

The Electric Power System

- Czech Republic -

Basic facts

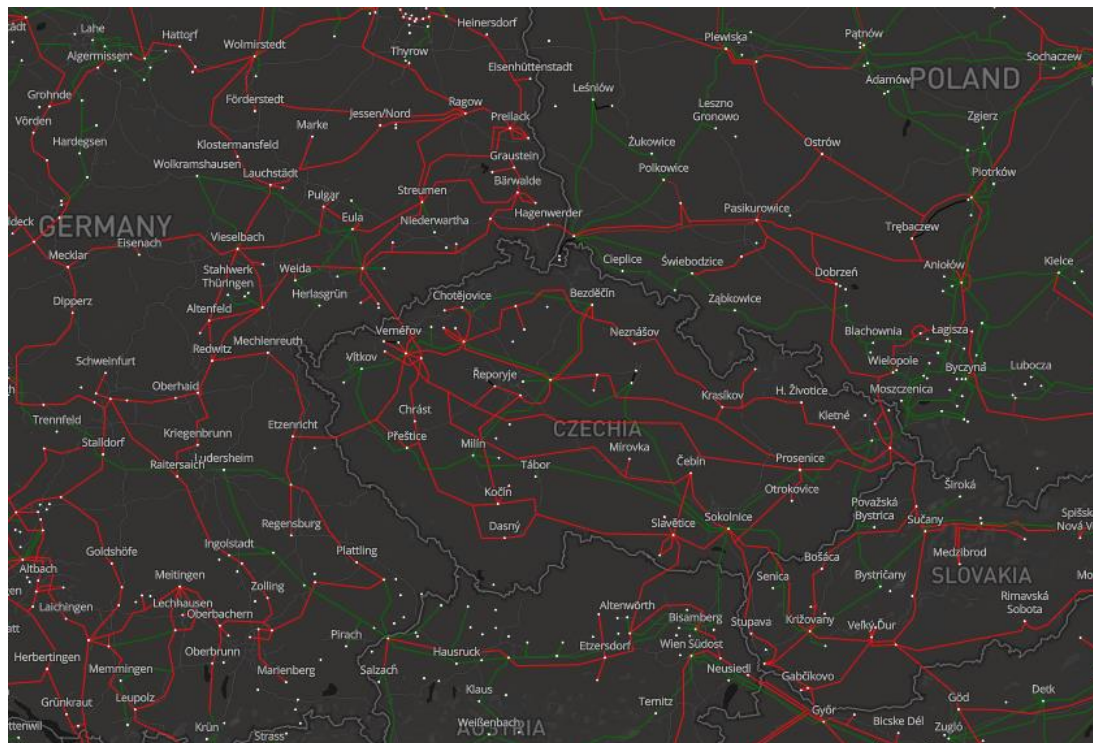
- ❑ Area (km²): 78,866
- ❑ Population: 10,557,420 (2018)
- ❑ Number of offtake points: 5,966,605 (2017)
- ❑ Number of TSOs: 1
- ❑ Number of DSOs: 254 (4/5/2018)
 - 3 main regional DSOs (E.ON Distribuce, ČEZ Distribuce, PREdistribuce)
 - 251 local DSOs
- ❑ Gross peak load in 2017 (MW): 11,769 (24/1/2017)
- ❑ CAIDI in regional distribution (min): 156.2 (2017)

www.eru.cz
www.cszo.cz

Global map of the grid and of its interconnections

Interconnections with:

- Slovakia (SK)
- Poland (PL)
- Austria (A)
- Germany (D)



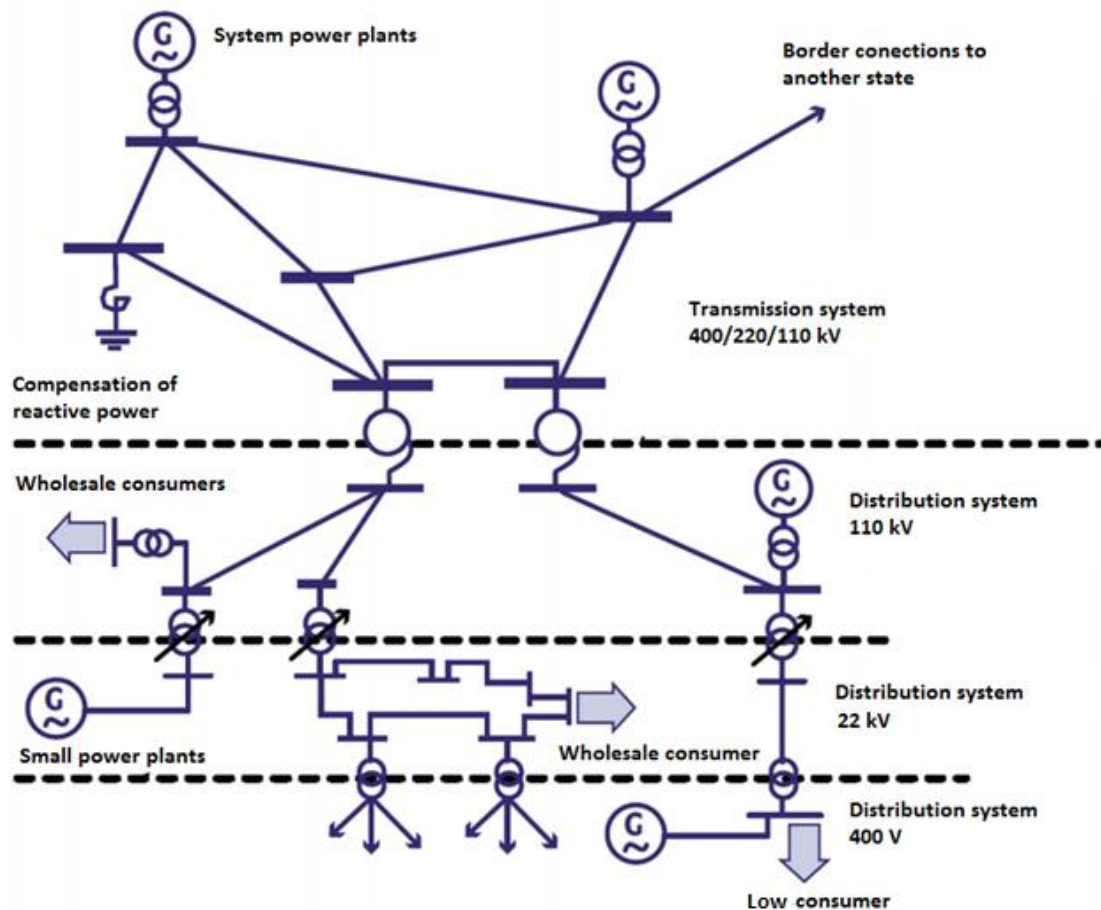


Grid facts and characteristics

System	Voltage level (kV)	Length of lines (km)
Transmission	400	3,735
	220	1,909
	110	84
Regional distribution systems	110	7,971
	3-35	76,327
	0.4	150,836

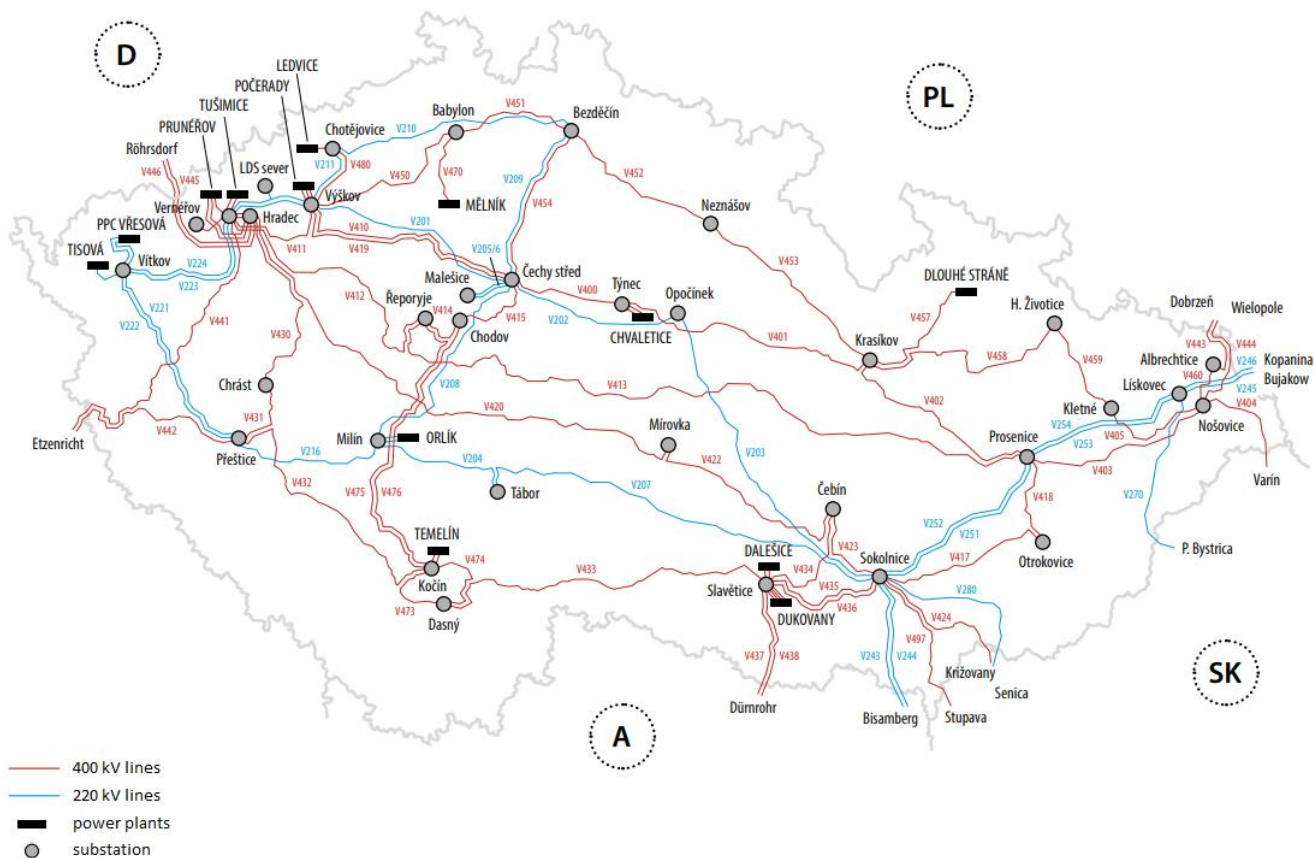
www.ceps.cz
www.eru.cz

Structure of power system



Toman, P. Provoz elektrizačních soustav. ČVUT, Praha 2011.

