Part of **innogy**

elmű·émász

Public charging in the Danube Region and in Hungary

ELMŰ-ÉMÁSZ · Szilárd Árvay· 25 May 2018

elmű-émász owns the DSO-s in Central and N-E Hungary

ELMŰ

- Network length: 23 993 km
- # of customers: 1,49 million
- owned by Innogy 55,25%; EnBW 27,25%; MVM 15,63%, Other 1,87%

ÉMÁSZ

- Network length: 23 026 km
- # of customers: 0,72 million
- owned by Innogy 54,26%; EnBW 26,82%; MVM 12,05%, Other 6,87%

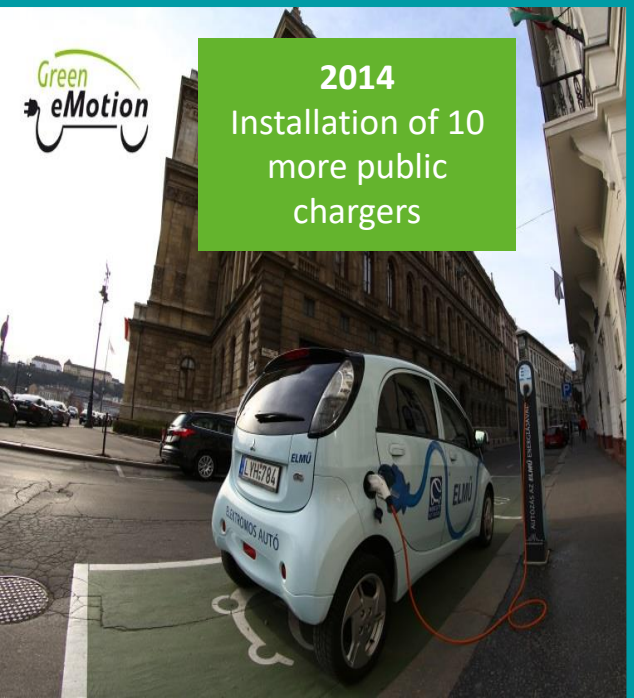
Retail	**Electricity 11,0 TWh (30%)**	**Gas 4,1 TWh (10%)**	**Sales Revenue 892 m €**
Grid	**Transmission 16,1 TWh**	**Connection points 2,3 M**	**Supply area 19.626 km²**

