CM.

The numbering of the measures is based on their breakdown into **C**ommon, **G**as, **E**lectric and **H**ydrogen measures.

Table 24 Summary of measures

Number of measure	Measure	Responsibility	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Legal/legislative																	
C1	Introducing an option for public contracting authorities to apply a methodology to calculate operating costs using lifetime costs when purchasing vehicles, pursuant to Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles	MRD																
C2	Taking account of the energy and environmental impacts of vehicles during tender proceedings to select operators of public transport services	MT																
C3	Compliance with the requirements of Directive 2014/94/EU concerning standards for the recharging and refuelling station infrastructure	MIT, MT																
C4	Compliance with the requirements of Directive 2014/94/EU in relation to operators of public recharging points	MIT, MT																
C5	Compliance with the requirements of Directive 2014/94/EC affecting businesses operating public recharging stations	MIT, MT																
C6	Compliance with the requirements of Directive 2014/94/EU concerning users' awareness of alternative fuels	MIT, MT																
E1	Specification of the requirements for electrical engineering qualifications for staff working on electric vehicles (Decree No. 50/1978 Coll.)	MoLSA																
G1	Amendment of the legislation covering fuels to cater for LNG-powered vehicles	MIT																
G2	Address the issue of removing barriers to the garaging of gas-powered vehicles	MI																
G3	Removing barriers in the area of LNG and hydrogen-powered vehicles	MI																

Number of measure	Measure	Responsibility	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Direct incentives for the purchase of means of transport using alternative fuels																	
C7	Support for the acquisition of vehicles powered by alternative fuels for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services	MRD																
C8	Purchasing vehicles powered by alternative fuels for fleets of municipal companies operating municipal waste collection vehicles	MRD																
C9	Developing a programme to replace central and local government fleets with vehicles with alternative powertrains	ME																
C10	Support for the purchase of electric/CNG powered vehicles by central and regional government agencies and organisations subsidiary to them, managed by them or founded by them	ME, MT																
E2	Support for the acquisition of battery-powered trolleybuses and trams for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services	MRD																
E3	Support for the purchase of electric and alternative fuel powered vehicles for entrepreneurs (for business purposes)	MIT																
G4	Support for the acquisition of propulsive rail vehicles powered by CNG/LNG for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services.	MT																
	Direct incentives for building the infrastructure																	
C11	Support for building public infrastructure for vehicles powered by alternative fuels (CNG, LNG, electricity and hydrogen)	MT																
C12	Support for building private recharging infrastructure for public transport	MRD																
C13	A unified methodology during the process of approving the construction of recharging and refuelling station infrastructure	MRD																
E4	Investment aid for the construction of corporate infrastructure for electric vehicles	MIT																

Number of measure	Measure	Responsibility	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Tax incentives																	
C14	Adjusting modes and rates of road tax for vehicles powered by CNG/LNG and electric vehicles over 12 t and at the same time introducing tax relief for LNG and hydrogen-powered vehicles	MF																
C15	Increasing the rate of depreciation for the 1st year for the CNG/LNG refuelling station infrastructure	MF																
C16	Increasing the rate of depreciation for the 1st year for electric and CNG/LNG-powered vehicles	MF																
C17	Support for the purchase of environmentally friendly passenger cars	MŽP																
C18	Relief from the payment of motorway vignettes for vehicles powered by alternative fuels	MD																
G5	Maintaining the reduced rate of excise duty on CNG even after 2020	MF																
	Demand-side non-financial incentives (including related measures of an administrative nature)																	
C19	Free parking in public car parks for vehicles powered by alternative fuels	Municipalities																
C20	Discounted parking in designated places for vehicles powered by alternative fuels	Municipalities																
E5	The use of bus and taxi lanes by electric/hydrogen powered vehicles	Municipalities																
E6	Dedicated traffic signs for electric vehicles	MT																
E7	Mandatory quotas for developers to provide connectivity for the recharging infrastructure	MRD, Municipalities																
E8	Labelling of electric vehicles	MT																

Na Františku 32, 110 15 Prague 1
+420 224 851 111
posta@mpo.cz, www.mpo.cz

Number of measure	Measure	Responsibility	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Research, technological development and demonstration																	
C21	Active support for research and development in the area of electromobility and other alternative fuels	TA CR																
C22	Targeted education for the professional and general public on alternative fuels	ME																
C23	Integrating clean mobility into framework educational programmes at secondary schools, accredited educational programmes at secondary vocational schools and accredited study programmes at universities	MEYS																
C24	Strengthening cooperation between universities, research organisations and industry in the development of alternative fuels in the CR	Deputy Prime Minister for the Science, Research and Innovation																
E9	Research and development in technologies for vehicles powered by electricity, recharging infrastructure and links between electromobility and the distribution system/Smart Grids	Deputy Prime Minister for the Science, Research and Innovation																
H1	Aid for research and development in the hydrogen sector, based on pilot projects	MT																
H2	Assessing the potential for the use of hydrogen propulsion in the CR	MT																
	Other measures																	
C25	Providing information to road users on the location, the type and the equipment available in recharging and refuelling stations though ITS systems	MT																
C26	Analysis of the potential for the use of alternative fuels in water transport	MT																
G7	Support for developing the use of biomethane in the transport sector	MA																

Number of measure	Measure	Responsibility	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Measures having a wider impact to support the renewal of the vehicle fleet																	
C27	Analysis of the possibility of reducing the depreciation period for motor vehicles	MIT		■														
C28	Analysis of taxation of vehicles in the Czech Republic	MF		■	■	■	■											
C29	Analysis of support for the decommissioning of vehicles in the CR (scrapping cars from 1 January 2015) and interest in a contribution for the purchase of a vehicle with an alternative powertrain	ME	■	■														
	Measures intended to implement the NAP CM																	
C30	Ongoing monitoring and evaluation of the implementation of measures proposed under the NAP CM	MIT	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E10	Interoperability of recharging infrastructure operators	MIT		■														
G6	Support for passage through the Czech Republic by domestic and foreign LNG-fuelled freight vehicles and semi-trailers	MT		■	■	■	■											

Na Františku 32, 110 15 Prague 1
+420 224 851 111
posta@mpo.cz, www.mpo.cz

6.1 Legal/legislative measures

C1 Introducing an option for public contracting authorities to apply a methodology to calculate operating costs using lifetime costs when purchasing vehicles, pursuant to Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles.	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Objective of the measure	The use of all the options offered by Directive 2009/33 EC in terms of support for clean vehicles to use energy and environmental impacts as criteria for granting contracts while relying on EC methodology (pursuant to Article 6 of the Directive), which calculates operational costs for energy consumption, CO_2 emissions and pollutant emissions from category M1 and N1 vehicles for their entire lifetime. According to this methodology, operating costs over the lifetime of the vehicle are calculated to provide a monetary statement of the energy and environmental impacts of the purchase decision. The application of this methodology may have a positive impact on the wider deployment of alternative fuel vehicles in the public sector.
Description of the measure	The use of proposed new possibilities for public contracting authorities to assess the lifetime costs of passenger cars and light utility vehicles (categories M1 and N1) within the framework of a proposed amendment to the Public Procurement Act would have been a sufficient measure, but it is necessary to add an explanatory note to the relevant provision, which will refer to the methodology regulated by Article 6 of Directive 2009/33/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of clean and energy-efficient road transport vehicles. *Note: The reason the aforementioned solution is proposed only for the vehicle categories referred to above is that they are the only vehicles for which an appropriate methodology for calculating fuel consumption exists at EU level.*
Budgetary impact/financing	No direct budgetary impact.
Agency responsible	MRD
Deadline	2016

C2 Taking account of the energy and environmental impacts of vehicles during tender proceedings to select operators of public transport services	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	To promote the penetration of vehicles powered by alternative fuels into vehicle fleets run by operators of public transport services by using the EC methodology set out in Directive 2009/33 EC.
Description of the measure	Section 12 of Act No 194/2010 on public passenger transport services states that, in a case involving public passenger transport, a contracting authority may only conclude an agreement on public services with a carrier whose offer has been evaluated as being the most advantageous in economic terms. Given the higher purchase price of these vehicles, this does not motivate carriers to include vehicles with alternative powertrains in their fleets. It is therefore proposed to amend the Act by including the paragraph below, which, following the model of the draft act on procurement procedures, which is currently being prepared, will allow a contracting authority to include in this economic evaluation of different offers lifetime costs, providing a means of taking into account the energy and environmental impacts of vehicles operated by individual carriers. The calculation of these costs would be made on the basis of the EC methodology for calculating operating costs for energy consumption, CO_2 emissions and pollutant emissions from vehicles over their entire lifetime. The following text is proposed to replace Section 12 paragraph 2: *For the assessment and evaluation of tenders, the relevant provisions of the Public Procurement Act shall apply mutatis mutandis so that the evaluation criterion for the selection of the carrier is ~~only~~ the economic merit of the offer.* ***Under this criterion, the lifetime costs of the vehicles operated may also be evaluated. An implementing regulation shall lay down the methodology for calculating lifetime costs.*** Alongside this revision, an amendment must also be made to the related Government Regulation No 63/2011 establishing minimum thresholds and indicators of quality and safety standards and the method of their demonstration in connection with the provision of public passenger transport services. Amendment of Section 1 (Scope of the amendment): *This Regulation* ***a)** defines vehicles which must enable the transport of persons with reduced mobility,* ***b)** defines the average age of vehicles in public transport services,* ***c)** sets out the methodology for demonstrating quality and safety standards,* ***d) sets out the methodology for calculating lifetime costs**.* An annex will also be attached to the aforementioned Decree, containing the methodology for calculating lifetime operating costs in wording corresponding to Article 6a of Directive 2009/33/EC.
Budgetary impact/financing	No direct budgetary impact.
Agency responsible	MT
Collaborating agency	MRD
Deadline	2017-2020