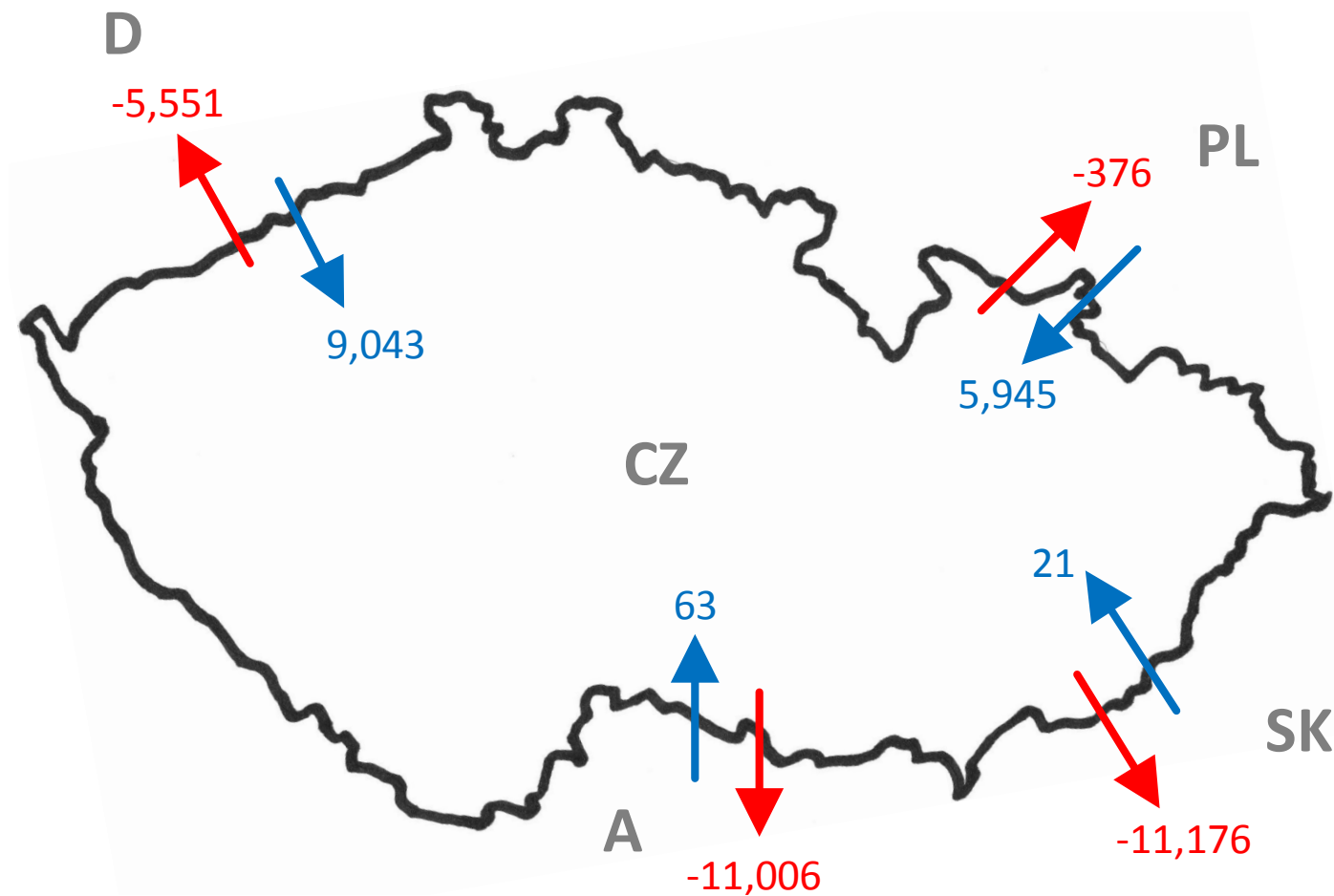
Map of the transmission system



Power balance in 2017

- ❑ Gross/net generation (TWh): 87.0/81.0
- ❑ Gross/net consumption (TWh): 73.8/61.9
- ❑ Imports TSO + DSOs (TWh): 15.1
 - TSO: 14.6 TWh
 - DSOs: 0.4 TWh
- ❑ Exports TSO + DSOs (TWh): -28.1
 - TSO: -27.9 TWh
 - DSOs: -0.2 TWh
- ❑ Total losses (TWh): 4.4
 - TSO: 1.2 TWh
 - DSOs: 3.2 TWh

Energy exchanges in 2017



www.eru.cz
www.wiki.rvp.cz



Information about TSO

- ❑ Name: ČEPS
- ❑ Network length (km): 5,728
- ❑ Served area (km²): 78,886
- ❑ Annual export/import balance (TWh): -27.9/+14.6
- ❑ Website: www.ceps.cz
- ❑ Actual issues in 2018:
 - gradual decommissioning of 220 kV system in long term horizon until 2040 and strengthening of 400 kV system
 - development of the system will be affected by source base, especially by commissioning of new nuclear units, renewables and large-capacity battery units



Cooperation and responsibilities of TSO and DSOs

□ DSO has to:

- have reserved capacity at substations
- do technical and operational arrangements which prevent influencing of voltage quality
- provide ancillary services to TSO
- follow TSO's orders
- present development plans

□ TSO has to:

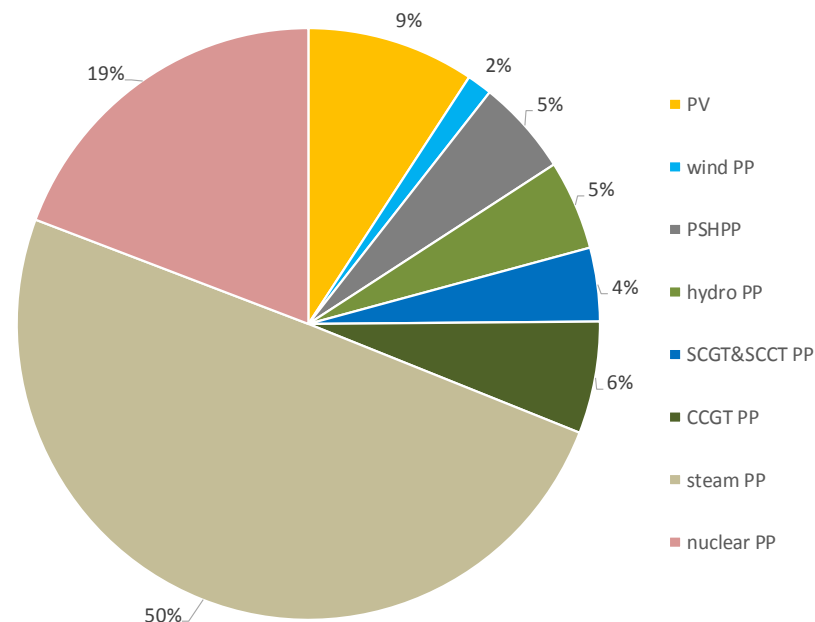
- inform DSOs about operational preparations
- present TSO's development plans
- present information about winter system's load
- inform DSOs about system further manipulations
- present other information needed for DS operation

Czech Republic. The Law of Energy, 458/2000 Sb.

Installed capacity with reference to generation technology

□ Installed capacities in 2017 (MW):

- Steam power plant (PP): 11,075
- SCGT and SCCT PP: 896
- CCGT PP: 1,364
- Nuclear PP: 4,290
- Solar PP: 2,070
- Wind PP: 308
- Hydro PP: 1,093
- Pumped storage PP: 1,172



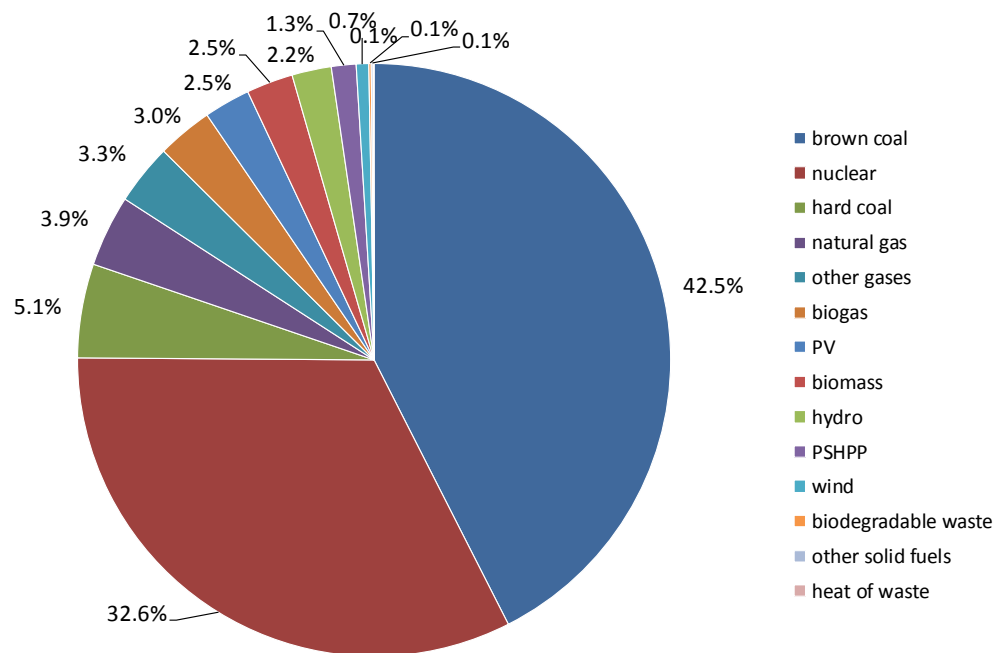
Ratios on total installed capacity in 2017 (%)



Electricity gross production according to primary resources

□ Gross power production in 2017 (TWh) :

