

EV-charging infrastructure - distribution utility perspective

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Number of charging sessions is growing fast



2016:

4.281 sessions

33.246 kWh

2017:

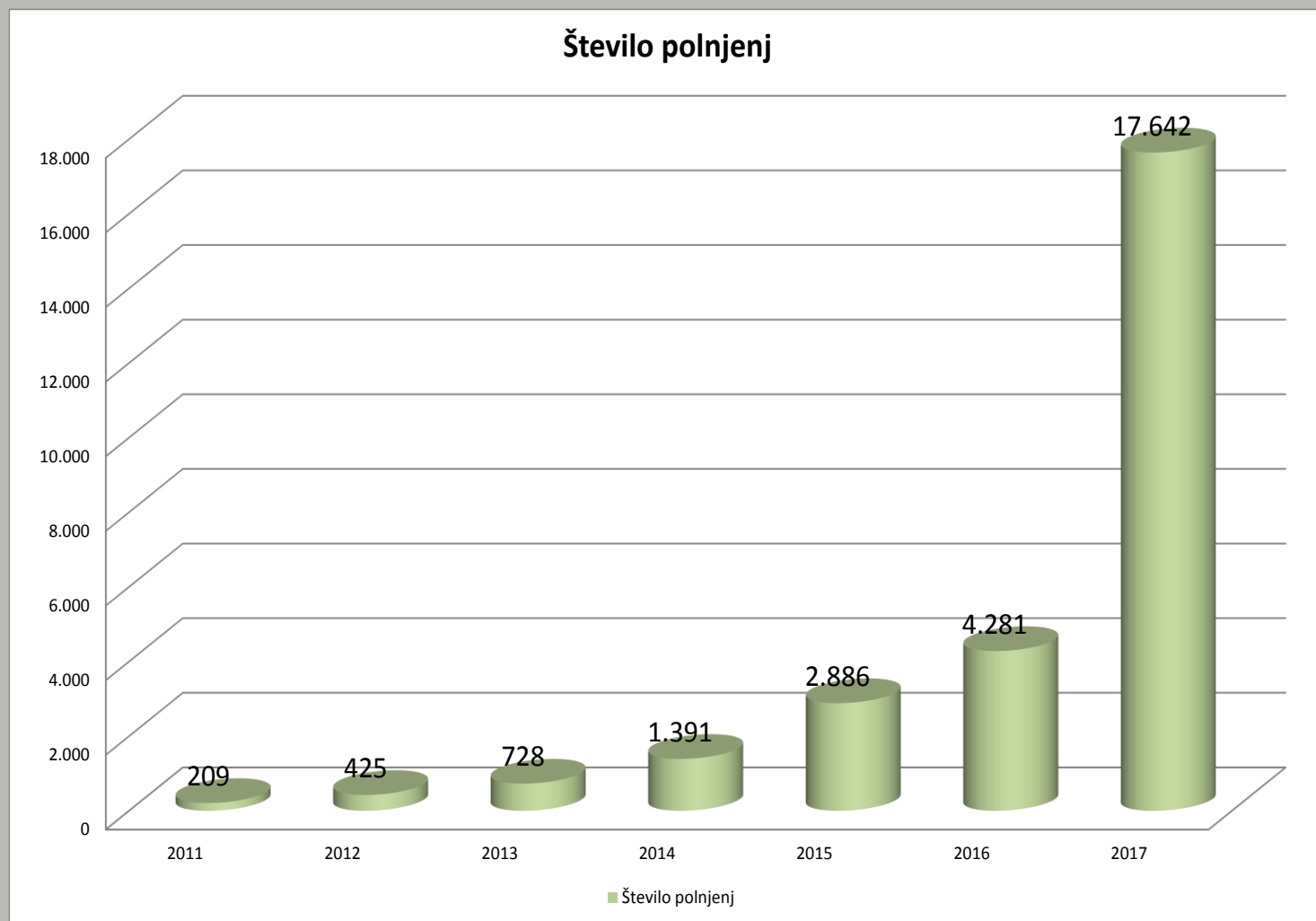
17.642 sessions

164.725 kWh

May 2018 only:

3.282 sessions

33.639 kWh



1. Costs of charging infrastructure

(source Elektro Ljubljana)



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BASED ON SAMPLE OF 60 CHARGING STATIONS