ELMŰ-ÉMÁSZ

2010
Inauguration of first public e-charger in Hungary

2011
ELMŰ-ÉMÁSZ purchased three new EV-s

2012
Installation of the first charging station in Miskolc



2014
Installation of 10 more public chargers

2015
Inauguration of the first DC charger at Budapest Airport

2017
ELMŰ-ÉMÁSZ purchased 15 new EV-s

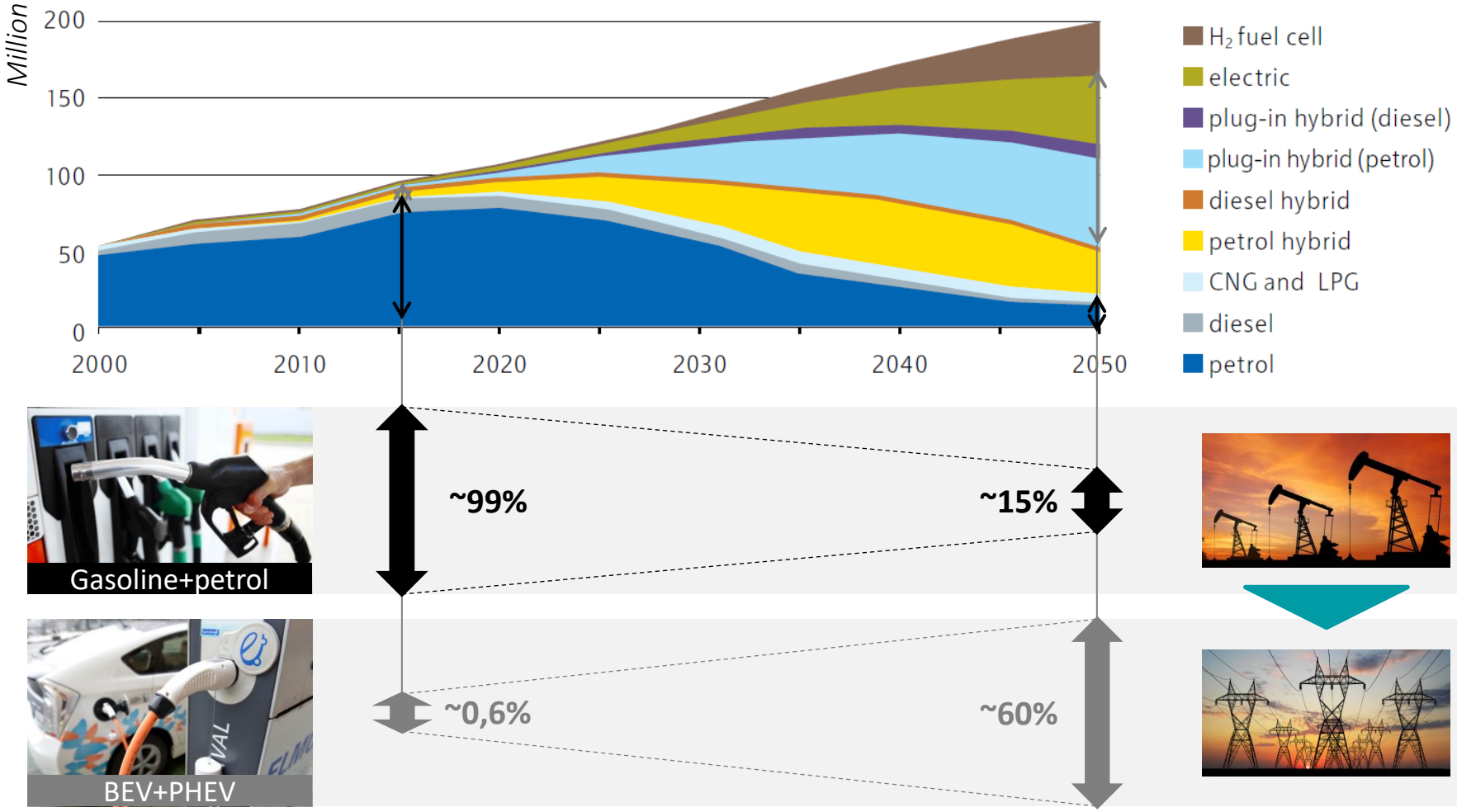
ELMŰ network of smart chargers:

- ✓ public: 39
- ✓ Semi-public & private: 60
- ✓ ELMŰ sites: 25

Altogether: 124 chargepoints

We have to prepare ourselves for a whole new world

Forecast of new vehicle sales on a global scale

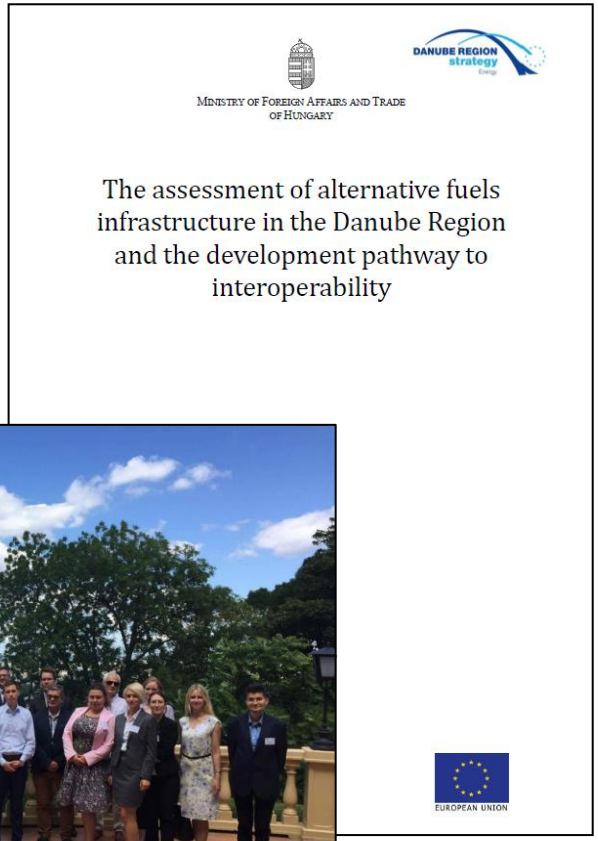


Source: IEA Energy Technology Perspectives

Public charging in the Danube Region

Alternative fuels infrastructure assessment was prepared for the Danube Region in 2017