C3 Compliance with the requirements of Directive 2014/94/EU concerning standards for the recharging and refuelling station infrastructure	
Links to strategic objectives	1.3 Creating conditions for increasing acceptance of electromobility among potential customers 2.3 Creating conditions for increasing acceptance of CNG-powered vehicles among potential customers 4. Initiating the development of hydrogen technology in transport
Description of the measure	Directive 2014/94/EU on the deployment of alternative fuels infrastructure (Article 4(4), Article 5(2) and Article 6(9)) requires that Member States ensure that recharging points, hydrogen and CNG refuelling points for motor vehicles deployed or renewed within a period of 36 months from the entry into effect of the Directive (i.e. to 10/2017), comply with the technical specifications set out in the annexes to the Directive. A unified approach to the construction of the appropriate recharging and refuelling infrastructure set out in the technical specifications, which, primarily in the case of electromobility, will ensure that drivers of electric vehicles will be able to charge their vehicles, at least in the medium-term, at any recharging station in the EU Member States, will clearly have a positive impact on acceptance of alternative fuels among potential customers. This requirement of the Directive will have to be adequately reflected in the current legislation (Act No 311/2016 on fuels and petrol stations, or in subsequent or related regulations).
Application of the measure in Europe/in the world	Given that, in this case, this measure results from new EU legislation, a similar measure will have to be adopted by all the EU Member States.
Budgetary impact/financing	No impact (obligation imposed on private entities)
Agencies responsible	MIT, MT
Deadline	12/2015

C4 Compliance with the requirements of Directive 2014/94/EU in relation to operators of public recharging points	
Links to strategic objectives	1.3 Creating conditions for increased acceptance of electromobility among potential customers
Description of the measure	Directive 2014/94/EU on the deployment of alternative fuels infrastructure (Article 4(4), Article 5(2) and Article 6(9)) requires Member States to ensure that operators of recharging stations comply with certain obligations: a) that they provide for the possibility for electric vehicle users to recharge on an ad hoc basis without entering into a contract with the electricity supplier or operator concerned, b) that the prices charged for recharging are clearly comparable, transparent and non-discriminatory. The advantage of this measure should be increased convenience and awareness on the part of drivers of electric vehicles when recharging them at public recharging stations. This requirement of the Directive is already reflected in general terms in the current legislation, for example in Acts Nos 634/1992 on consumer protection and 526/1990 on prices, and possibly in subsequent or related regulations).
Application of the measure in Europe/in the world	We assume that all Member States have incorporated this requirement in their national legislation in accordance with European legislation on consumer protection.
Budgetary impact/financing	No impact (obligation imposed on private entities)
Agencies responsible	MIT, MT
Collaborating agency	MF
Deadline	12/2015 (Analysis of the current legislation) 10/2016 (possible implementation)

C5 Compliance with the requirements of Directive 2014/94/EC affecting businesses operating public recharging stations	
Links to strategic objectives	1.4 Improving conditions for businesses in areas relating to electromobility
Description of the measure	Directive 2014/94/EU on the deployment of alternative fuels infrastructure (Article 4(8) and (12)) requires Member States to ensure that certain matters are implemented that might have a positive effect on businesses operating public recharging stations. These concern the following areas: a) ensuring that operators of recharging points are free to purchase electricity in the EU and also to provide their services in the name and on behalf of other service providers, b) the obligation for distribution system operators to cooperate with operators of recharging stations accessible to the public, c) contractual freedom for operators of recharging stations. This requirement of the Directive will have to be adequately reflected in the current legislation within the remit of the MIT (more details will be added during the process of transposing the Directive).
Application of the measure in Europe/in the world	Given that, in this case, this measure results from new EU legislation, a similar measure will have to be adopted by all the EU Member States.
Budgetary impact/financing	No impact (obligation imposed on private entities)
Agencies responsible	MIT, MT
Deadline	10/2016

C6 Compliance with the requirements of Directive 2014/94/EU concerning users' awareness of alternative fuels	
Links to strategic objectives	1.3 Creating conditions for increased acceptance of electromobility among potential customers 2.3 Creating conditions increased acceptance of CNG-powered vehicles among potential customers
Description of the measure	Directive 2014/94/EU on the deployment of alternative fuels infrastructure (Article 7(1) and (2)) requires Member States to ensure that information on motor vehicles which can be regularly fuelled with individual fuels placed on the market or recharged by recharging points is made available. Such information should be included in motor vehicle manuals, at refuelling and recharging points, on motor vehicles and in motor vehicle dealerships in their territory. This requirement of the Directive will have to be adequately reflected in the applicable Acts or implementing regulations within the remit of the MD (as it relates to vehicles) and the MIT (as it relates to refuelling and recharging stations).
Application of the measure in Europe/in the world	Given that, in this case, this measure results from new EU legislation, a similar measure will have to be adopted by all the EU Member States.
Budgetary impact/financing	No impact (obligation imposed on private entities)
Agencies responsible	MIT, MT
Deadline	10/2016

E 1 Specification of the requirements for electrical engineering qualifications for staff working on electric vehicles (Decree No 50/1978)	
Links to strategic objectives	1.4 Improving conditions for businesses in areas relating to electromobility
Aim of the measure	The aim of the measure is to specify and precisely define the activities that can be carried out on an electric car by a worker without the need for an electrical engineering qualification.
Description of the measure	In its present form, Decree No 50/1978 professional competence in electrical engineering requires that all workers performing independent tasks on appliances with a higher voltage than is safe have an electrical engineering qualification in accordance with the relevant section of this Decree. Under the new Government Regulation, which replaces Decree No 50/1978 on professional competence in electrical engineering, the activities that the relevant worker should be able to perform after self-study followed by a short training course and exam, should be specified. It is proposed that these activities should be defined as follows: • disconnecting an electric vehicle from a traction battery and ensuring electrical safety for subsequent mechanical work, • reconnecting an electrical vehicle and ensuring electrical safety, • issuing a report on the vehicle's electrical operation.
Application of the measure in Europe/in the world	Germany - the necessary qualifications are divided into 3 levels - not working with electrical parts - working with disconnected electrical parts - working with electrical parts connected to the input, etc.
Budgetary impact/financing	No direct budgetary impact. Reducing costs for operators of vehicle repair shops.
Agency responsible	MoLSA
Collaborating agencies	Auto SAP, SDA
Deadline	2016

G1 Amendment of the legislation covering fuels to cater for LNG-powered vehicles.	
Links to strategic objectives	3.2 Adding to the current legislative framework covering LNG-fuelled vehicles
Aim of the measure	Following developments in the legislation covering LNG-powered vehicles (in particular the adoption of an amendment to Decree No 341/2014[17], which also incorporates EU legislation on the approval of LNG-powered vehicles[18]) it would be desirable to amend certain regulations relating to fuels, to enable LNG to be perceived as a standard alternative fuel, under a similar regimen as CNG. The purpose of the proposed amendment is to submit a potential seller of LNG to the same legal regime as a seller of CNG. This is a key prerequisite for the development of LNG refuelling stations.
Description of the measure	The following legislative amendments have been proposed: 1) Amendment to Act No. 311/2006 on fuels • The following text is proposed to amend Section 2 (j): *'a distributor of fuels is a person who sells, or is authorised to sell, fuels on the territory of the Czech Republic, with the exception of* *1. sales of fuels in petrol stations,* *2. sales of compressed **or liquefied** natural gas, if its seller holds a valid permit to sell gas pursuant to the Energy Act.* • The following text is proposed to amend Section 5 paragraph 4: *The provisions of paragraphs 1 to 3 shall not apply to the sale or delivery of fuels to the fuel tank of a vehicle operated by a basic unit of the integrated emergency system[10)] or a vehicle operated by the armed forces[3)], to the delivery of fuels for private use only pursuant to Section 2(d) or to the sale or delivery of compressed or **liquefied** natural gas'.* 2) Amendment to Decree No 133/2010 on the quality and records of fuels • It is proposed to add a new definition to Section 2: ***liquefied natural gas (hereinafter referred to as 'LNG') is gas used to fuel internal combustion ignition engines classified under combined nomenclature code 2711 11.*** • A new annex will also have to be attached to the Decree, which would, in a similar manner to Annex 3 (CNG quality indicators) resolve the issue of LNG quality.
Budgetary impact/financing	No direct budgetary impact.
Agency responsible	MIT
Deadline	2016

[17] See Annex 11 to this Decree 'Conditions for the conversion of vehicles powered by liquefied petroleum gas or compressed or liquefied natural gas'.

[18] Amendment of UNECE Regulation 115.