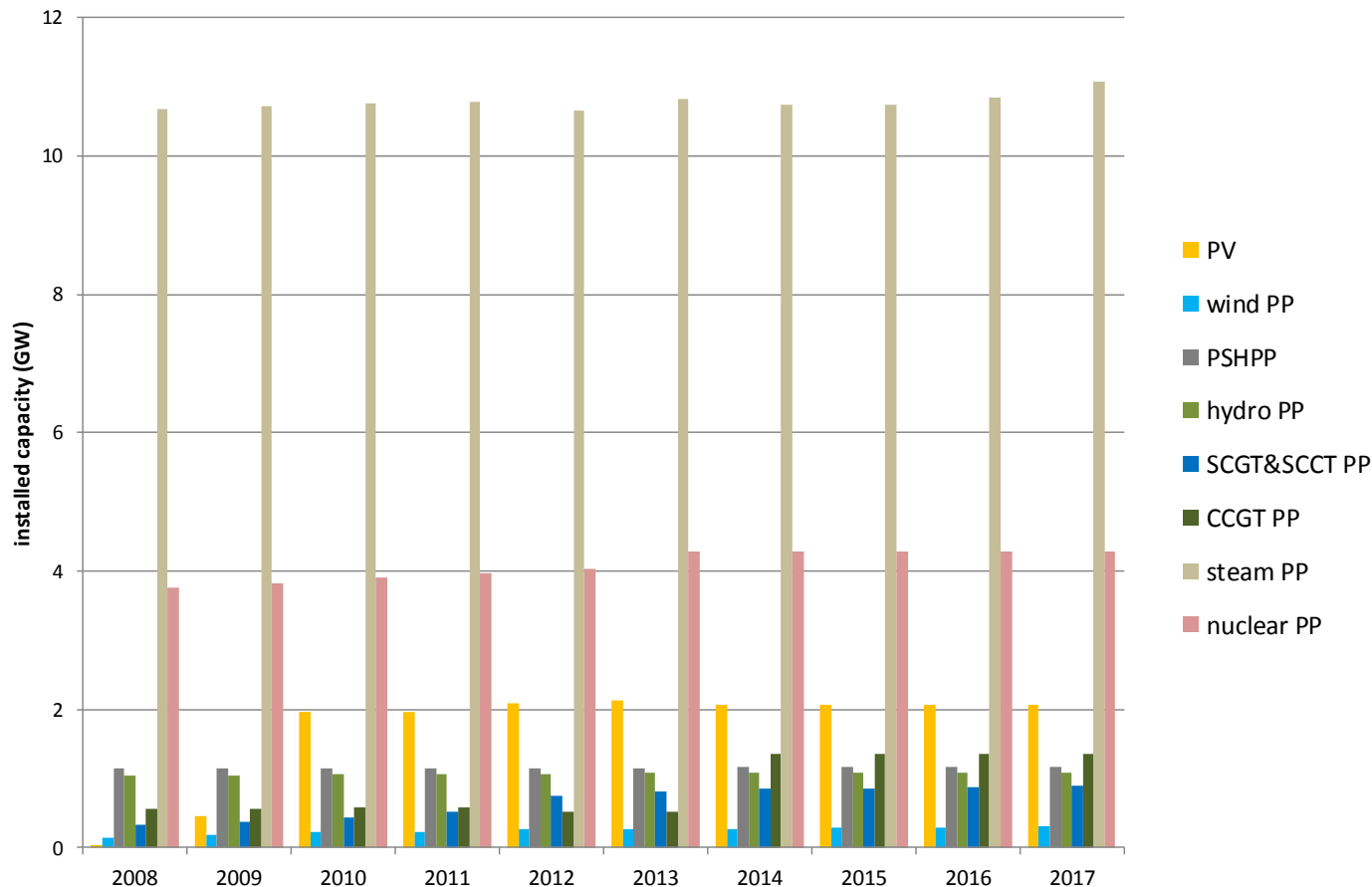
- Biomass: 2.2
- Coal:
 - ❖ hard coal: 4.5
 - ❖ brown coal: 37.0
- Natural gas: 3.4
- Hydro: 1.9
- Nuclear: 28.3
- Solar power: 2.2
- Wind power: 0.6
- PSHPP: 1.2
- Biogas: 2.6
- Others: 3.2



Ratios on gross electricity generation in 2017 (%)