- Századvég Economic Research Institute has prepared a study for the EU Danube Region Strategy – Energy, coordinated by the Ministry of Foreign Affairs and Trade of Hungary.
- The findings were presented to the government representatives of the 14 participating countries of the Danube Region Strategy at the 14th Steering Group Meeting in July 2017.



Roll-out of alternative fuel vehicles will be highly different in countries with modern and with rather aging fleets

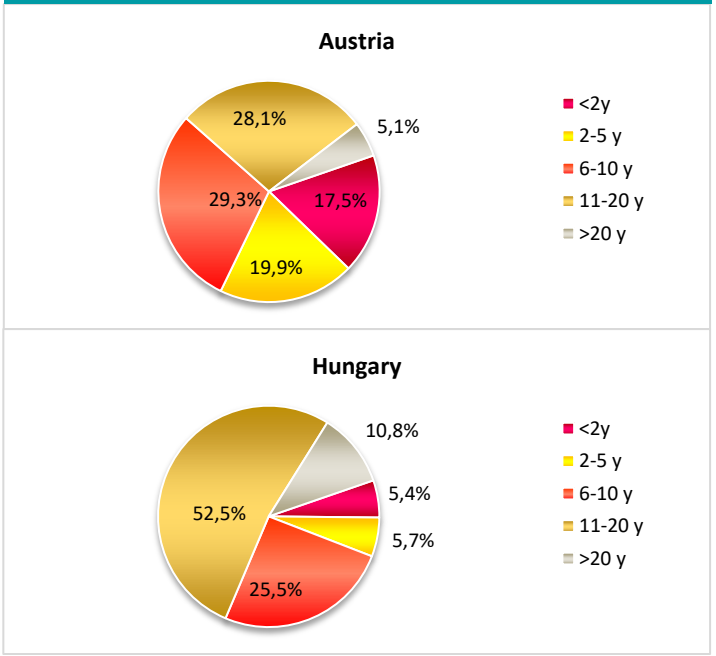
Most often used mode of passenger transportation in the **Danube Region** countries: **Passenger cars**.

Composition of the passenger **car stock** can **differ markedly even among EU countries** of the region.

For instance, in 2015:

- **cars younger than 2 years: AT had three times as much** in its national portfolio **compared to HU**.
- **cars older than 20 years: 5.1% in AT, 10.8% in HU**.

Age structure of M1 vehicle stock (2015)



Heterogeneity of the national transport sectors within the Region: varying age structure of the passenger vehicle fleets.