G2 Address the issue of removing barriers to the garaging of gas-powered vehicles	
Links to strategic objectives	2.3 Creating conditions for a better perception of CNG-powered vehicles on the part of potential customers
Aim of the measure	To remove one of the main barriers preventing the expanded use of gas-powered vehicles
Description of the measure	Although the amendment of MT Decree No 341/2002 on approving the technical eligibility and on the technical conditions for operating vehicles on roads, which was adopted at the end of last year (MT Decree No 341/2014), omitted the provision preventing the entry of LPG or CNG powered vehicles into closed storage, garage or other similar spaces where entry is not expressly allowed, the problem of garaging vehicles powered by natural gas has still not been fully resolved. The main obstacle is a legislative requirement embedded in the current text of MI Decree No 268/2011 on technical conditions for fire protection in buildings, which refers to ČSN 73 6058. This regulates the equipment for separate, serial and collective garages in such a way that CNG-powered vehicles would represent a greater fire risk for garages than petrol-powered vehicles. Because of this, a number of operators of collective garages in the Czech Republic prefer to fit signs at entrances to these garages prohibiting the entry of CNG-powered vehicles. It is therefore proposed that a working group be formed from the GD FRS/Škoda Auto/CGA in order to find a consensual solution to the problem of garages (e.g. by carrying out tests of gas-powered vehicles) and the subsequent adoption of the relevant legislation (particularly in relation to MI CR Decree No 268/2011.).
Practical example	To apply the experience of neighbouring countries, where CNG-powered vehicles can be parked in garages, with certain exceptions permitted (Germany, Austria, etc.)
Links to other measures	Revision of related national legislation The drafting of normative documents (TPG 982 01) and their revision on the basis of current requirements reflecting developments in the CNG sector in the CR. Resolving the issue with the GD FRS CR and garage owners.
Budgetary impact/financing	To be quantified on the basis of materials prepared with the collaboration of AutoSAP, GD FRS CR and CGA.
Agency responsible	MI
Collaborating agencies	MIT, CGA
Deadline	2016 to amend the legislation, 2020 for the entry into effect for the measure for existing structures

Na Františku 32, 110 15 Prague 1
+420 224 851 111
posta@mpo.cz, www.mpo.cz

G3 Removing barriers in the area of servicing LNG and hydrogen-powered vehicles	
Links to strategic objectives	3.2 Adding to the current legislative framework covering LNG-fuelled vehicles 4. Initiating the development of hydrogen technology in transport
Aim of the measure	To remove legislative, technical and other barriers in the area of servicing LNG and H2 powered vehicles
Description of the measure	Revision of related national legislation To prepare a standard regulating conditions for the operation of service stations for vehicles powered by H2, LNG and LPG.
Practical example	Requirements for servicing CNG-powered vehicles are already incorporated in the normative Czech Gas Association document TPG 982 02 - Conditions for the operation, repair, maintenance, inspection, display and sale of motor vehicles with a CNG powertrain (valid from 1 September 2015. To apply the experience of neighbouring countries (Germany, Austria, etc.).
Budgetary impact/financing	No direct budgetary impact. Benefits for operators of service stations.
Agency responsible	MI
Collaborating agencies	MoLSA, MIT, GD FRS, CGA
Deadline	2016-17

6.2 Direct incentives for the purchase of means of transport using alternative fuels

C7 Support for the acquisition of vehicles powered by alternative fuels for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	Support for the purchase of vehicles powered by alternative fuels
Description of the measure	The aid system will be adjusted to reflect the volume of emissions produced from these vehicles. In accordance with the public service obligation to ensure that bus companies procure vehicles powered by alternative fuels (CNG, electric buses) for their fleets. Reduced fees for the use of the railway infrastructure on RIA lines in favour of rail vehicles powered by CNG. This measure has been proposed following on from the requirement set out in Directive 2014/94/EU (Article 3) that the national policy framework for the development of the market also included measures that can promote the deployment of alternative fuels infrastructure in public transport services
Practical example	Transport companies and private carriers operating buses with alternative powertrains in the CR under the public service obligation. To build on the Replacement Programme for public bus transport vehicles (MT), which was cancelled in 2011 without being replaced and Government Resolution No 550/2003 – 'State financial participation in the systematic promotion of the development of urban public transport and public transport services over the coming years', with a maximum contribution of CZK 500 000 for the purchase of gas-powered buses.
Budgetary impact/financing	IROP CZK 4.3 billion to 2023
Agency responsible	MRD
Deadline	2015-2023

C8 Purchasing vehicles powered by alternative fuels for fleets of municipal companies operating municipal waste collection vehicles	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	Support for the purchase of vehicles powered by alternative fuels
Description of the measure	Ensure that there are sufficient funds in central and local government budgets for the purchase of new environmentally-friendly vehicles for municipal waste collections and other municipal vehicles (cleaning and spraying vehicles) powered by CNG and electricity - e.g. when renewing the TS fleet.
Practical example	• Pražské služby, a.s. operates 76 municipal vehicles powered by CNG. • The City of Tábor technical service uses 6 vehicles powered by CNG. • Other companies operating CNG-powered municipal vehicles in the CR: AVE, A.S.A., Marius Pedersen and Komwag. • France – Paris uses all-electric vehicles for municipal waste collection (SITA).
Budgetary impact/financing	Budgets of towns and municipalities, according to their investment plans. The OP EIC supports small and medium sized enterprises (under Priority Axis 3 Efficient energy management, development of energy infrastructure and renewable energy sources, support for the introduction of new technologies in the management of energy and secondary raw materials, EUR 37.6 million have been allocated)
Agency responsible	MIT
Collaborating agency	MF
Deadline	Ongoing from 2016

C9 Developing a programme to replace central and local government fleets with vehicles with alternative powertrains	
Links to strategic objectives	1.2 Stimulating demand for electric cars 1.3 Creating conditions for a better perception of electromobility on the part of potential customers 2.2 Stimulating demand for CNG-powered vehicles 2.3 Creating conditions for a better perception of CNG-powered vehicles on the part of potential customers
Aim of the measure	The measure aims to promote the penetration of electric vehicles/CNG-powered vehicles into vehicle fleets by removing the additional costs in the total cost of ownership (TCO) in comparison with vehicles with internal combustion engines. Another goal is to reduce emissions and to improve air quality.
Description of the measure	The programme will build on the previous 'Programme for environmentally friendly vehicles', which ran from 2009 to 2013, giving priority to vehicles powered by alternative fuels and setting a clearly defined target for the share of these vehicles in the fleets of the institutions involved.
Application of the measure elsewhere in Europe/in the world	China - 30% of cars operated by the government should be EV by 2016.
Similar measures in the CR	Programme to replace public administration fleets with environmentally friendly vehicles (to the end of 2013).
Budgetary impact/financing	The measure will affect the budgets of the relevant government agencies.
Agency responsible	ME
Collaborating agencies	MT, MIT, MRD
Deadline	2016-2020

C10 Support for the purchase of electric/CNG powered vehicles by central and regional government agencies and organisations subsidiary to them, managed by them or founded by them	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	The measure aims to promote the penetration of electric vehicles/CNG-powered vehicles into vehicle fleets by removing the additional costs in the total cost of ownership (TCO) in comparison with vehicles with internal combustion engines. Another goal is to reduce emissions and to improve air quality.
Description of the measure	Following on from the upcoming programme to replace the state administration fleet with vehicles with alternative powertrains (see measure C9) a support financial mechanism will be created, which will help to achieve the targets set out for this programme in terms of the share of vehicles powered by alternative fuel in central government fleets and, possibly, also those of local governments. In its optimum form, this could be a combination of direct subsidies[19] and innovative financial instruments (i.e. Interest free or low-interest loans, for example).
Application of the measure elsewhere in Europe/in the world	Austria - grant for the purchase of an electric car to a maximum of 1,000 € + support for operating carsharing.
Similar measures in the CR	Subsidies from the EFEKT programme to increase the efficiency of public lighting, etc.
Budgetary impact/financing	In the case of direct subsidies (the amount in brackets) this would amount to around CZK 56.6 million[20] for a share of approximately 10% of the government agency fleet - 366 CNG (100 000), 100 electric cars (200 000).
Agency responsible	ME, MT
Collaborating agencies	MF, MIT
Deadline	2016-2020

[19] We can expect the direct subsidy option to apply on the condition that an amendment targeting this programme can be agreed with the EC within the framework of a possible revision of the OPT, relating to support for vehicles powered by alternative fuels (specific objective 2.2) from the current support which is only for the alternative fuels infrastructure, to also include partial support for the purchase of vehicles.

[20] The specific amount targeted has not yet been decided, and therefore these figures are only indicative in nature, for illustration.

E2 Support for the acquisition of battery-powered trolleybuses and trams for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services	
Links to strategic objectives	1.2 Stimulating demand for electric cars
Aim of the measure	Support for the acquisition of battery-powered trolleybuses and trams
Description of the measure	Transport companies and private carriers operating battery-powered trolleybuses and trams in the CR under the public service obligation. This measure has also been proposed following on from the requirement set out in Directive 2014/94/EU (Article 3) that the national policy framework for the development of the market also included measures that can promote the deployment of alternative fuels infrastructure in public transport services
Budgetary impact/financing	IROP - CZK 4.3 billion to 2023
Agency responsible	MRD
Deadline	2015-2023

E3 Support for the purchase of electric and alternative fuel powered vehicles for entrepreneurs (for business purposes)	
Links to strategic objectives	1.2 Stimulating demand for electric cars 4. Initiating the development of hydrogen technology in transport
Aim of the measure	Support for the purchase of vehicles powered by alternative fuels (vehicles powered by electricity/fuel cells)
Application of the measure elsewhere in Europe/in the world	Italy – a wide offer of support programmes (rebates) for the purchase of or conversion to a CNG powered vehicle and the construction of refuelling stations, 'New ECO Incentives for 2013 – 2015 programme'. France – support amounting to EUR 1 000 is provided for the purchase of a passenger car with CO_2 emissions below 120 g/km, VAT refunded to companies for a set volume of CNG taken, 12 months depreciation on investments in CNG refuelling stations (French Environmental Agency ADEME).
Similar measures in the CR	Investment grant for the implementation of energy-saving measures under OPEI Ecoenergy.
Budgetary impact/financing	The OP EIC supports small and medium sized enterprises (under Priority Axis 3 'Efficient energy management, development of energy infrastructure and renewable energy sources, support for the introduction of new technologies in the management of energy and secondary raw materials', EUR 37.6 million).
Agency responsible	MIT
Deadline	2016-2020