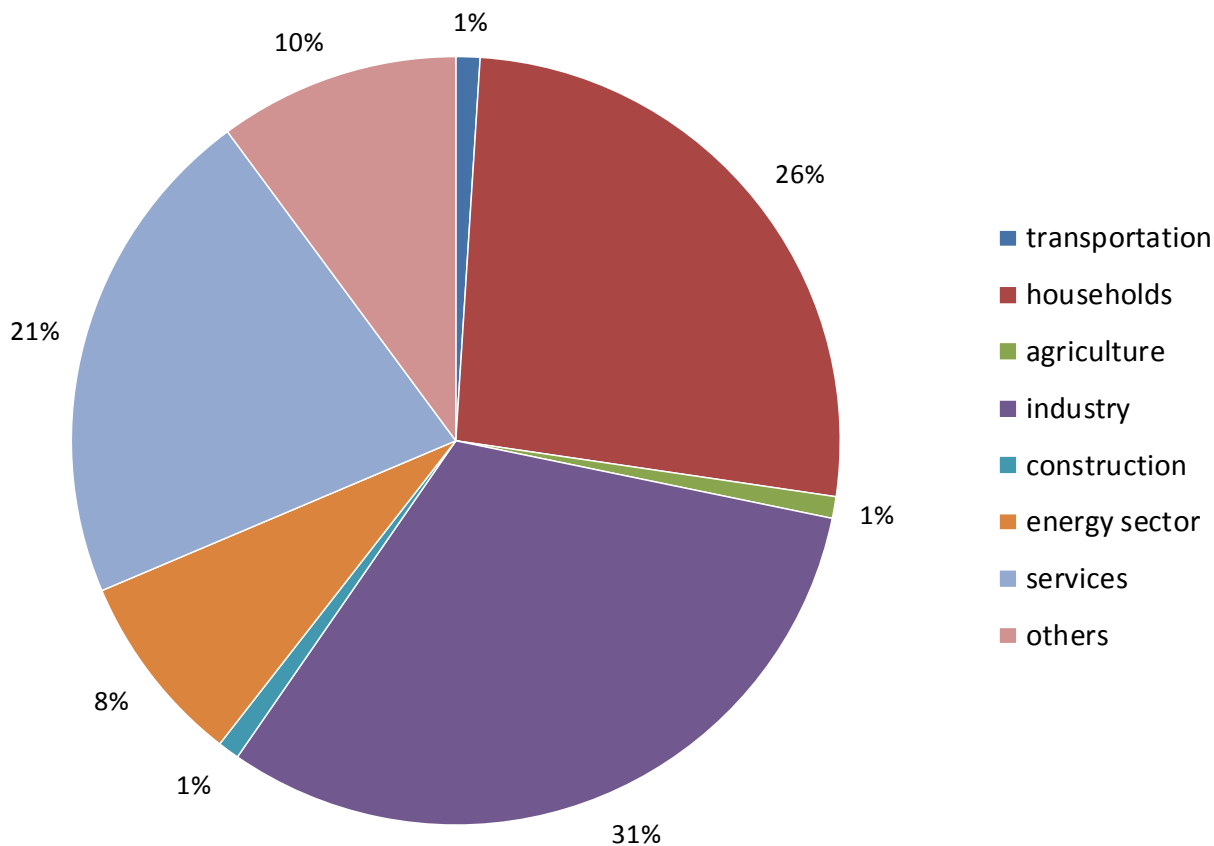
www.eru.cz

Development of generation capacities since 2008

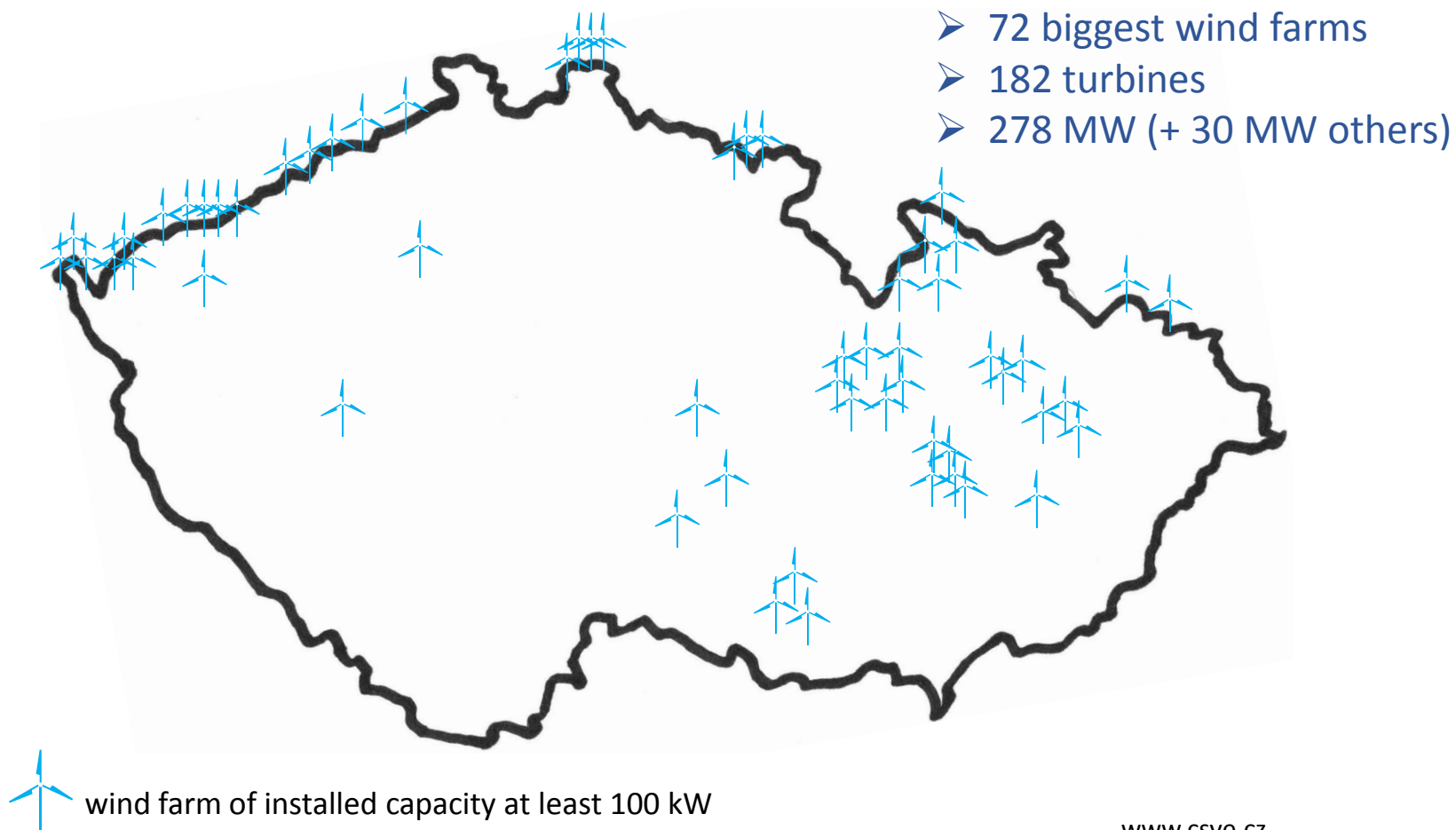


www.eru.cz

Consumption per customer groups in 2017



Location of wind farms



www.csve.cz

www.wiki.rvp.cz

Location of PV power plants



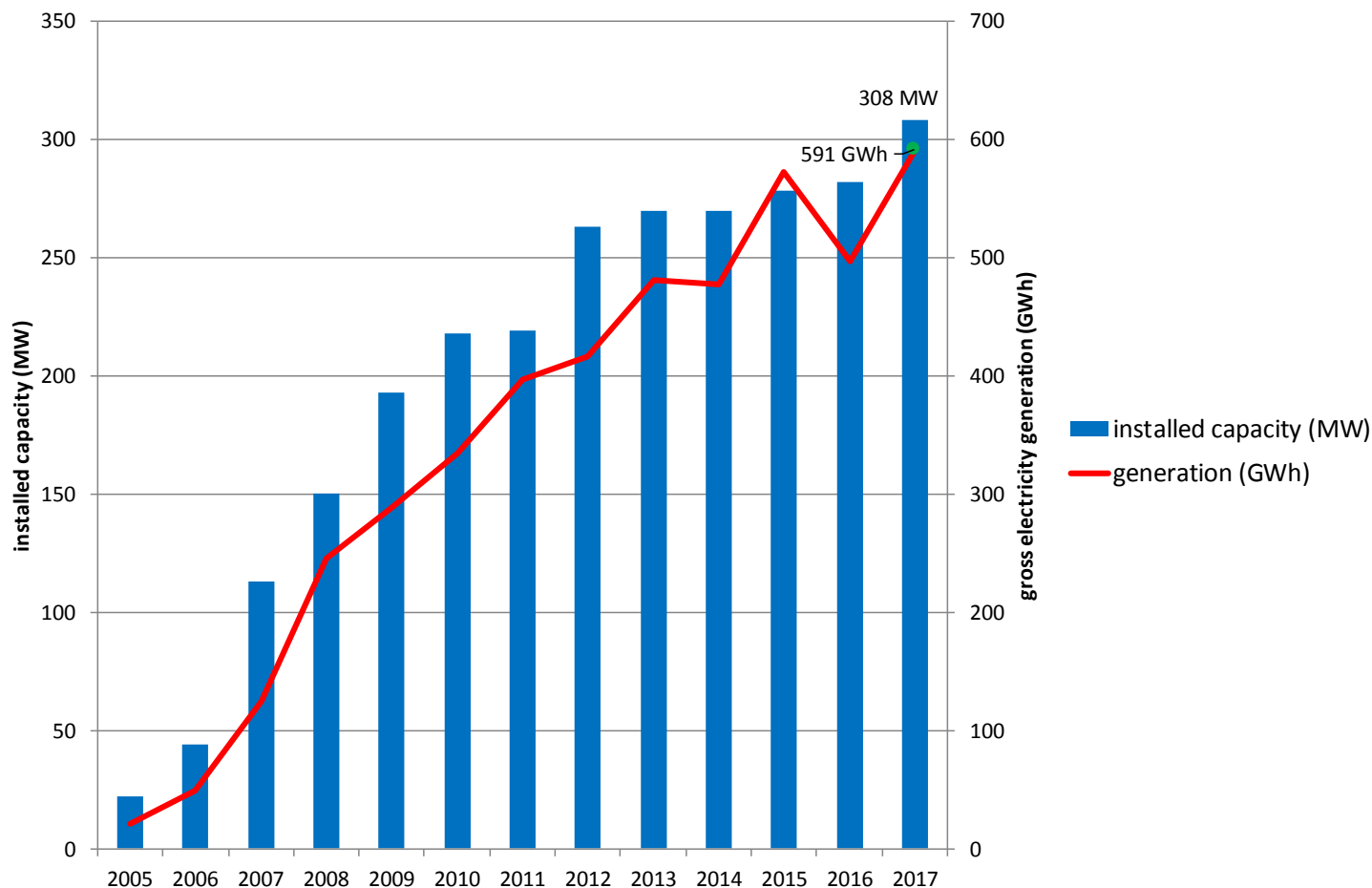
- 28,315 solar PP in total
- 519 of them have their installed capacity more than 1 MWp
- the biggest PP is located in Ralsko (56 MWp)
- more than 10 mil. panels
- average installed capacity reaches 77 kWp/plant



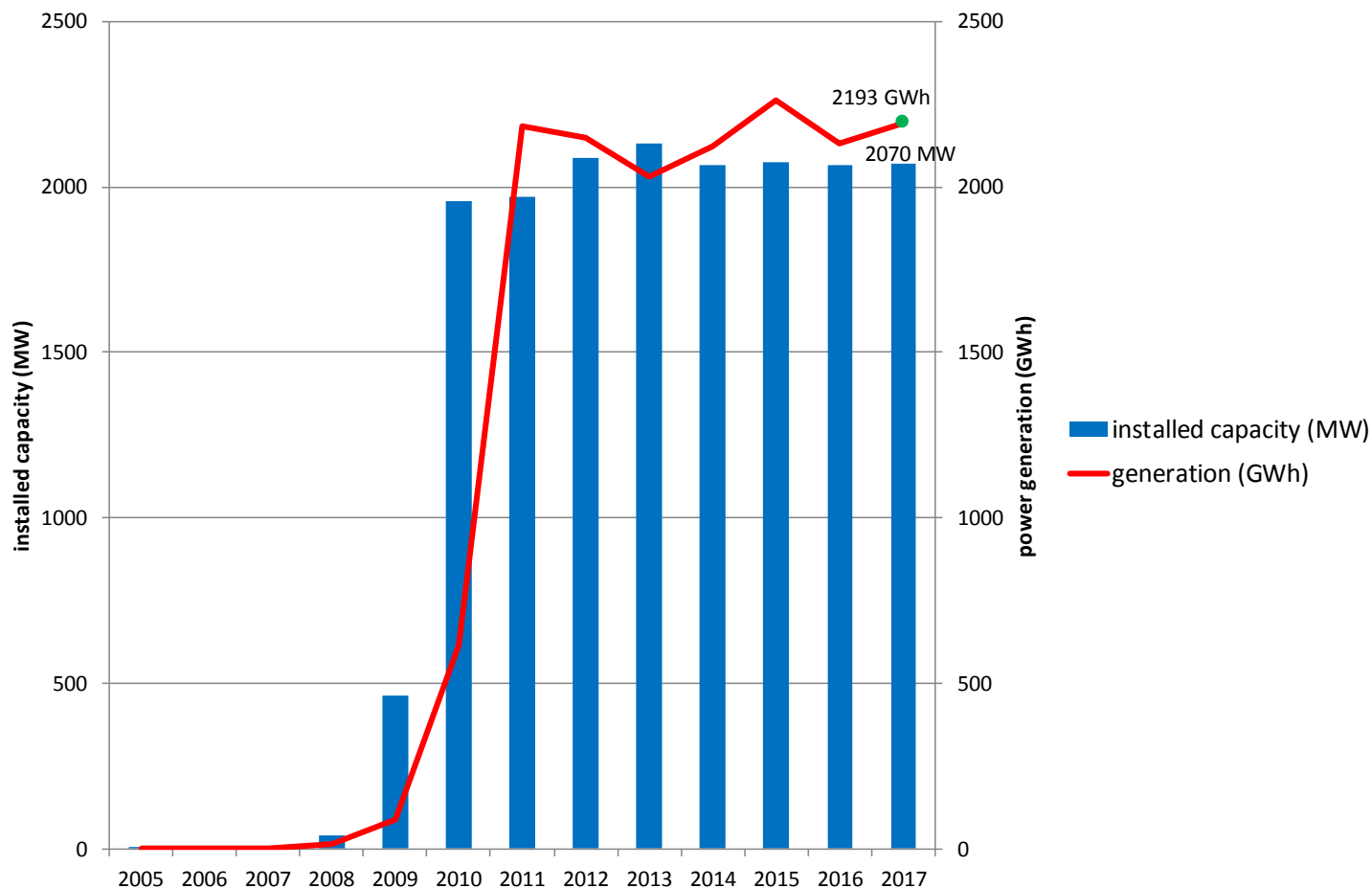
installed capacity of a PV power plant more than 100 kWp