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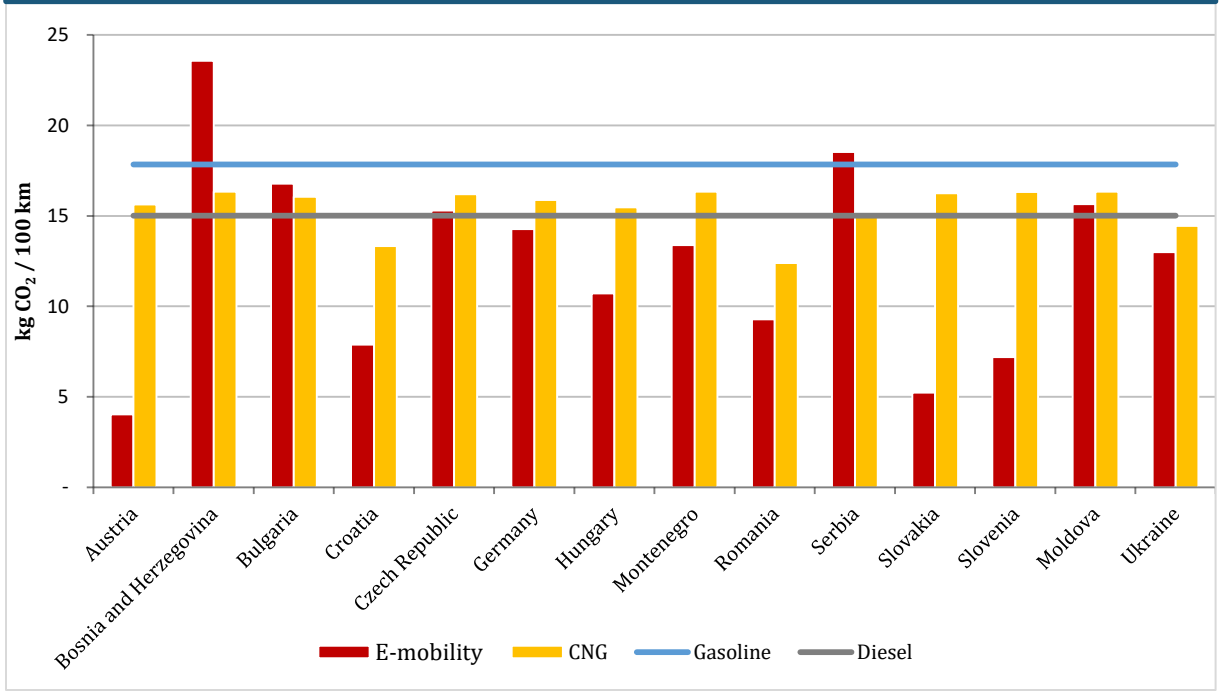
Emission intensity of alternative fuels in the Danube Region are different,with AT being best fitted to e-mobility

E-mobility provides for the greatest divergence in emission levels, and is not always the option with the lowest emissions.

Countries with significant natural gas production have lower emissions from CNG as the commodity does not need to be imported from abroad.

Well-to-wheel emission* intensity of fuels considering real M1 category mileage



*For the emissions from diesel and gasoline the report assumed an average emissions level as published by the JRC in 2013.

If countries rely excessively on fossil electricity generation sources, then the well-to-wheel emission intensity of electricity will be greater than any other fuel in consideration.

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Diverging support policies for alternative fuels in the Danube Region

Only a few countries (AT, DE, HU, SI) support e-mobility at all levels of the support policy hierarchy:
- **subsidies to decrease fix costs;**
- **infrastructure creation;**
- **decreasing operational costs).**

HR and SK supports e-mobility at two levels of the hierarchy, while Slovakia also provides the widest available support for natural gas infrastructure and vehicles.

Unfortunately the research did not reveal any support measures for any of the alternative fuel technologies in non-EU member state countries.

Availability of support measures for alternative fuels as per the support policy hierarchy

	E-mobility	Natural gas
Austria	3/3	1/3
Bosnia and Herzegovina	0/3	0/3
Bulgaria	1/3	0/3
Croatia	2/3	0/3
Czech Republic	1/3	1/3
Germany	3/3	1/3
Hungary	3/3	1/3
Montenegro	0/3	0/3
Romania	1/3	0/3
Serbia	0/3	0/3
Slovakia	2/3	2/3
Slovenia	3/3	0/3
Moldova	0/3	0/3
Ukraine	0/3	0/3

Currently e-mobility enjoys the greatest support, however, non-EU countries currently do not provide any incentives for alternative fuels.

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Proposed measures: clean transport infrastructure development along the most important transport corridors

1. Developing **AFV-s** is **meaningless without** the related filling **infrastructure.**
2. It is through the **TEN-T network** that the EU wishes to **enhance transport connections** between countries.
3. **EU** member states are **required to provide alternative fuels infrastructure along** core **TEN-T** networks.
4. The **TEN-T** network **is indicatively extended into third countries** as well, recognising that tourism, mobility of employees and trade connect the states.

Proposals

1. In the **Western Balkans**, have indicative **TEN-T** networks be **equipped with electric and** in a few cases with **LNG** infrastructure.
2. The **capitals of Moldova and Ukraine should be accessible with electric vehicles from EU Member States**.