G4 Support for the acquisition of propulsive rail vehicles powered by CNG/LNG for fleets run by transport companies and fleets run by operators providing urban public transport and intercity public transport services.	
Links to strategic objectives	2.1 Stimulating demand for CNG-powered vehicles
Aim of the measure	Support for the purchase of propulsive rail vehicles powered by CNG/LNG
Description of the measure	To ensure that rail carriers procure rail vehicles powered by CNG/LNG for their fleets. The aid system will be adjusted to reflect the volume of emissions produced from these vehicles. This measure has also been proposed following on from the requirement set out in Directive 2014/94/EU (Article 3) that the national policy framework for the development of the market also included measures that can promote the deployment of alternative fuels infrastructure in public transport services
Budgetary impact/financing	OPT - Under Priority Axis 2, EUR 1.327 billion has been allocated to support sustainable transport and to remove bottlenecks in key network infrastructures.
Agency responsible	MT
Deadline	2017-2025

6.3 Direct incentives for building the infrastructure for alternative fuels

C11 Support for building public infrastructure for vehicles powered by alternative fuels (CNG, LNG, electricity and hydrogen)	
Links to strategic objectives	1.1 Facilitating the construction of an infrastructure of refuelling stations 2.1 Facilitating the construction of an infrastructure of CNG refuelling stations 3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles 4. Initiating the development of hydrogen technology in transport
Aim of the measure	Further to Directive 2014/94/EU, the measure is aimed at achieving the specific objectives defined in the NAP CM.
Description of the measure	Part of the costs associated with the construction of recharging/refuelling stations will be covered from the upcoming MT grant programme. The percentage amount of the aid should be differentiated depending on the current state of the relevant recharging/refuelling station infrastructure.
Budgetary impact/financing	Financing from the OPT under specific objective 2.2 (estimated allocation of total costs up to CZK 1.2 billion) to 2020.
Agency responsible	MT
Deadline	2016-2020

C12 Support for building private recharging infrastructure for public transport	
Links to strategic objectives	1.1 Facilitating the construction of an infrastructure of refuelling stations 2.1 Facilitating the construction of an infrastructure of CNG refuelling stations
Aim of the measure	The aim of the measure is to support the expansion of electric buses/buses to CNG in urban and suburban public transport, which is directly linked to the construction of a sufficiently high performance recharging infrastructure within public transport depots and along vehicle routes for occasional recharging, refuelling.
Description of the measure	Support for the construction of the necessary recharging/refuelling infrastructure would be in the form of direct monetary subsidies, which may relate either to the number of vehicles serviced or the area covered. Investment into the necessary infrastructure is expensive for public transport bodies, particularly when there is inadequate power output in the area of the site designated for the construction of a station and new lines have to be laid.
Budgetary impact/financing	IROP - Under Priority Axis 7c, EUR 472 million has been allocated, for the purpose of increasing the share of sustainable forms of transport.
Agency responsible	MRD
Deadline	2015-2023

C13 A unified methodology during the process of approving the construction of recharging and refuelling station infrastructure	
Links to strategic objectives	1.1 Facilitating the construction of an infrastructure of refuelling stations 2.1 Facilitating the construction of an infrastructure of CNG refuelling stations
Aim of the measure	The measure is aimed at simplifying and accelerating the approval processes associated with the construction of recharging/refuelling station infrastructure.
Description of the measure	One of the current problems (also because this technology is still evolving) is the rigidity of the locally competent building authorities during building and land use proceedings and the lack of uniformity in procedures and the documentation required. Standardising the processes and reducing the documentation required for the relevant approval proceedings would accelerate and reduce the cost of building a network of recharging stations and allow more effective planning of its development. Under this measure, an information brochure will be prepared in electronic form, and published on the MRD and MIT websites. The brochure will contain, inter alia, the following information: • Details of CNG and electricity as fuels. • Infrastructure needed for CNG and electricity. • The regulatory framework for the infrastructure. • Examples of good practice in building infrastructure.
Budgetary impact/financing	No impact.
Agency responsible	MRD
Cooperating agency	ME
Deadline	2016

E4 Investment aid for the construction of corporate infrastructure for electric vehicles	
Links to strategic objectives	1.1 Facilitating the construction of an infrastructure of refuelling stations 4. Initiating the development of hydrogen technology in transport
Aim of the measure	The measure is aimed at encouraging the penetration of electric cars into corporate fleets by covering part of the costs associated with installing the necessary private infrastructure.
Description of the measure	The use of the subsidy will be conditional on the acquisition and subsequent operation of electric cars/vehicles with fuel cells. A typical project relating to the introduction of low-carbon technologies in the transport sector will be pilot projects aimed at introducing electromobility to enterprises to produce the desired synergistic effect between OP Transport and the Integrated Regional Operational Programme. Eligible expenditure will be spent on acquiring the related technologies and recharging stations. The project output will be an expansion in recharging infrastructure and the number of electric vehicles in the CR. Successful projects will present electromobility as a low-emission and low-cost means of transport in major agglomerations.
Budgetary impact/financing	The OP EIC (under Priority Axis 3 Efficient energy management, development of energy infrastructure and renewable energy sources, support for the introduction of new technologies in the management of energy and secondary raw materials, EUR 37.6 million have been allocated)
Agency responsible	MIT
Deadline	2016 – 2020

6.4 Tax incentives

C14 Adjusting modes and rates of road tax for vehicles powered by CNG/LNG and electric vehicles over 12 tonnes and at the same time introducing tax relief for LNG and hydrogen-powered vehicles	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles 3.2 Adding to the current legislative framework covering LNG-fuelled vehicles 4. Initiating the development of hydrogen technology in transport
Aim of the measure	Adoption of a comprehensive adjustment of time-limited tax breaks for road tax aiming to replace the current programme of reduced rates of road tax based on vehicle age with a new regime in which the tax relief on road tax would be derived from the respective EURO vehicle emission class. Another aim is to introduce tax relief for LGN and hydrogen powered vehicles.
Description of the measure	It is proposed that the current concept of tax relief on road tax based on vehicle age, contained in Section 6(6) of the Act on Road Tax be replaced by a new system of tax relief derived from meeting the relevant EURO vehicle emission class, making the tax relief from road tax higher for vehicles powered by alternative fuels than for vehicles with conventional powertrains in emission class EURO VI.
Application of the measure in Europe/in the world	UK - electric cars are exempt from road tax (road tax is based on CO_2 emissions, all cars with emissions below 100 g CO_2/km are exempt. Austria - exemption from monthly road tax. Germany – exemption from road tax for a period of 10 years from the first registration. Italy – EV exempt from road tax for a period of 5 years from registration, subsequently they are only subject to 25% of the road tax in a number of regions. Portugal – electric vehicles are exempt from annual road tax. Sweden – exemption from road tax for EV and PHEV (depending on the ratio of CO_2 emissions and the vehicle weight) with a consumption of less than 37 kWh per 100 km for a period of 5 years from the first registration. Norway – EV exempted from road tax and motorway tolls/vignettes.
Budgetary impact/financing	Thousands of CZK from the State Transport Infrastructure Fund budget. This sum should be offset be the overall increase in the number of vehicles required to pay road tax (see growth in traffic).
Agency responsible	MF
Collaborating agencies	MT, MIT, ME
Deadline	2017

C15 Increasing the rate of depreciation for the 1st year for the CNG/LNG refuelling station infrastructure	
Links to strategic objectives	1.1 Facilitating the construction of an infrastructure of refuelling stations 2.1 Facilitating the construction of an infrastructure of CNG refuelling stations 3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles
Aim of the measure	The measure is aimed at promoting the installation of recharging/refuelling station infrastructure at a stage when their construction and operation are to some extent risky. Return on investment into this infrastructure is typically long (particularly at the commercialisation stage, i.e., before the market is fully developed). Speeding up depreciation rates reduces investors' exposure to risk and promotes the early deployment of a network of recharging/refuelling stations that is sufficiently dense, while at the same time reducing risks associated with the rapid obsolescence of the technology.
Description of the measure	Increasing the rate for the 1st year of depreciation (as in Section 31 and Section 32 of Act No 586/1992 income taxes, hereinafter referred to as 'the AIT'): This accelerates depreciation in the first year and increases the rate by 20% compared to the standard depreciation rate. Under the CZ-PRODCOM rate schedule, only filling stations have a code, 2711503302. Refuelling stations have no code. We therefore recommend introducing one in an amendment to the AIT.
Application of the measure elsewhere in Europe/in the world	USA – tax credit – from 2009-2013 an owner of a site equipped with a public recharging station could deduct up to 50% of the cost of the recharging station and the costs of its installation (up to USD 50 000) for each site. Belgium – to the end of 2013 a natural person could deduct 40% of the investment in an outdoor recharging station accessible to the public (to a maximum of EUR 250). In 2011, companies could write off their investment in RC over 2 years and deduct 21.5% of the investment from their tax base.
Similar measures in the CR	Extraordinary depreciation - Section 30a AIT - this measure was adopted as part of the fights against the financial crisis in order to use tax breaks to promote the acquisition of new fixed assets classified under depreciation groups 1 and 2. Increased rate during the 1st year of depreciation - Section 31 and Section 32 of the AIT - e.g. agricultural and forestry equipment, or equipment for water purification and treatment.
Budgetary impact/financing	Millions of CZK in income tax. This involves the distribution of tax deductions over the depreciation period.