- Stations owned by us (Elektro Ljubljana d.d.).
- Average total investment cost is over 12.500 € per unit.
- Parking place and charging station itself is only 20 – 35 % of total investment.
- In average about 75-80% of total installation cost are costs on the side of distribution network.
- **In any case, EV-charging infrastructure is and will be built by distribution utilities and not „EV-charging infrastructure providers“.**
- **Since network is regulated business, EV- charging infrastructure competes with other network developments.**
- **Any business model needs to take DSO into consideration to bring success.**



2. Structure of the network



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2. Structure of the network

(source EIMV)



LOADING OF THE NETWORK BY EV

- 44 km/day -> 11 kWh/day.
- Ideally/theoretically possible to get through with 0,5 kW per EV, practically 1 kW.
- Charge time 10 hours -> 1,1 kW.
- 100 customers per transformer station with average load of 1,5 kW.
- 200.000 EV-s in 2030 means 25 of them per transformer station.
- 25 kW of additional load on transformer of 150 kW.
- Electric energy consumption grows already anyway.

- **2030 goal means a need to refurbish of some thousands of transformer stations and kilometers of lines -> rough estimation 40-60 Mio € only in Elektro Ljubljana case.**

- **2050 -> only EVs as new cars -> maybe over 1.000.000 of EVs in Slovenia !!??**

3. Network financing

(source Elektro Ljubljana)



DISTRIBUTION OF ELECTRIC ENERGY IS REGULATED BUSINESS

- Elektro Ljubljana Asset Value – cca 420 Mio €.
- New Value of asset can be estimated to considerably over 1 Billion €.
- Life cycle of equipment used to be 30 years in average – is decreasing.
- Simple reproduction requires 33 Mio € investment yearly.
- Exact figure of Elektro Ljubljana investment in 2017 (32,917).
- Growth in consumption is about already 3% -> requires 30 Mio € more.
- EKS (Energetski Koncept Slovenije) expects such growth for next 30 years!

- **To support existing e-mobility plans, another 1 Billion € would be needed only for investments of Elektro Ljubljana in the next 30 years -> 3,3 Billion on national level!!!**
- **Will regulator/government allow us to use these funds for this purpose?**
- **Will DSO-s be forced to decline network connections to some users?**

- **Can mass introduction of EVs help to reduce this figures?**

Potential savings in the network



MAIN CONSTRAIN AT DSO LEVEL IS THE CAPACITY OF THE NETWORK

- Capacity of the network needs to perform whenever needed!
(24/7 for 30 years – every failure to comply has penalties as consequence)
- V2G concept -> EV batteries used for utility purposes
- **44 km/day -> 11 kWh/day.**
- **Charge time 10 hours -> 1,1 kW.**
- **Ideally/theoretically possible to get through with 0,5 kW per EV, practically 1 kW.**
- Giving power back takes time – 5,5 kWh -> 5 hours. And refill another 5 hours.
- EV to be connected 20 hours/day -> practically on every location. Double construction of infrastructure becomes necessary.
- **To save 1 kW we need to construct another 1 kW.**

Potential savings in the network



BOTTLENECKS IN DISTRIBUTION NETWORKS ARE ON PARTICULAR LOCATIONS. WE COULD AVOID INVESTMENT AND SAVE MONEY:

- If there was enough flexible power in particular location -> in case of EV they needed to be able to stop charging or even return power.
- If there was readiness to have EV charged later (much later).
- If there were EVs always connected in numbers high enough to provide sufficient flexibility.

- **1 kW of available power in the network costs in average approximately 100 € / year** (source: several studies of EIMV & our own calculations)

- **How many EVs needed to be at location to save 1 kW on 24/7 basis? 3? 5? 10?**
- **Earnings of 33, 20 or 10 €/year!!**
- **Making additional cycles on expensive batteries!!**

Conclusions



- **Business models to develop effective construction process of EV-charging are still do be developed and distribution utilities need to be part of them.**
- **Distribution utilities are willing to participate in optimization of the process of electrification of the transport; it is our job and we have knowledge and experiences!!**
- **All participants in e-mobility development need to have realistic expectations of what is possible and what is economically justified in order to properly plan development.**
- **Without addressing of the network issues there are only very limited possibilities for desired expansion of e-mobility.**