www.elektrarny.pro

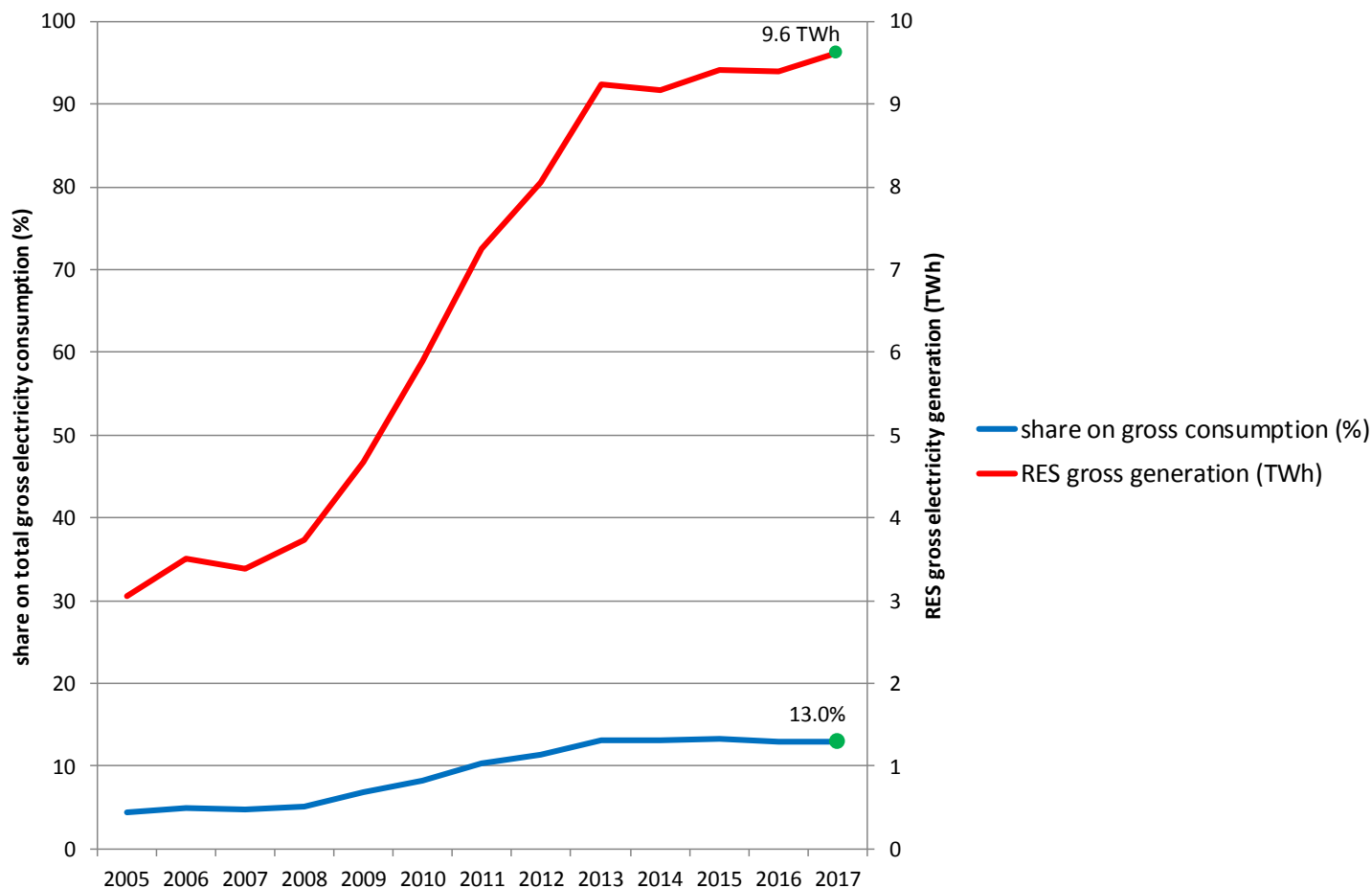
Development of wind power



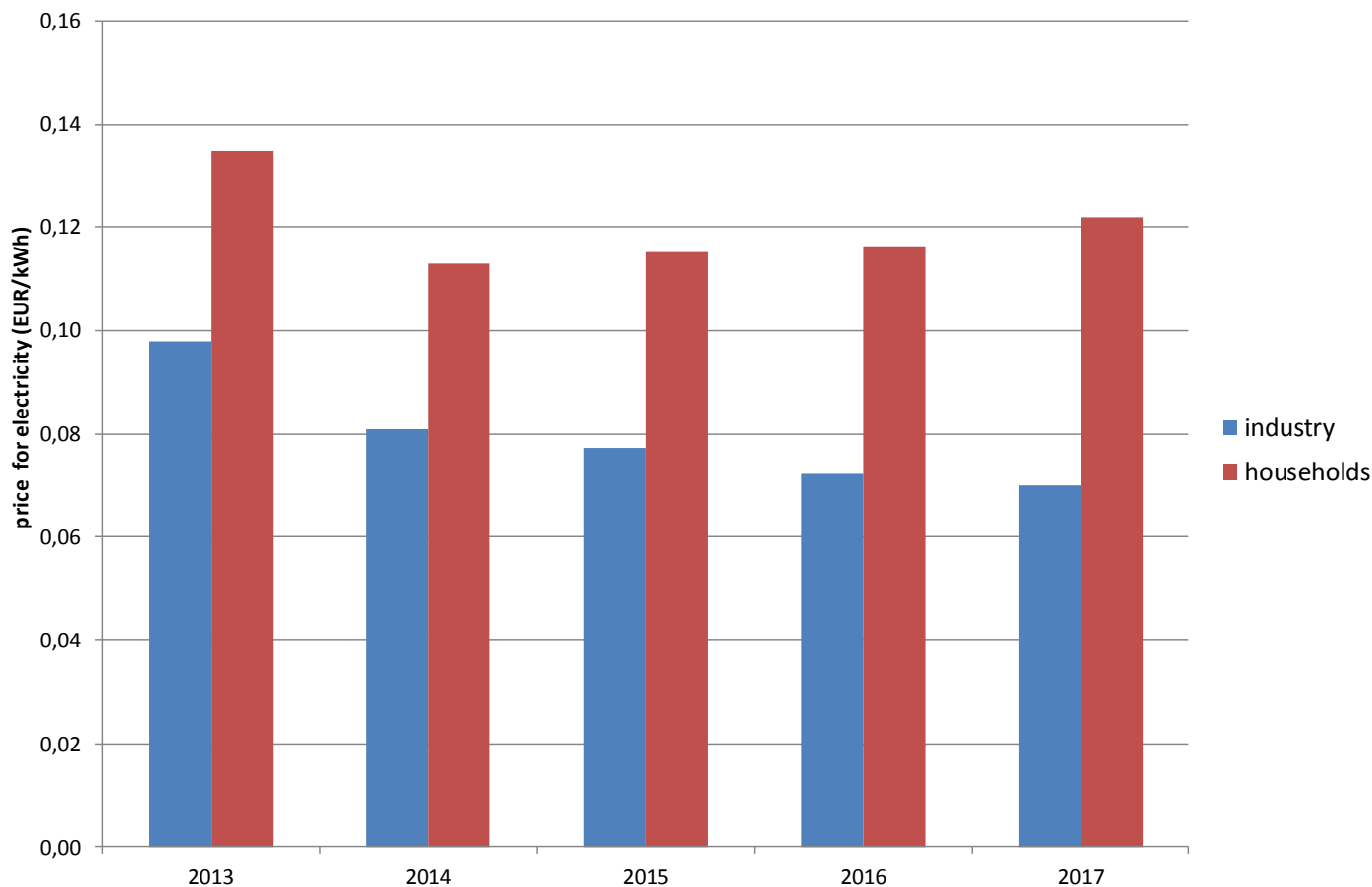
Development of PV power



RES production since 2005



Price development for industry and households

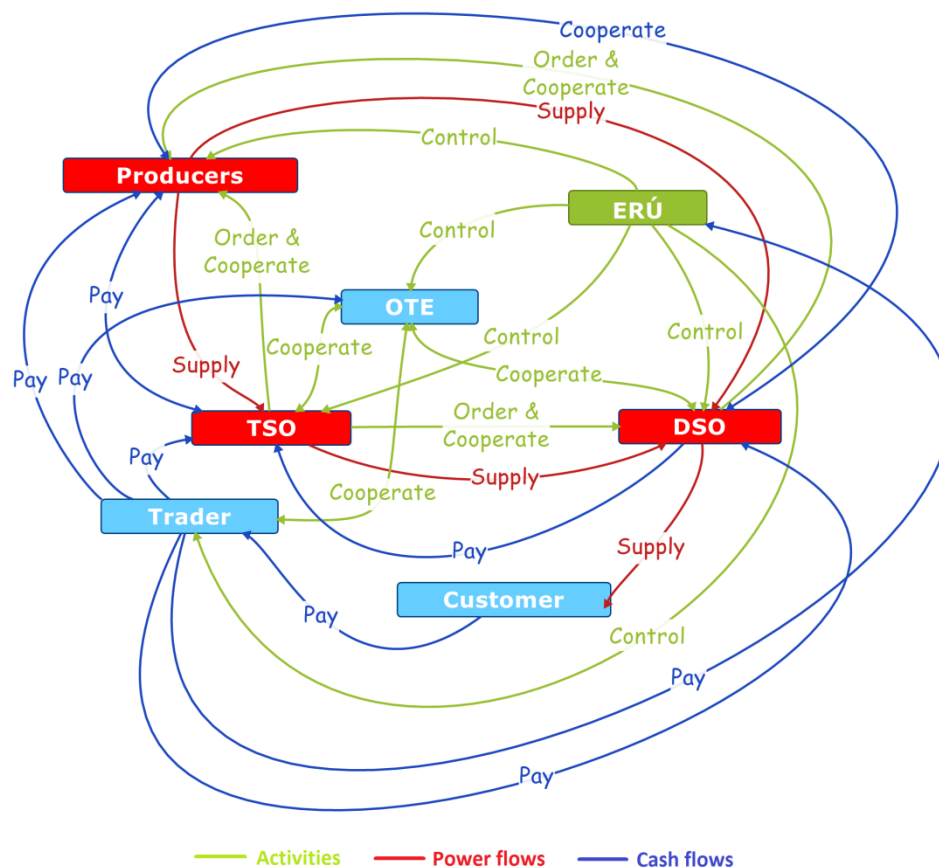


* excluding taxes and levies, price for S2 of the year

ec.europa.eu

Electricity market organisation

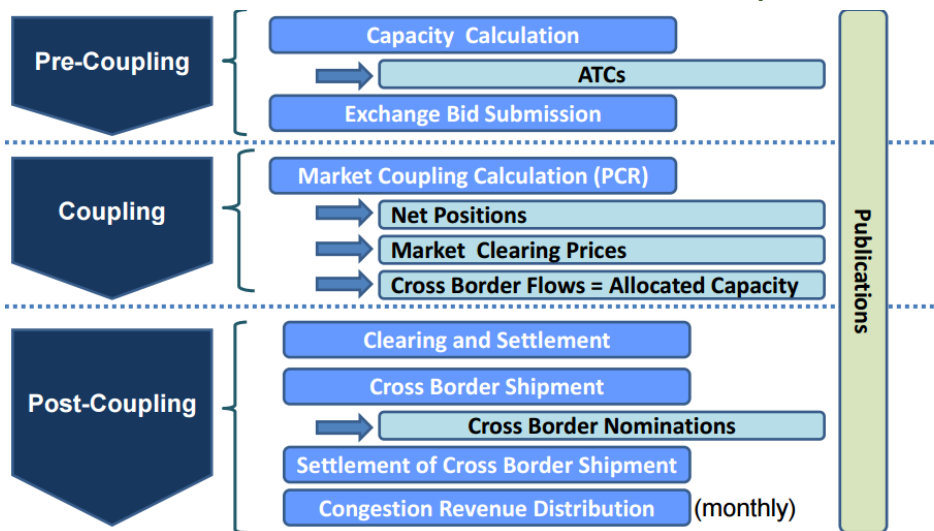
- ❑ President of the Energy Regulatory Office (ERÚ) is appointed by president of the Czech Republic
- ❑ OTE, a. s. (Czech Market Operator) organizes the short-term electricity and short-term gas market. Provides evaluation, billing and settlement of imbalances



EGÚ Brno, a.s.