Agency responsible	MF
Collaborating agencies	MIT, MT
Deadline	2016-2020

C16 Increasing the rate of depreciation for the 1st year for electric and CNG/LNG-powered vehicles	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles 3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles
Aim of the measure	The measure is aimed at reducing the total cost of ownership (TCO) of electric vehicle and CNG/LNG-powered vehicles, thereby making them more competitive with vehicles with conventional internal combustion engines. Savings are achieved by the option of accelerating the depreciation of the vehicle (the rate of depreciation would decrease alongside the expected fall in the TCO).
Description of the measure	Increasing the depreciation rate during the 1st year of depreciation (as in Section 31 and Section 32 of the AIT). This accelerates depreciation in the first year and increases the rate by 20% compared to the standard depreciation rate. Vehicles with alternative powertrains (apart from electric vehicles - 8703 90 10) are not distinguished under the customs rate schedule. These vehicles would be specified in a similar way as in Act No 16/1993 on road tax, Section 3 Tax exemption, paragraph (f).
Application of the measure elsewhere in Europe/in the world	Extraordinary depreciation: UK – cars emitting less than 95 g CO_2/km can write off 100% of the value during the first year. Deductible item: Belgium – companies can deduct a certain % of the costs associated with the operation of company cars (depreciation, maintenance, repairs, parking, etc.) depending on their CO_2 emissions, pure EV can deduct 120% of the costs associated with the operation of the vehicle from their tax base.
Similar measures in the CR	Extraordinary depreciation - Section 30a AIT - this measure was adopted as part of the fights against the financial crisis in order to use tax breaks to promote the acquisition of new fixed assets classified under depreciation groups 1 and 2. Increased rate during the 1st year of depreciation - Section 31 and Section 32 of the AIT - e.g. agricultural and forestry equipment, or equipment for water purification and treatment.
Budgetary impact/financing	In millions of CZK in income tax. This involves the distribution of tax deductions over the depreciation period. This involves hundreds of cars each year.
Agency responsible	MF
Deadline	2016-2020

C17 Support for the purchase of environmentally friendly passenger cars	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles 3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles
Aim of the measure	To support the purchase of environmentally friendly passenger cars, i.e. vehicles with alternative powertrains and vehicles with low fuel consumption.
Description of the measure	The measure introduces an entirely new obligation linked to the registration of new passenger cars. The measure would introduce an obligation to pay a fee (malus) on registration of a new passenger car with high emission levels of greenhouse gases (high fuel consumption) and pollutants and the payment of a bonus on registration of a vehicle with very low emissions of greenhouse gases (vehicles with very low fuel consumption) and pollutants, or a vehicle with an alternative powertrain. Before introducing the fee, an analysis will be carried to find the exact level of the malus and bonus and to lay down the conditions (production of greenhouse gas emissions, or other similar parameter) under which the malus would be paid, or the bonus would be paid.
Application of the measure elsewhere in Europe/in the world	France – bonus-malus system, vehicles with emissions up to 20 g CO_2/km receive EUR 6 300 (maximum limit is 27% of the price of the car inc. VAT) and 20–60 g CO_2/km EUR 4 000 € (maximum limit is 20% of the price of the car inc. VAT). United Kingdom (natural persons and legal entities), the Netherlands (all new cars).
Budgetary impact/financing	Zero. The system is revenue-neutral. The penalties laid on vehicles with higher emissions are offset by the advantages given to vehicles with lower emissions. The only negative impact on the state budget would be an increase in the administrative burden.
Agency responsible	ME
Collaborating agencies	MF, MT, MIT
Deadline	Analysis/Methodology 2016, introduced from 30 June 2017.

C18 Relief from the payment of motorway vignettes for vehicles powered by alternative fuels	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	The measure aims to promote the purchase of vehicles with alternative powertrains in the form of relief from payment of motorway vignettes related to their operation (i.e. lower operating costs, having a positive impact on total cost of ownership - TCO).
Description of the measure	The relief would only apply to listed vehicles and would be graded with respect to the parameters of the vehicles, taking into account to level of emissions: • All-electric vehicles (BEV) – complete exemption from the payment of fees • PHEV, CNG – relief with respect to the parameters of the vehicle Motorway vignettes (vehicles up to 3.5t CZK1 500/year, CZK 440/month, CZK 310 /10 days). This exemption is regulated by Section 20a of Act No 13/1997 on roads, as amended.
Application of the measure elsewhere in Europe/in the world	Similar registration taxes apply in other EU Member States (e.g. Spain, Ireland, etc.).
Budgetary impact/financing	State Transport Infrastructure Fund (in millions of CZK). This will be compensated by the increase in the number of vehicles using motorway vignettes.
Agency responsible	MT
Collaborating agency	MF, ME
Deadline	2015-2020

G5 Maintaining the reduced rate of excise duty on CNG even after 2020	
Links to strategic objectives	2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	Investment security and achieving the required proportion of consumption of natural gas in the transport sector.
Description of the measure	Retaining the Voluntary Agreement to 2020 (between the gas companies and the government), provided there is no unexpected enormous growth in consumption of CNG (in excess of the plan) as a result of the existing rate settings and the related significant deficits in excise duty on mineral oils. The text of the Voluntary Agreement is based on Resolution of the Government of the CR No 563 of 11 May 2005, which approved the 'Support Programme for alternative fuels in the transport sector – natural gas' as well as the indicative target to achieve a minimum 10% share of total fuel consumption in the transport sector for consumption of natural gas by 2020, in accordance with COM (2001) 370. By the end of 2016, the Government will discuss with CGA, AutoSAP and another other stakeholders the possibility of setting and calculating more favourable rates for CNG compared to conventional fossil fuels from 2020 until such time as consumption of CNG has reached 10% of total fuel consumption. The recommended tariff calculation should take account of the status of CNG as a more environmentally friendly fuel and the higher costs related to its operation to ensure that the future rate setting does not slow down investment activity in this sector until such time as a 10% share of CNG in the fuel market has been achieved. The resulting calculation will only be used as an illustrative recommendation for the future Government.
Practical example	Zero excise duty - Latvia, Luxembourg, Belgium, Hungary, Malta, Bulgaria, Ireland, France. Reduced excise duty - Estonia, Spain, Sweden, France, Portugal, Austria, Slovenia, Germany, Great Britain and Italy.
Links to other measures	Implementation of Directive 2003/96/EC in the Czech legislation
Budgetary impact/financing	Depending on the tax rate and the period for which it is guaranteed, on developments in the consumption of natural gas in relation to the development of gas-powered vehicles, etc., the measure will have a negative impact on the state budget. The estimated loss in excise duty totals CZK 1.6 billion in 2020 under the most optimistic scenario, i.e. with consumption of approximately 230 million m^3 CNG. This amount should be offset by the overall growth in traffic, which is also reflected in increased consumption (petrol and diesel). The excise duty collected for these fuels should cover any loss caused by a lower rate for CNG[21].
Agency responsible	MF
Collaborating agency	MIT, MT, ME
Deadline	Until a 10% share of total consumption of natural gas in the transport sector has been achieved (until 2025 under the plan). Recommended calculation of rates after 2020 (2017).

[21] According to the forecast in the NAP CM (Chapter 3.1.4) individual passenger transport is expected to rise to 123% by 2035 (passenger kilometres) compared to the 100% value for 2010 and bus transport is expected to rise - over the same comparative period - to 153% of the 2010 value. In the case of freight transport (tonne kilometres) the increase in road traffic is expected to rise to a value of 166% by 2035 (relative to 100% in 2010). The expected gradual increase in fuel consumption is based on the aforementioned increase in traffic and should be corrected both in terms of the anticipated increases in engine efficiency and in terms of the high number of people transported. This correction factor would be applied to the entire forecast of the transport volume to 2035 (i.e. not only for the expected growth in traffic), because there will probably be a gradual replacement of vehicles during this period, which is why it has been proposed - as an average value - to use a correction factor = 0.75. When applying

this correction factor, when calculating the weighted average of the share of consumption of the aforementioned transport modes, we can infer that there will be a gradual growth in fuel consumption to 113% of current values. If we use the values for current proceeds from excise duty on fuel (CZK 80 billion/year - data from the NAP), the total proceeds from excise duty on fuel in the target year would rise by CZK 10.4 billion, which means that - in the event the supported scenario for the development of CNG/LNG is achieved (i.e. the target of achieving a ten-percent share of fuel sales for CNG/LNG in 2025 - the related fall in proceeds from excise duty on CNG/LNG in the target year would be less than half (it would only reach around CZK 5 billion/year) and it is therefore clear that the expected fall in proceeds from tax would be adequately offset by an increase in traffic.