Map sources: European Commission

To create interoperability within the Danube Region, it is suggested that the indicative TEN-T routes that penetrate Western Balkan countries are equipped with electric charging infrastructure, and if needed LNG, while the capitals of Ukraine and Moldova should be accessible from EU countries with electric vehicles.

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Estimated costs of the proposed infrastructure developments

If the EU Member States execute Directive 2014/94/EU on on the deployment of alternative fuels infrastructure, then an additional 36-47 fast charging points in non-EU countries are sufficient for interoperability in the Danube Region.

The combined costs of the developments account to EUR 2,350,000.

	No. of electric charging points	Cost of electrification
Ukraine	10-12	EUR 600,000
Moldova	2-3	EUR 150,000
Serbia	12-15	EUR 750,000
Bosnia and Herzegovina	7-10	EUR 500,000
Montenegro	5-7	EUR 350,000
Bulgaria	Dealt through Directive 2014/94/EU and national alternative fuels framework policies.	n/a
Romania		n/a
Germany		n/a
Austria		n/a
Czech Republic		n/a
SUM	**36-47**	**EUR 2,350,000**

It was assumed that EU countries will develop appropriate electric charging network along core TEN-T networks as per 2014/94/EU.

It was assumed that a 100 kW charger costs EUR 50,000 as per the average of CEF projects.

These infrastructure developments should take place by 2025, so that the Region will not lag behind the EU-wide roll-out.

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Public charging in Hungary

Different kinds of usage and destination require different levels of charging power

A @ Home	B @ Public	C @ Work	D @ Semi-public	E @ Stations
Short distance	Short distance	Short distance		Long distance
1-15 hours of staying times	0,5-8 hours of staying times			~10 mins
Low Voltage	Medium Voltage			MV or HV*
~ 7 kWh / day	> 7 kWh / day			> 50 kWh / charge
90-95% of all the trips				5-10%

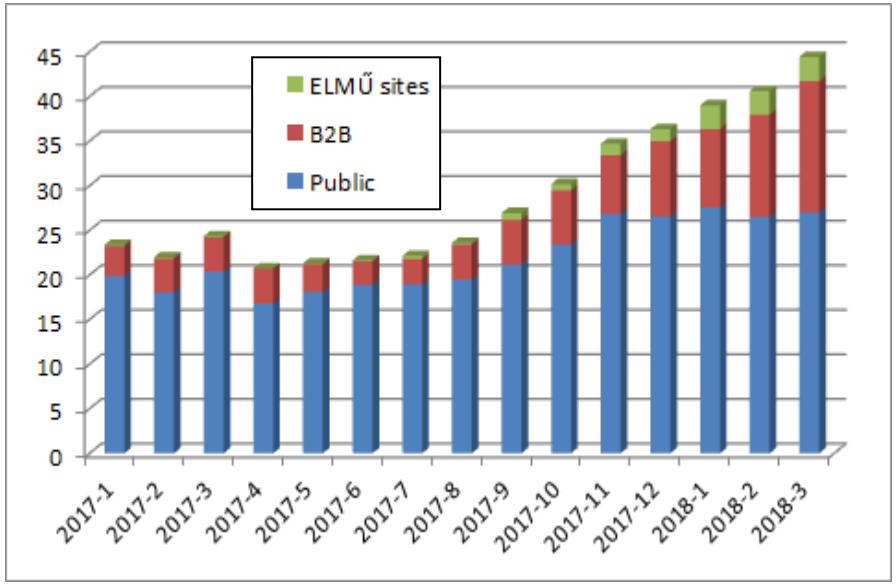
*Medium or High Voltage

In spite of dynamic increase in charging volumes...

Usage of chargers operated by ELMŰ:

- A total of 307 MWh was charged in 2017;
- 3200 charging sessions per month on an average;
- Average charging volume in January-December 2017 was between 7.3-9.2 kWh/session;
- In March 2018, 44.4 MWh electricity was charged on all chargers operated by ELMŰ;

Monthly charging volumes on the ELMŰ operated chargers in 2017-2018 (MWh)



Total number of electric cars (BEV and PHEV) by April 2018:

5.927

...currently there is no positive business case for setting up a public AC charging infrastructure in Hungary.