Specific aspects of the electricity market

- ❑ CZ is a member of 4M Market Coupling project
- ❑ Launching of the XBID project – interconnection of intraday markets – CZ will join probably in 2019
- ❑ A total volume of 22.3 TWh (21.8 TWh as day-ahead) of electricity was traded in 2017 on OTE market platform



www.ote-cr.cz



The End

The Electric Power System

- Slovakia -

Basic facts

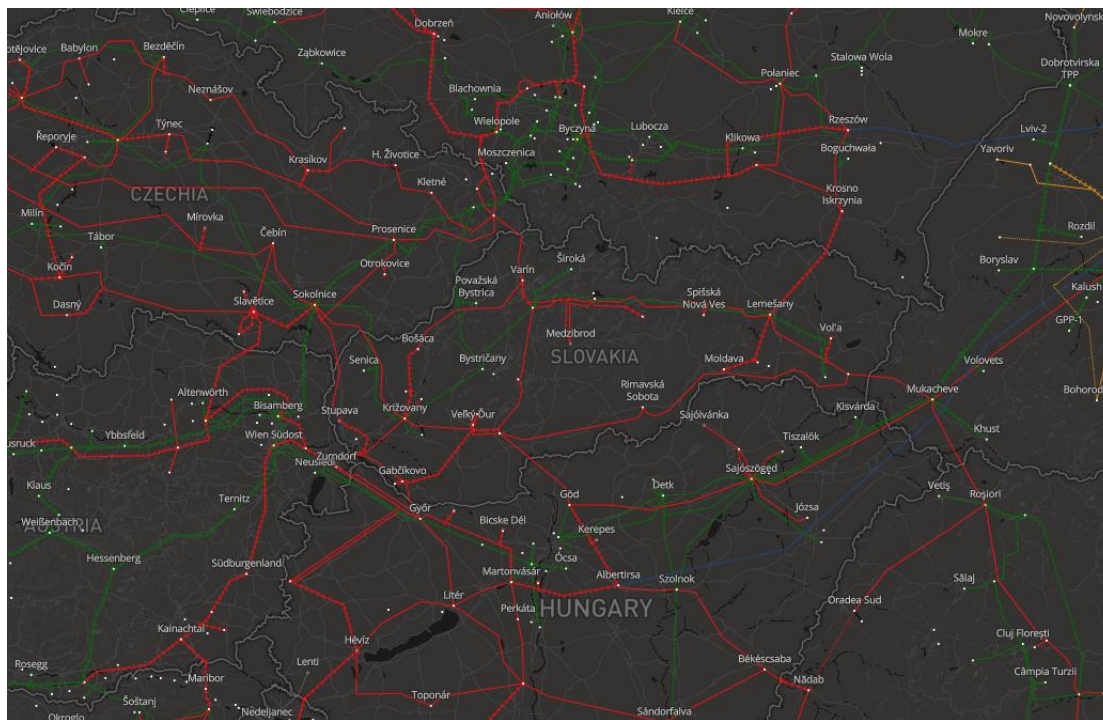
- ❑ Area (km²): 49,036
- ❑ Population: 5,443,120 (2017)
- ❑ Number of offtake points: 2,495,938 (2016)
- ❑ Number of TSOs: 1
- ❑ Number of DSOs: 149 (2018)
 - 3 main regional DSOs :
 - ❖ Západoslovenská Distribučná, a. s.,
 - ❖ Stredoslovenská energetika - Distribúcia, a. s.,
 - ❖ Východoslovenská distribučná, a.s.
 - 146 local DSOs
- ❑ Peak load in 2017 (MW): 4,550

www.statistics.sk
www.sepsas.sk
www.zdis.sk
www.sse-d.sk
www.urso.gov.sk
www.vsds.sk

Global map of the grid and of its interconnections

□ Interconnections with:

- Czech Republic (CZ)
- Poland (PL)
- Hungary (H)
- Ukraine (UA)





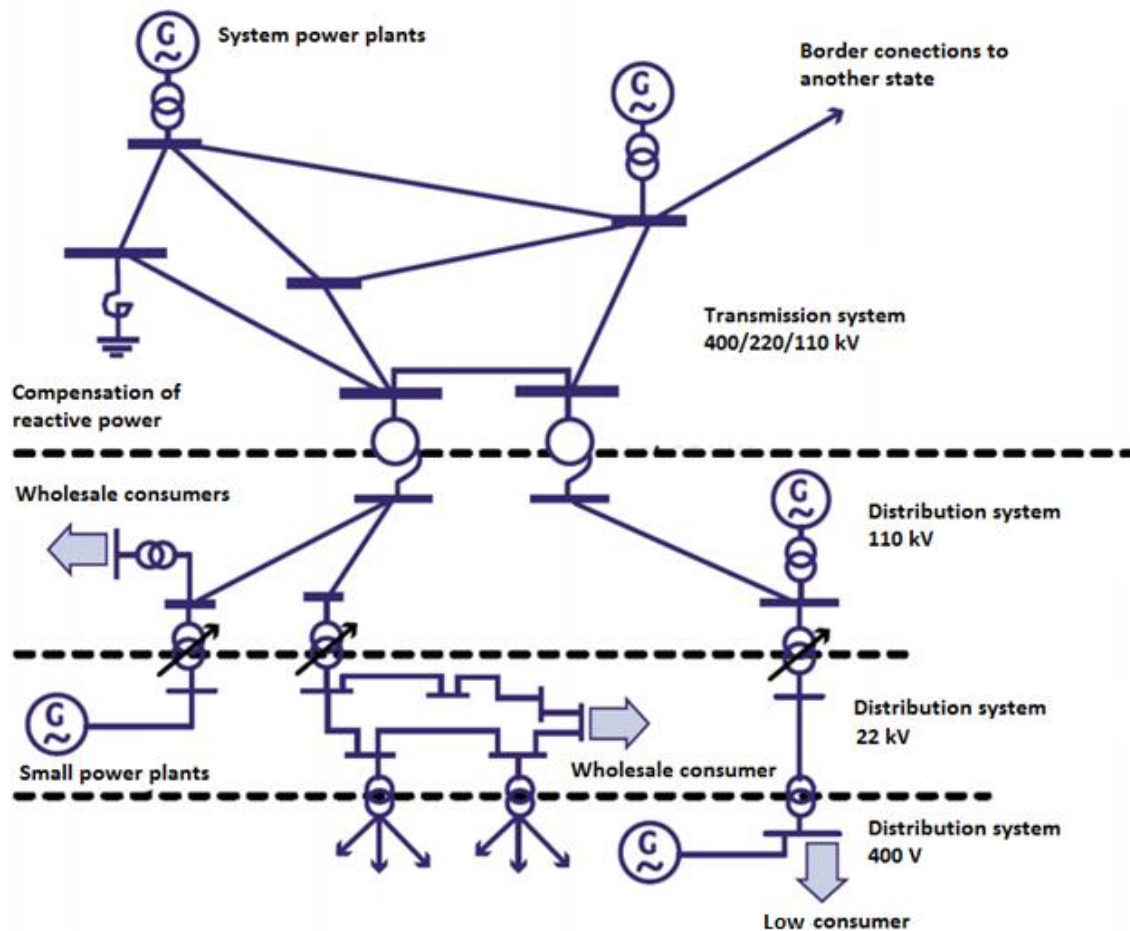
Grid facts and characteristics in 2016

System	Voltage level (kV)	Length of lines (km)
Transmission	400	1,740
	220	685
	110	40
Regional distribution systems	110	6,705*
	22	32,718*
	0.4	53,909*