6.5 Demand-side non-financial incentives (including related measures of an administrative nature)

C19 Free parking in public car parks for vehicles powered by alternative fuels	
Links to strategic objectives	1.2 Stimulating demand for electric cars 1.3 Creating conditions for a better perception of electromobility on the part of potential customers 2.2 Stimulating demand for CNG-powered vehicles 2.3 Creating conditions for a better perception of CNG-powered vehicles on the part of potential customers
Aim of the measure	The measure aims to provide users of vehicles powered by alternative fuels with advantages compared to vehicles with internal combustion engines running on conventional fuels, which might improve their total cost of ownership (TCO) thanks to savings on parking.
Description of the measure	The measure is designed to be temporary.
Application of the measure elsewhere in Europe/in the world	Germany – laws approved in 2014, which allow municipalities to provide free parking in designated zones. The Netherlands - Rotterdam provides free parking for electric cars in the city centre for a period of one year, Amsterdam – free parking. Norway – free parking in public parking spaces.
Budgetary impact/financing	Reduced revenues for operators of parking lots, with the total estimated at a maximum of some tens of millions of CZK to 2020 from the budgets of cities and municipalities.
Agency responsible	Operators of public parking lots (locally competent municipality).
Deadline	2016

C20 Discounted parking in designated places for vehicles powered by alternative fuels	
Links to strategic objectives	1.2 Stimulating demand for electric cars 2.2 Stimulating demand for CNG-powered vehicles
Aim of the measure	The measure is aimed at providing users of vehicles with alternative powertrains with advantages compared to vehicles with internal combustion engines running on conventional fuels, which might improve their total cost of ownership (TCO) thanks to the possibility of, temporarily (to 2020), parking in zones with limited access (blue zones) at a discounted price (depending on emission volumes).
Description of the measure	100% discount for BEV, 50% for PHEV and CNG. The same applies to time-limited cards (half-year/quarterly, etc.).
Application of the measure elsewhere in Europe/in the world	Germany – laws approved in 2014, which allow municipalities to provide free parking in designated zones. The Netherlands - Rotterdam provides free parking for electric cars in the city centre for a period of one year, Amsterdam – free parking. Norway – free parking in public parking spaces.
Similar measures in the CR	Reduced prices for parking cards for a legal entity whose core business is a community service (CZK 250/quarter).
Links to other measures	E8 - electric labelling
Budgetary impact/financing	Reduced revenues for operators of the zones - mainly cities and municipalities, estimated to be in the tens of millions of CZK to 2020.
Agency responsible	Operator of the zones (locally competent municipality).
Deadline	2016

E5 The use of bus and taxi lanes by electric/hydrogen powered vehicles	
Links to strategic objectives	1.3 Creating conditions for increased acceptance of electromobility among potential customers 4. Initiating the development of hydrogen technology in transport
Aim of the measure	The measure is aimed at providing users of vehicles powered by electricity/hydrogen with advantages compared to vehicles with internal combustion engines.
Description of the measure	The measure will require an amendment to Ministry of Transport Decree No 30/2001 implementing the rules of road traffic and the treatment and management of road traffic. It specifically concerns Section 12(1) of the Decree, which defines the sign 'dedicated lane' (No IP 20a – see sub-paragraph (z)): *Dedicated lane' (No IP 20a), which designates a lane reserved for public transport buses or trolleybuses and* ***at the same time for electric vehicles and hydrogen-powered vehicles*** *and their location in relation to other lanes; at the same time this land is indicated on the road surface by horizontal signs, in particular No H 1a or No H 2a and the word 'BUS'; the lower part of the sign may indicate the period during which the lane is reserved; at road intersections the dedicated lane is only indicated by horizontal signs; the sign may also indicate a lane moving in the opposite direction; in the event the dedicated lane is reserved for another type of vehicle or for a particular purpose, the appropriate symbol for the vehicle or a suitable text is entered in the blue field,*
Application of the measure elsewhere in Europe/in the world	Germany – laws approved in 2014, which allow municipalities to introduce the possibility for EV to drive in bus/taxi lanes (marked vehicles). Norway – EV can drive in bus lanes.
Similar measures in the CR	Lanes are already reserved for taxis or public transport or cyclists.
Budgetary impact/financing	Realistically, no cost (given the number of vehicles that would use this option it would not restrict traffic in these lanes).
Agency responsible	Locally competent municipality.
Deadline	2016-17 in the case of electric vehicles, in the case of hydrogen-powered vehicles, depending on the results of the study referred to in measure H1.

E6 Dedicated traffic signs for electric vehicles.	
Links to strategic objectives	1.3 Creating conditions for increased acceptance of electromobility among potential customers
Aim of the measure	The measure is aimed at defining, and embedding in the relevant legislation, the definition of reserved parking spaces for electric vehicles in order to be able to impose sanctions in a situation where these benefits are misused in a way that is comparable, for example, with violations against parking spaces reserved for the disabled.
Description of the measure	Traffic signs are regulated by Act No 361/2000 on road traffic and on amendments to certain Acts, Title II Section 62, Traffic Signs. An appropriate sign will have to be proposed for this purpose and embedded in the legislation.
Application of the measure elsewhere in Europe/in the world	Germany – laws approved in 2014, which allow municipalities to reserve parking spaces by recharging stations. Netherlands – reserved parking spaces for electric cars exist in Amsterdam (free parking), for which it is not necessary to wait (up to 10 years).
Similar measures in the CR	Reserved parking places, e.g. for cars transporting physically disabled people, for companies, state institutions, etc.
Budgetary impact/financing	Minimal (the preparation of the proposal and its approval, implementation) within the budgets of the MT and municipalities.
Agency responsible	MT
Deadline	2016-17

E7 Mandatory quotas for developers to provide connectivity for the recharging infrastructure	
Links to strategic objectives	1.3 Creating conditions for increased acceptance of electromobility among potential customers
Aim of the measure	The measure is aimed at reducing the costs of building the recharging infrastructure by imposing an obligation on developers to ensure connectivity for a predetermined number (percentage) of parking places in newly built or refurbished buildings and parking lots. To be addressed within the context of changes to the ČSN standards[22].
Description of the measure	Additional costs associated with the supply of electricity or deploying the necessary infrastructure to enable the subsequent supply of electricity (cable grommets, distributors) represent minimum additional costs during construction/reconstruction. In contrast, additional work without this preparation is expensive and increases overall costs for the construction of the recharging infrastructure, while at the same time restricting traffic in these buildings/parking lots and extends the period of construction. *Note: In the same way, it is possible in future to address the issue of imposing an obligation on new operators of filling stations also to offer a vehicle recharging service at these stations.*
Budgetary impact/financing	Minimum increase in project-related costs and implementation costs.
Agency responsible	municipality
Deadline	2016 (implementation)

[22] The issue of parking is included in ČSN standards 73 61 10, 73 60 56 and 73 60 58.

E8 Labelling of electric vehicles.	
Links to strategic objectives	1.3 Creating conditions for increased acceptance of electromobility among potential customers
Aim of the measure	Quick and easy differentiation of electric cars from other vehicles.
Description of the measure	The measure is aimed at supporting the enforcement of regulatory measures by making electric vehicles clearly and uniquely distinguishable from other vehicles (particularly from vehicles with internal combustion engines. It will subsequently be possible to assess the legitimacy of the exploitation of certain benefits intended for electric vehicles (access, parking, etc.).
Application of the measure elsewhere in Europe/in the world	Germany - a law was approved in 2014, which designates special labelling for EV registered in Germany – for licence plates registered outside Germany – stickers.
Similar measures in the CR	Identification of LPG/CNG powered vehicles, taxis
Budgetary impact/financing	Costs associated with the preparation and creation of the labels will fall under the MT budget.
Agency responsible	MT
Deadline	2016-17

6.6 Research, technological development and demonstration

C21 Active support for research and development in the area of electromobility and other alternative fuels	
Links to strategic objectives	5. Research and development in the area of alternative fuels
Aim of the measure	Prioritising research topics and registered programmes focusing on support for clean mobility/alternative fuels.
Description of the measure	Within the framework of new calls for the EPSILON programme (TA CR) and the TRIO programme (MIT) to promote the area of clean mobility/alternative fuels as a priority area. Support for research and development of clean mobility/alternative fuels will also be part of the OP EIC (MIT) as part of the APPLICATION programme.
Agency responsible	TA CR
Budgetary impact/financing	No impact.
Collaborating agency	MIT, CzechInvest
Deadline	2016

C22 Targeted education for the professional and general public on alternative fuels.	
Links to strategic objectives	5. Research and development in the area of alternative fuels
Aim of the measure	The measure is aimed at providing relevant, unbiased information on the issue of clean mobility, to inform the public (professional and general) of the strategy of the government, and possibly of the regions and municipalities, as regards the development of clean mobility, breaking down mistrust in the use of alternative powertrains and supporting the commercial deployment of electric vehicles to corporate customers and the wider public.
Application of the measure elsewhere in Europe/in the world	Germany
Similar measures in the CR	EKIS, supported seminars/educational events related to energy savings.
Links to other measures	Support for the development of vehicles with alternative powertrains.
Budgetary impact/financing	CZK 20 million. - State Environmental Fund
Agency responsible	ME
Collaborating agencies	MT, MIT
Deadline	2015-2016

C 23 Integrating clean mobility into framework educational programmes at secondary schools, accredited educational programmes at secondary vocational schools and accredited study programmes at universities	
Links to strategic objectives	5. Research and development in the area of alternative fuels
Aim of the measure	To promote targeted specialised teaching in the area of clean mobility, support the production of a sufficient number of experts in the relevant industrial sector
Description of the measure	Incorporate the topic of clean mobility in a coordinated manner in study programmes at universities and secondary schools and educational programmes at NGOs and environmental centres with the aim of producing sufficient numbers of experts for related disciplines as a means of promoting domestic industry and competitiveness.
Application of the measure elsewhere in Europe/in the world	Germany, USA
Similar measures in the CR	For example, a new programme was opened at CTU in 2013 Open electronic systems.
Budgetary impact/financing	Covered by the existing budgets for secondary schools, secondary vocational schools and universities
Agency responsible	As far as secondary schools and secondary vocational schools are concerned, through coordination with the MoSLA
Collaborating agency	ME
Deadline	2016

C24 Strengthening cooperation between universities, research organisations and industry in the development of alternative fuels in the CR	
Links to strategic objectives	5. Research and development in the area of alternative fuels
Aim of the measure	Promoting research and development in alternative fuels in the CR
Description of the measure	To provide systematic support for groups of entities involved in the field of alternative fuels to enable them to define priorities for research and development in clean mobility in a coordinated manner.
Application of the measure elsewhere in Europe/in the world	Green eMotion
Similar measures in the CR	e.g. TP Sustainable Energy, Epsilon
Budgetary impact/financing	None.
Agency responsible	Deputy Prime Minister for Science, Research and Innovation
Collaborating agency	MoSLA, MIT, TA CR, MT
Deadline	2016