LOW UTILISATION

Monthly energy charged
27 MWh

Theoretical maximum*/month
617 MWh

4,4% average utilisation

- Before the introduction of payment
- Impossible to recover investment costs with such conditions
- Operation costs can be partially recovered

WHAT KIND OF COSTS NEED TO BE COVERED?

~54%

OPERATION

- Maintenance, troubleshooting
- Electricity and grid fee
- IT costs including payment solutions
- Call centre
- Self-consumption

~46%

INVESTMENT

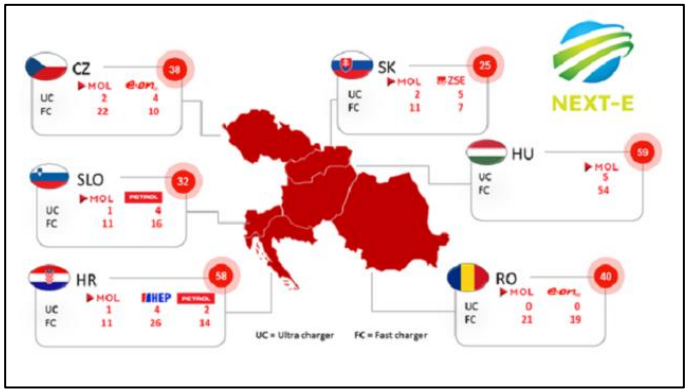
- Charging equipment (hardware)
- Grid connection fee
- Installation, IT commissioning
- Charging licence fee
- Parking lot painting, traffic signs, bumper protection, etc.

*39 ELMŰ AC chargepoints with 22 kW

But the number of chargers in HU will increase by 400% within two years from EU and state funds

Hungary:

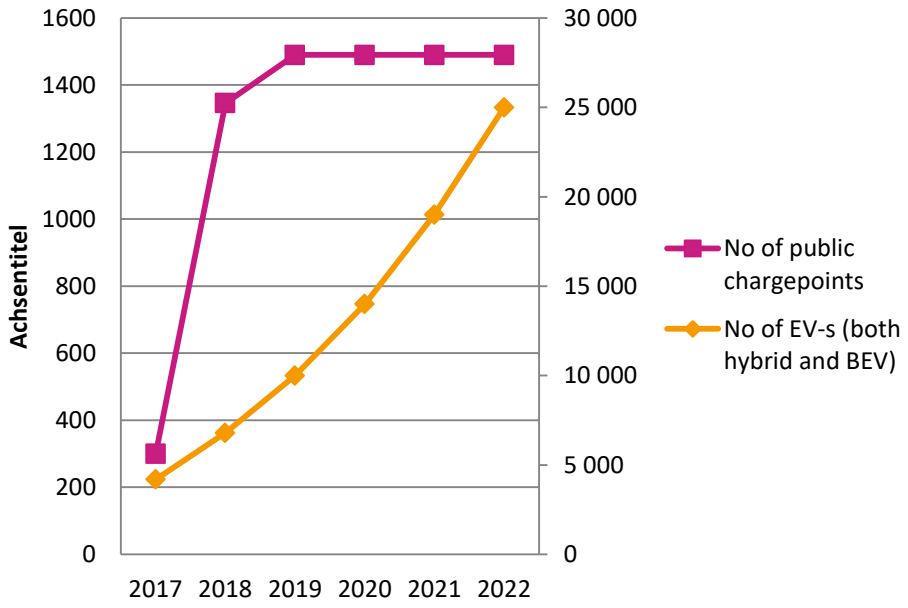
- e-Mobi Ltd (100% state owned e-mobility company): 235 AC + 75 DC chargers to 78 towns by mid 2018;
- MOL-EON-Nissan Next-E project: 57 DC until 2019 on highways;
- Municipality charger installation programme: 193 AC + 20 DC chargers by 75 towns;
- Tesla – one Supercharger (up to 120 kW) to Győr by end of 2017 + one to Nagykanizsa by end 2018
- OMV and Verbund AG applied for EU funds for 118 DC chargers, 13 to Hungary
- NKM –'significant' number of e-chargers together with municipalities in 2017