www.sepsas.sk
www.zsdis.sk
www.sse-d.sk
www.vsds.sk

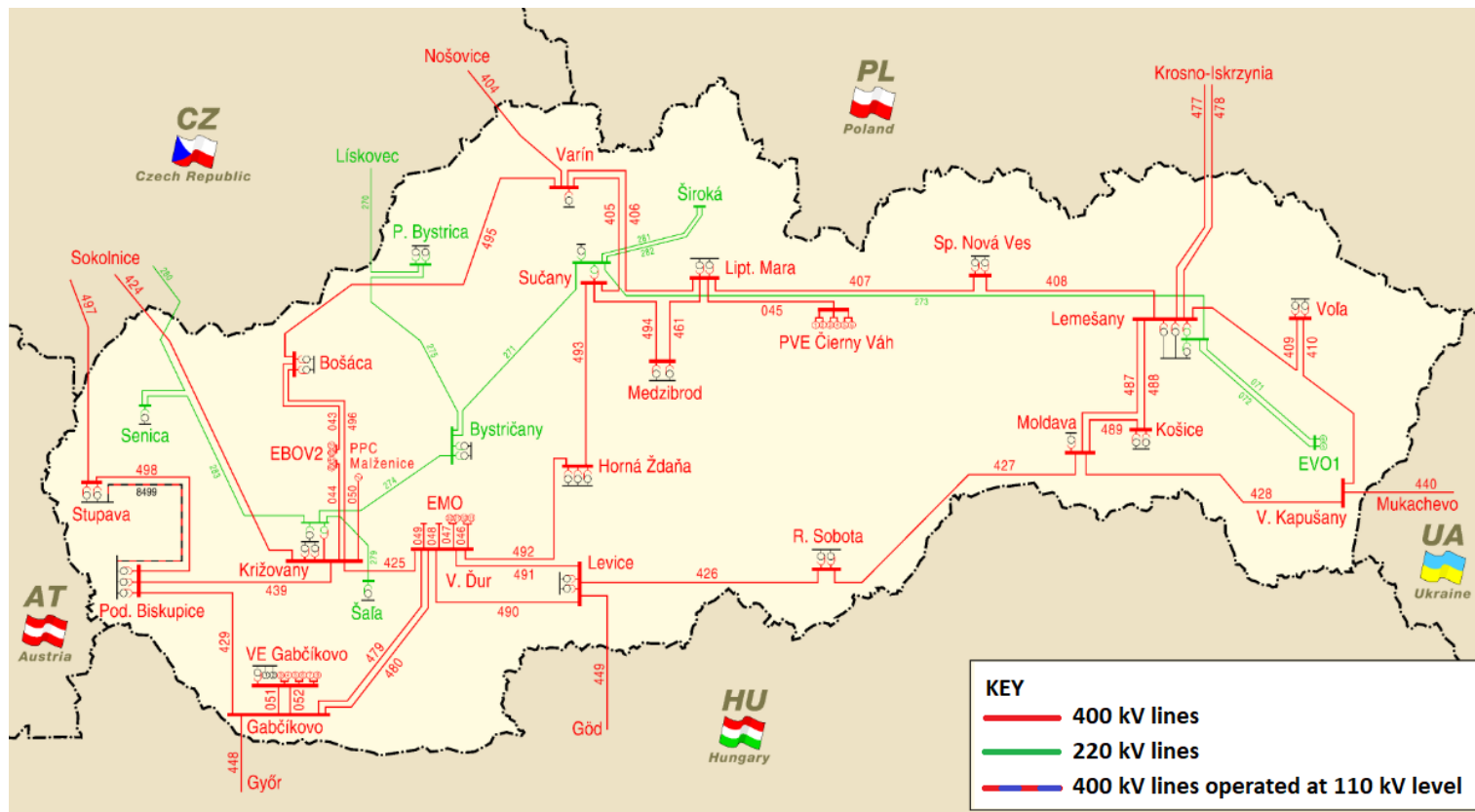
* VSD have not actualized data since 2014

Structure of power system



Toman, P. Provoz elektrizačních soustav. ČVUT, Praha 2011.

Map of the transmission system



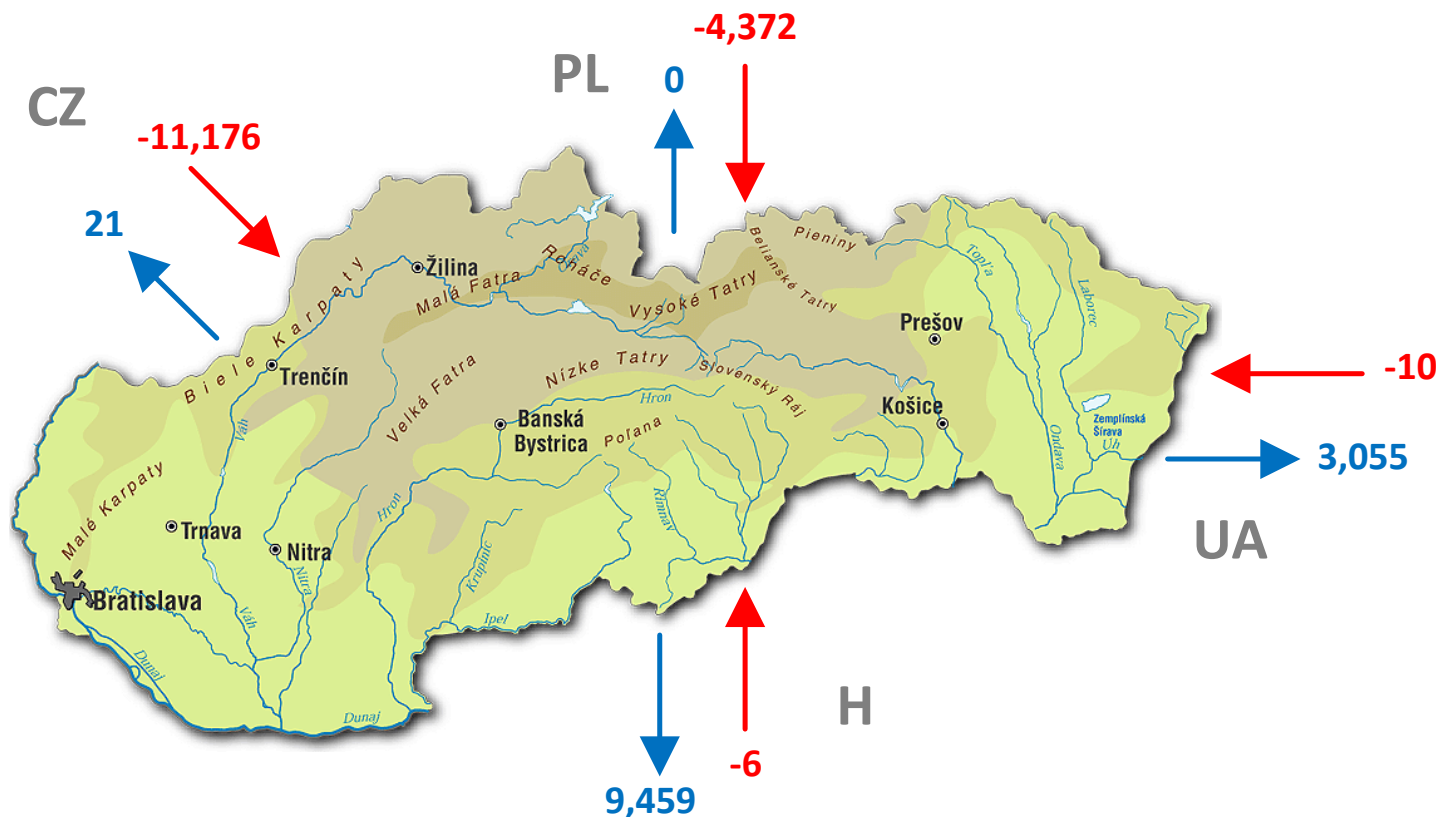
Power balance in 2017

- ❑ Gross power generation (TWh): 28.0
- ❑ Gross power consumption (TWh): 31.1
- ❑ Imports (TWh): 15.6
- ❑ Exports (TWh): -12.5
- ❑ Balance (TWh): 3.0
- ❑ Renewables share on production (%): 8.7*
- ❑ Hydro PP & PSHPP share on production (%): 16.7

* excluding hydro PP & pumping hydro PP (PSHPP)

www.sepsas.sk

Energy exchanges in 2017



www.geography.upol.cz
www.sepsas.sk



Information about TSO

- ❑ Name: Slovenská elektrizačná prenosová sústava
- ❑ Network length (km): 2,465
- ❑ Lines length (km): 3,044
- ❑ Substations (-): 25
- ❑ Transformation capacity (GVA): 11.6
- ❑ Actual topic: announced new cross-border lines
 - 2x 400 kV: Gabčíkovo (SK) – Gönyü (H)– Veľký Ďur (SK)
 - 2x 400 kV: Rimavská Sobota (SK) – Sajóivánka (H)
- ❑ Website: www.sepsas.sk



Cooperation and responsibilities of TSO and DSOs

❑ DSO has to:

- get necessary information from other electricity market subjects
- do technical and operational arrangements which prevent influencing of voltage quality
- provide ancillary services and information to TSO
- follow TSO's orders
- operate DS securely without any discriminatory operational steps
- etc.

❑ TSO has to:

- operate TS securely without any discrimination
- inform DSOs about operational preparations
- present TSO's development plans and TS efficiency
- get needed information from other electricity market subjects
- inform DSOs and foreign TSOs about system further manipulations in TS
- present and provide other information to the Regulatory Office for Network Industries (ÚRSO)
- etc.

Slovakia. The Energy Act, 251/2012 Z. z.

Installed capacity with reference to generation technology

☐ Installed capacities in 2017 (MW):

➤ Fossil power plants (PP): 2,348

- ❖ natural gas: 1,106
- ❖ brown coal PP: 333
- ❖ hard coal: 221
- ❖ oil: 257
- ❖ fuel mixtures: 431

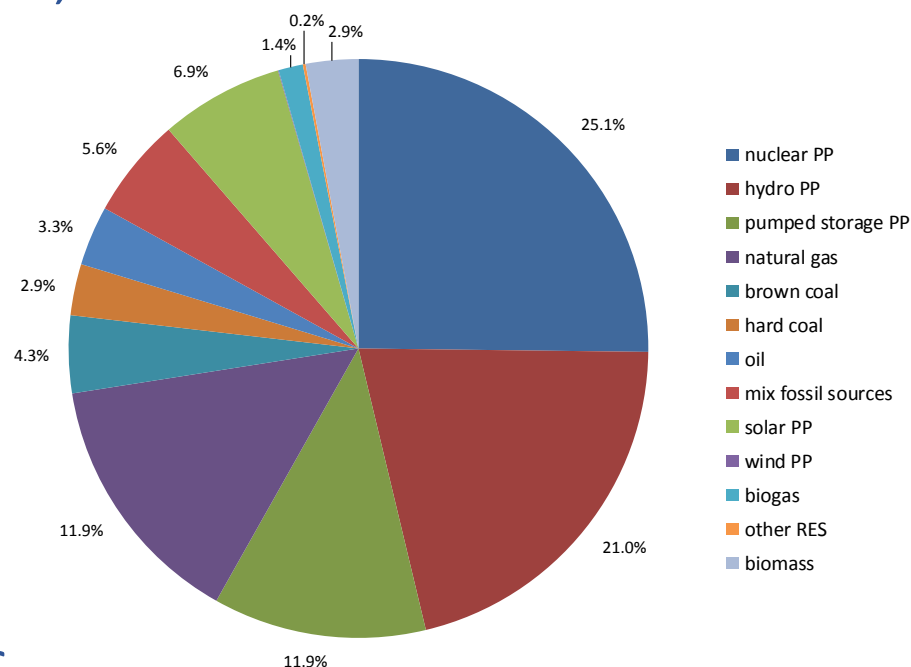
➤ Nuclear PP: 1,940

➤ Solar PP: 530

➤ Wind PP: 3

➤ Hydro PP: 1,623

➤ Pumped storage PP: 916



Ratios on total installed capacity in 2017 (%)