E9 Research and development in technologies for vehicles powered by electricity, recharging infrastructure and links between electromobility and the distribution system/Smart Grids.	
Links to strategic objectives	5. Research and development in the area of alternative fuels
Aim of the measure	Promoting the competitiveness of the CR in the area of electromobility technologies
Description of the measure	In collaboration with the industrial sector, to define within the existing (and future) research programmes programmes/calls focusing on: 1. Technologies relating to electric powered vehicles, thereby promoting the competitiveness of domestic industry. 2. Technologies relating to recharging stations for electric vehicles, thereby promoting the competitiveness of domestic industry. 3. Technologies relating to the integration of electromobility in the distribution grid (including related technologies in the accumulation of electricity, demand side management, etc.), thereby promoting on the one hand the competitiveness of domestic industry (producers of technologies) while also searching for cost-effective solutions for the seamless integration of electromobility into the Czech energy system.
Application of the measure elsewhere in Europe/in the world	Germany - regional demonstration projects
Budgetary impact/financing	Funding through existing programmes (this involves setting priorities/programmes) in millions of CZK
Agency responsible	Deputy Prime Minister for Science, Research and Innovation
Collaborating agency	MIT, MT, TA CR
Deadline	2016

H1 Aid for research and development in the hydrogen sector, based on pilot projects.	
Links to strategic objectives	4. Initiating the development of hydrogen technology in transport 5. Research and development in the area of alternative fuels
Description of the measure	Under this measure, a pilot project entitled 'Establishment of hydrogen regions' should be implemented, providing a basis for the creation of a hydrogen infrastructure in selected regions (refuelling stations, sustainable hydrogen production) and the subsequent use of this infrastructure (public transport, fleets of passenger cars). Priority will be given for support to regions located along the main corridors of the Trans-European transport network (e.g. Prague, Brno, Ostrava, Pilsen, Olomouc, Ústí nad Labem). During the 2015-2020 period, at least 2 regional centres should be built.
Practical example	Projects (refuelling stations and vehicles): HyFleet:CUTE (47 urban buses powered by hydrogen in 10 regions). CHIC (Clean Hydrogen In European Cities) – 26 hydrogen-powered buses in 12 EU cities. H2moves Scandinavia - a fleet of 17 passenger cars. TriHyBus – development and implementation of the first hydrogen-powered buses in the new EU Member States and a refuelling station (Neratovice) – co-financed from the ERDF and the MT.
Budgetary impact/financing	Use of subsidies from EU funds (e.g. CEF, FCH JU), CZK 50 -100 million.
Agency responsible	MT
Collaborating agency	ÚJV Řež, a.s. HYTEP Czech hydrogen technology platform
Deadline	2015 – 2020

H2 Assessing the potential for the use of hydrogen propulsion in the CR	
Links to strategic objectives	4. Initiating the development of hydrogen technology in transport
Description of the measure	Under this measure, a feasibility study should be prepared, evaluating the potential use of hydrogen power in the CR, both in the context of global and, in particular, European-wide technological progress in this area, but primarily in the assessment of demand from potential users in the CR.
Practical example	
Budgetary impact/financing	Use of subsidies from EU funds (e.g. CEF, FCH JU), approximately CZK 0.5 -1.5 million.
Agency responsible	MT
Collaborating agency	ÚJV Řež a.s. Czech hydrogen technology platform
Deadline	2016-17

6.7 Other measures

C25 Providing information to road users on the location, the type and the equipment available in recharging and refuelling stations though ITS systems	
Links to strategic objectives	Objective 1.3 Creating conditions for increased acceptance of electromobility among potential customers Objective 2.3 Creating conditions for increased acceptance of CNG-powered vehicles among potential customers
Description of the measure	Following on from the development of smart grids and equipping the infrastructure with recharging and refuelling stations, information will have to be provided to road users, in particular concerning the location, type and equipment available in recharging and refuelling stations. The most appropriate tool to provide this information appears to be a National Access Point, which will be established to provide 'minimal universal information on traffic', in other words traffic information on the situation on the roads, where the nature of this information will warn drivers of dangerous traffic situations. The aforementioned National Access Point will also serve as a source of information on recharging and refuelling stations along the road network. The development of related information services will allow drivers to be informed of available stations and the distance to the nearest recharging point or refuelling station prior to and during their journeys. The concept for this measure corresponds to the Action Plan for the development of intelligent transport systems (ITS) in the CR to 2020 and looking forward to 2050 (see Resolution of the Government of the CR of 15 April 2015 No 268) according to which sources of information on recharging and refuelling stations along the road network will be incorporated into the National Access Point. This source will be progressively expanded and road traffic users will be provided with information services on the accessibility of these stations.
Agency responsible	MT
Budgetary impact/financing	State Transport Infrastructure Fund budget - millions of CZK.
Deadline	2018

C26 Analysis of the potential for the use of alternative fuels in water transport	
Links to strategic objectives	4 Research and development in the area of alternative fuels
Description of the measure	Directive 2014/94/EU on the deployment of alternative fuels infrastructure requires that Member States on the one hand assess the supply of electricity for inland waterway vessels in inland ports and also designate inland ports that are to provide access to CNG/LNG refuelling stations. In both cases, emphasis is laid on assessing actual market needs. It was stated in the NAP CM that it does not appear effective at present to consider the installation of recharging equipment at public ports in the CR in the immediate future, nor to build a refuelling station for vessels using CNG/LNG as a fuel at public ports in the CR. However, this conclusion will have to be re-examined in the near future, at least before the next revision of the NAP CM. To analyse the possibility of using CNG/LNG in shipping (e.g. inland navigation, etc.).
Agency responsible	MT
Budgetary impact/financing	CZK 0.5 - 1.5 million, MT budget.
Deadline	2016-17

G7 Support for developing the use of biomethane in the transport sector	
Links to strategic objectives	2.2 Stimulating demand for CNG-powered vehicles 3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles
Aim of the measure	Support for developing the use of biomethane in accordance with the Action Plan for Biomass in the CR and the NAP for energy from renewable sources.
Description of the measure	Support for the production of biomethane as a renewable and environmentally friendly fuel, (see the Action Plan for Biomass in the CR - Chapter 3.2.2. and 5.1.2) laying down a business model in terms of support for the use of this product. The development of renewable sources is one of the fundamental postulates of the EU energy policy (Directive 2009/28/EC) and developing biomethane production could be one of the applicable options. The graphs presented in the NAP CM show clearly that biomethane used in the transport sector - as concern vehicle range based on production from 1 hectare of agricultural land - the best solution and this could be a reason for developing its production (apart from the extremely high positive contribution to emission savings - see the graph showing emissions with 20% of biomethane in CNG). However, support for the production of biomethane must be resolved through the tax system, because the support from the gas sector, which was previously considered, would disrupt market equilibrium for the gas sector.
Practical example	Germany, Sweden, Austria, Switzerland
Links to other measures	Production, purification and injection of biomethane
Budgetary impact/financing	Funding from public grants.
Agency responsible	MA
Collaborating agency	ERO, MIT, ME
Deadline	2016

6.8 Measures having a wider impact to support the renewal of the vehicle fleet

C27 Analysis of the possibility of reducing the depreciation period for motor vehicles	
Aim of the measure	An analysis of the possibility of reducing the period of depreciation will provide a qualified analytical base for decision-making in this area. The analysis should verify the assumption that reducing the depreciation period will subsequently lead to a higher offer of relatively new‘ second-hand cars in the domestic market, thereby reducing imports of used cars over 10 years old.
Description of the measure	Analysis of the possibility of transferring motor vehicles from depreciation group 2 to depreciation group 1 and identification of the impacts.
Practical example	Accelerated depreciation was implemented in the context of anti-crisis measures for newly acquired tangible assets (i.e. also for vehicles) from 20 July 2009 to 30 June 20010. The depreciation period was shortened from five to two years. The use of accelerated depreciation was successful and contributed to the renewal of the vehicle fleet for corporate entities. The effect of renewal was a subsequent higher offer of ’newer‘ used cars on the Czech market, with low emission levels and a reduction in imports of used cars over 10 years old.
Budgetary impact/financing	The analysis will also verify the assumption that the budgetary impact will be fiscally neutral over time. Increased vehicle sales with the subsequent higher collection of VAT, maintaining jobs both for the final manufacturer and for manufacturers of parts and accessories, with adequate contributions to the state budget, can be considered a benefit for the state budget.
Budgetary impact/financing	CZK 0.5 - 1 million.
Agency responsible	MIT
Collaborating agency	MF
Deadline	2016