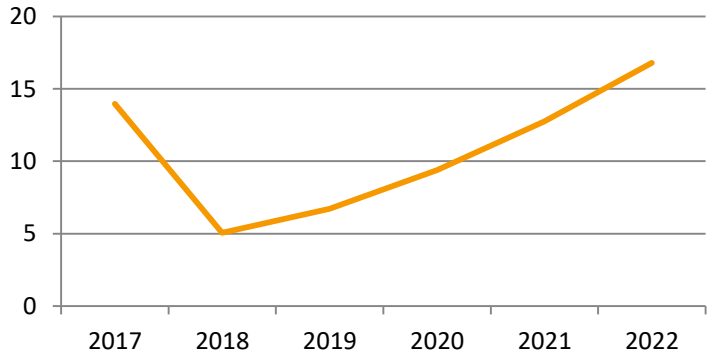
Within two years, at least 428 new public AC + 167 new public DC chargers are expected to be installed in Hungary to the existing 150 .

Expected utilisation rate of chargepoints will remain low in the next 5 years

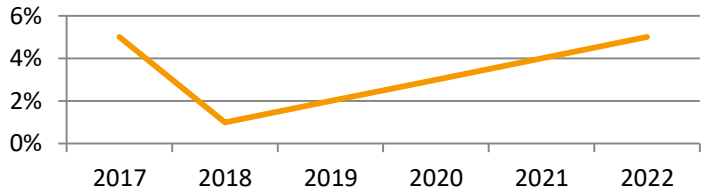
Forecast on EV and chargepoint numbers



EV/chargepoint



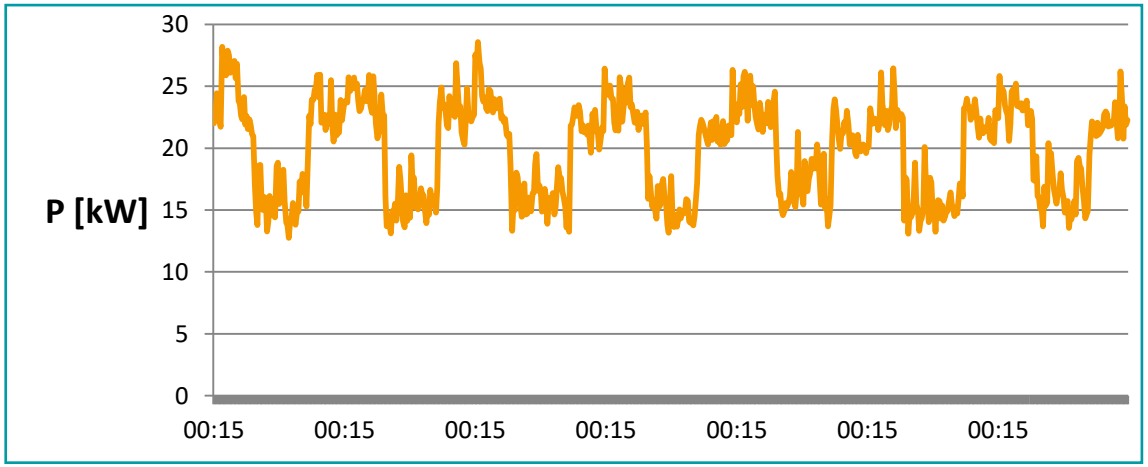
Expected utilisation rate of a chargepoints based on ELMŰ experience



The next 5 years will be characterised by intensive increase of chargepoints (funded by the state and B2B) and a modest increase of EV-s. This has a direct effect on the utilisation rate of individual chargepoints.

DC-charging along highways is impossible without significant grid development.

Weekly consumption rate of a petrol station



The power need of the petrol stations might increase with one magnitude.

- Transformer replacements
- Grid reinforcements
- New substations

- A petrol station is characterized by a 15-30 kW power need.
- Petrol and gasoline have much higher energy density than the batteries in EV-s.

- If we want to offer the same quantity of energy in the form of electricity for unit of time, then even 40 pieces of 300 kW DC chargers are required.

This is equivalent to 12 MW of electric power.

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Thank you for your attention!

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