C28 Analysis of charges on vehicles in the Czech Republic	
Links to measure	Adjustment of modes and rates of road tax for vehicles powered by CNG/LNG and electricity over 12 tonnes
Aim of the measure	Optimising charges on vehicles in the Czech Republic in relation to externalities in transport, supporting the purchase of low-emission vehicles and pressure to decommission old vehicles with higher emissions
Description of the measure	Analysis of current forms of charging and taxing vehicles in the CR (road tax, motorway vignettes and tolls) including a comparison of the situation in this area in other EU Member States and finding a correlation between the structure of the vehicle fleets in specific countries and the regime of road tax and charges they apply. The analysis will propose a structure for road tax that takes account of the impact externalities from transport on the environment and will also contain an assessment of the possibility of introducing other measures relating to charges on vehicles. The analysis will take into account the measures contained in card C14. An assessment of the impacts of its introduction will also be presented. The result will be a recommendation to introduce or not to introduce road tax for all passenger cars and small utility vehicles.
Practical example	This is a standard economic tool, used in a number of countries as an element to help the systematic reduction of emissions from vehicles in operation. Passenger cars in particular are subject to charges in the EU. Charging cars on the basis of CO_2 emissions is used in more than 15 EU Member States.
Budgetary impact/financing	If the road tax is extended to all passenger cars and small utility vehicles, we can expect a positive effect - an increase in tax revenue as a source of income for the state budget/State Transport Infrastructure Fund amounting to at least CZK 4.5 billion/year (this will depend on how the parameters are set).
Agency responsible	MT
Budgetary impact/financing	CZK 1 - 2 million.
Collaborating agencies	ME, MIT, MF
Deadline	Deadline for the analysis 2017 Deadline for implementation 2019

S29 Analysis of support for the decommissioning of vehicles in the CR (scrapping cars from 1 January 2015) and interest in a contribution for the purchase of a vehicle with an alternative powertrain	
Aim of the measure	Analysis • motivating the public and companies to decommission old vehicles while purchasing new vehicles with alternative powertrains (CNG-powered and electric cars), • motivating the public and companies to decommission old vehicles, with a positive impact on reductions in the number of vehicles whose operation places an excess burden on the ambient air and human health and which threaten the environment when they are incorrectly managed.
Description of the measure	An analysis will be carried out of the interest in and motivational incentives for the decommissioning of old vehicles from the road vehicle register while purchasing a low-emission vehicle, as well as an analysis of the interest in and motivational incentives for decommissioning old vehicles from the vehicle register without the need to purchase a new vehicle. The result of the analysis will determine the financial sum that motivates the owner of an old car (defined on the basis of EURO emission limits) to purchase a new low-emission car and to hand the old over to an authorised facility for ecological disposal of wrecks and also the financial sum that would motivate an owner to hand over their car (scrapping) to an authorised facility for ecological disposal of wrecks without having to purchase a new car.
Practical example	Despite their significantly lower mileage, old cars place a higher burden on the environment and human health than vehicles meeting higher levels of EURO standards. These vehicles also have a complete lack of safety features, with fatal consequences during accidents (not only in terms of life and health, but also in environmental terms - fluid leaks). Owners of these vehicles should be motivated to decommission them and replace them with more environmentally friendly vehicles. Many countries have introduced an economic tool in the form of a one-off grant for the purchase of a CNG-powered vehicle (Germany, Switzerland) and for an electric vehicle (USA, France, Japan, Sweden, China).
Budgetary impact/financing	Analysis - around CZK 200 000 net of VAT. Following on from the results of the analysis, a contribution will be introduce, using the funds collected pursuant to 37e of Act No 185/2001 on wastes (fees to support the collection, treatment, recovery and disposal of scrap cars).
Agency responsible	ME
Deadline	Deadline for the analysis 2015 Following on from the analysis, a contribution will be introduced in 2016.

Measures intended to implement the NAP CM.

S30 Ongoing monitoring and evaluation of the implementation of measures proposed under the NAP CM	
Links to strategic objectives	Relates to all the objectives listed in Chapter 4.1 of the NAP CM.
Aim of the measure	Evaluation of the implementation of the NAP CM and its updated version.
Description of the measure	In order to provide regular information on the current state of implementation of measures proposed in the NAP CM, a working group will be established under the management of the MIT, with the involvement of the relevant stakeholders. This should also be the platform for discussing both any modification of the measures proposed and any measures newly proposed in response to changing circumstances and the impacts of measures already implemented. The process proposed will also enable compliance with the obligations arising from Article 10 of Directive 2014/94/EU as regards the submission of regular reports on the implementation of the national policy framework.
Agency responsible	MIT
Budgetary impact/financing	No impact.
Collaborating agencies	MT, ME, MRD
Deadline	Updated report submitted to the Government and the European Commission at least once every three years, Report on the implementation of the NAP submitted to the government once a year.

E10 Interoperability of recharging infrastructure operators	
Links to strategic objectives	1.3 Creating conditions for a better perception of electromobility on the part of potential customers
Description of the measure	To ensure interoperability and the possibility of recharging electric cars at stations run by different operators (or service providers) than those with whom the user has concluded a contract. Directive 2014/94/EU on the deployment of alternative fuels infrastructure allows operators of recharging stations to provide electric vehicle recharging services to customers on a contractual basis, including in the name and on behalf of other service providers. This solution offers a user-friendly option for customers who use the services of a number of operators. This service is dependent both on the technical conditions (recharging stations run by different operators must be mutually compatible, both in terms of connectivity with the vehicle and in the sense of customer identification, which is mainly addressed by other requirements set out in the Directive) and, particularly, business conditions (the provision of services to customers on behalf of other providers requires corresponding settings for contractual relations between operators and setting conditions for the mutual recognition of customers, or the products and services offered. This is therefore primarily a civil law relationship between operators. Past experience from other countries shows that this functionality can be addressed by a purpose-built solution in the form of a specific market integrator, generally at national level (although it can also be international) often tied to the need to establish a specific entity to provide (integrate) these services. An alternative solution is to use the growing number of solutions offered by companies specialising in the integration of networks from a number of operators and the offer of a consolidated solution for customers, who offer these solutions to operators as a form of service. Some of these solutions are fully functional today and we can expect further expansion should there be interest in them (i.e. Including international solutions). It is clearly highly likely that the recharging network will become connected naturally, based on agreements between operators, which will ensure the necessary integration. However, it is difficult to identify the optimum solution at the moment in a market that is only just emerging, including decisions as to whether a state role is necessary or not. It is therefore proposed that this area should be monitored and that developments should be analysed in collaboration with recharging station operators and any conclusions or recommendations for further action should be adopted in the context of the evaluation/revision of the NAP.

E10 Interoperability of recharging infrastructure operators	
Practical example	In a number of countries (Netherlands, Germany) solutions connecting systems run by multiple operators are at different stages of operation and companies offering these services are expressing active interest in expanding into other EU Member States. In connection with the fulfilment of the objectives of the Directive, we can expect increased momentum in the development of solutions on offer.
Budgetary impact/financing	No impact to date.
Agency responsible	MIT
Collaborating agencies	OTE, MD, recharging infrastructure operators.
Deadline	2016

G6 Support for passage through the Czech Republic by domestic and foreign LNG-fuelled freight vehicles and semi-trailers	
Links to strategic objectives	3.1 Creating the basic conditions for the future development of the market for LNG-powered vehicles
Aim of the measure	Preparation for the construction of a network of LNG refuelling stations, including the implementation of a pilot project.
Description of the measure	In the event of interest on the part of stakeholders involved in the construction of LNG stations, a feasibility study on the construction of a network of refuelling stations and, possibly, also the implementation of a pilot project could be prepared using funds from the CEF
Practical example	LNG refuelling station in the Netherlands operated by Shell. More than 1 000 LNG-powered vehicles in the European Union, particularly the long-haul LNG and LCNG refuelling station in Warsaw.
Budgetary impact/financing	CEF/CZK 0.5 - 20 million.
Agency responsible	MT (only administrative support, will not submit an application)
Collaborating agency	MIT
Deadline	2015 – 2017

7. Monitoring and evaluation of implementation of the measures

The implementation of the NAP CM will be monitored and evaluated on an ongoing basis, with outputs from this evaluation incorporated into annual reports, which will always be submitted to the Government of the CR for approval/information by 30 September. On the basis of an assessment of measures implemented during the period from 2015 to 2017, an updated document will be prepared in 2018. The new document, which will address clean mobility for the period after 2021, will be submitted in 2020.

The MIT, working together with the ME and MT (as well as other ministers responsible for the implementation of individual sub-measures of the NAP CM) is responsible for preparing reports and for the overall evaluation of the NAP CM.

Given the need also to evaluate the contribution from the European structural and investment funds towards the implementation of the NAP CM (particularly as concerns the OP T, OP EIC and IROP), this will be ensured by the predetermined deadlines (for more detail see also the relevant MRD ESIF Guidelines).

The evaluation of the NAP CM will be based on an assessment of fulfilment of indicators (see below), the funds spent on the implementation of individual measures, as well as an expert evaluation including a substantive interpretation of quantitative inputs (as well as, possibly, an evaluation of the impacts/effects arising from the implementation of sub-measures). In addition to the measures, the objectives of the NAP CM will also be evaluated, i.e. how a given measure contributed to the overall fulfilment of the objective set.

The report will also evaluate any obstacles to the implementation of the NAP CM, including proposals for their solution/removal.

The evaluation of the implementation of measures proposed in the NAP CM will be based on the following structure:

Name of the measure	Coordinator	Deadline for implementation	State of implementation (yes/no/partially)	Evaluation of implementation (substantive/expert evaluation of the state of implementation of the measure)

Proposed indicators

Indicator	**Year**	**NAP CM plan for the given year**	**Actual situation in the given year**
Number of electric cars			
Number of electric recharging stations			
Number of CNG-powered vehicles			
Number of CNG refuelling stations			
Numbers of LNG-powered vehicles (vessels)			
Numbers of LNG refuelling stations			
CNG consumption in the transport sector (m^3)			
LNG consumption in the transport sector (m^3)			

Drawdown of funds for clean mobility from OP EIC, OPT and IROP (in thousands of CZK)

Programme	2015	2016	2017	2018	2019	2020
OP EIC						
OPT						
IROP						
National programmes[23]						

[23] Individual reports will specify the national programmes from which funding will be drawn for the implementation sub-measures.