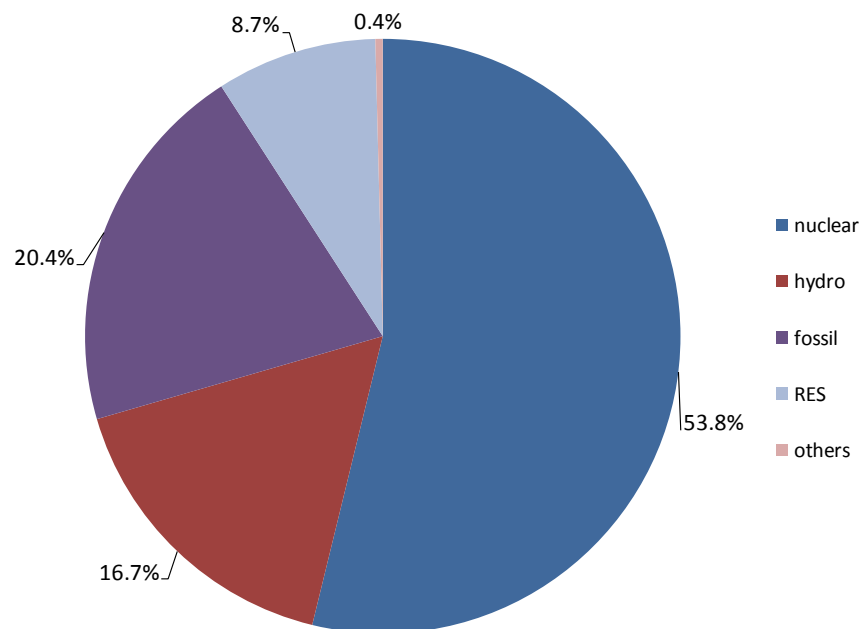
www.sepsas.sk



Electricity gross production according to primary resources

□ Electricity produced in 2017 (GWh) :

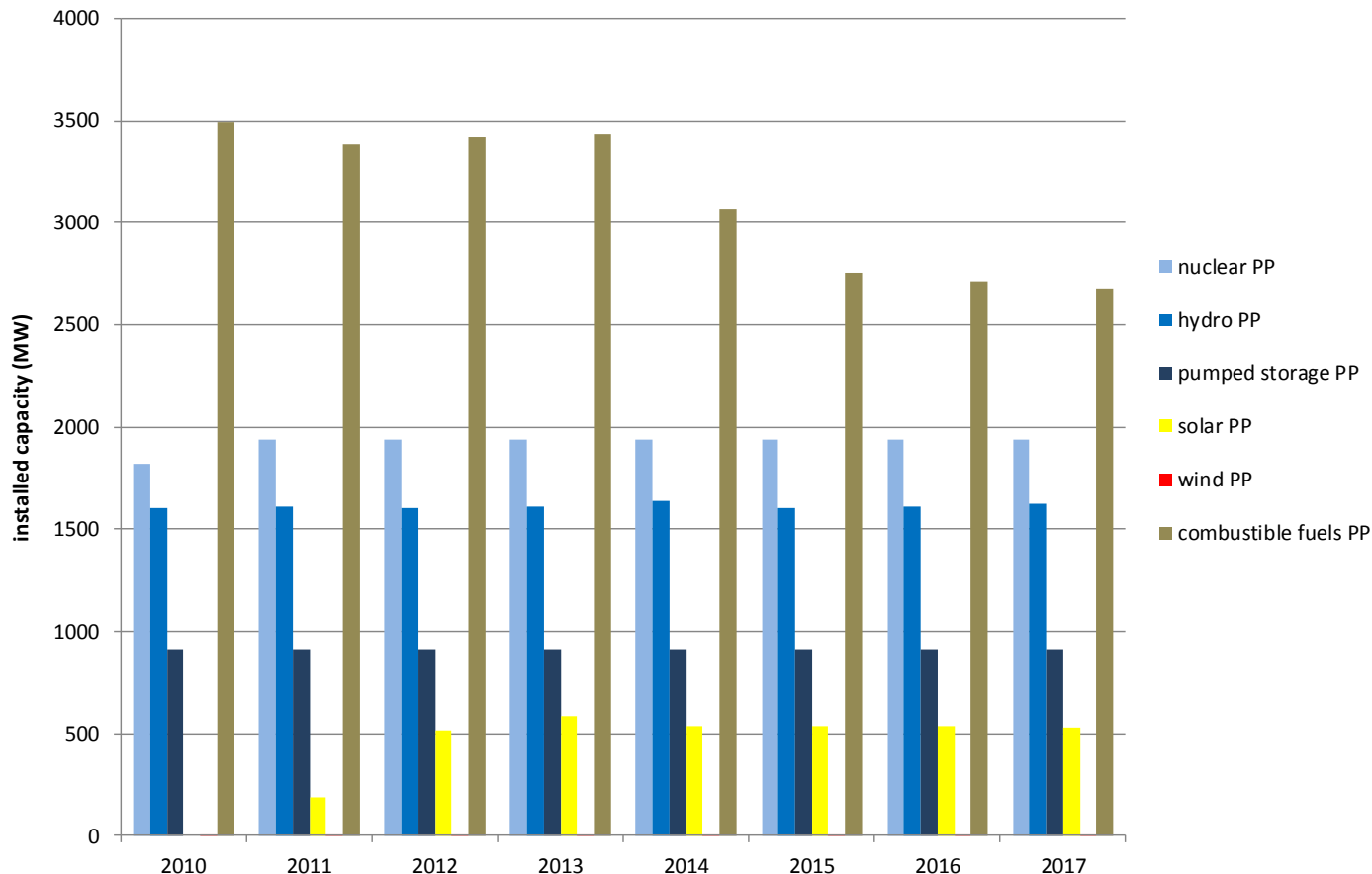
- Nuclear: 15,081
- Fossil: 5,711
- Hydro: 4,677
- Renewables: 2,445
- Others: 112



Ratios on gross electricity production in 2017 (%)

www.sepsas.sk

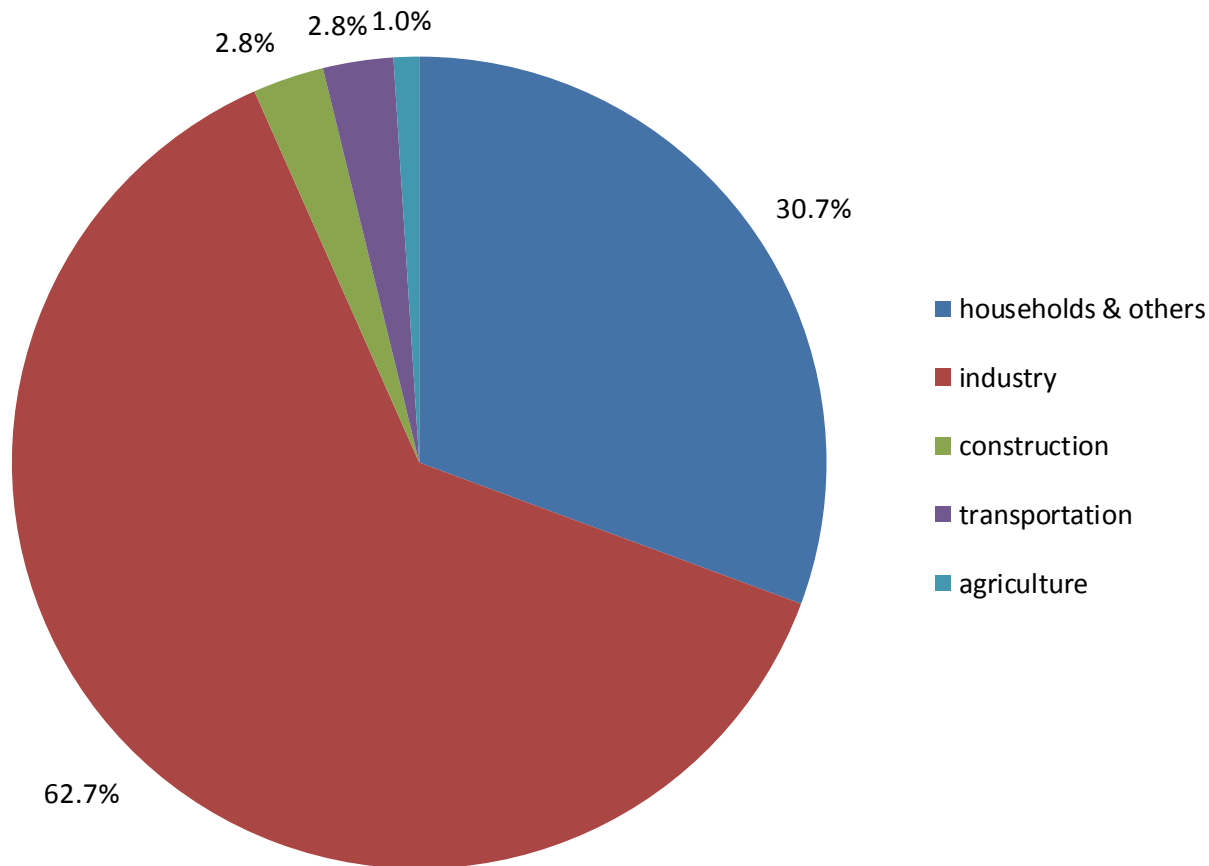
Development of generation capacities since 2010



www.statistics.sk



Net consumption per customer groups in 2016



www.statistics.sk

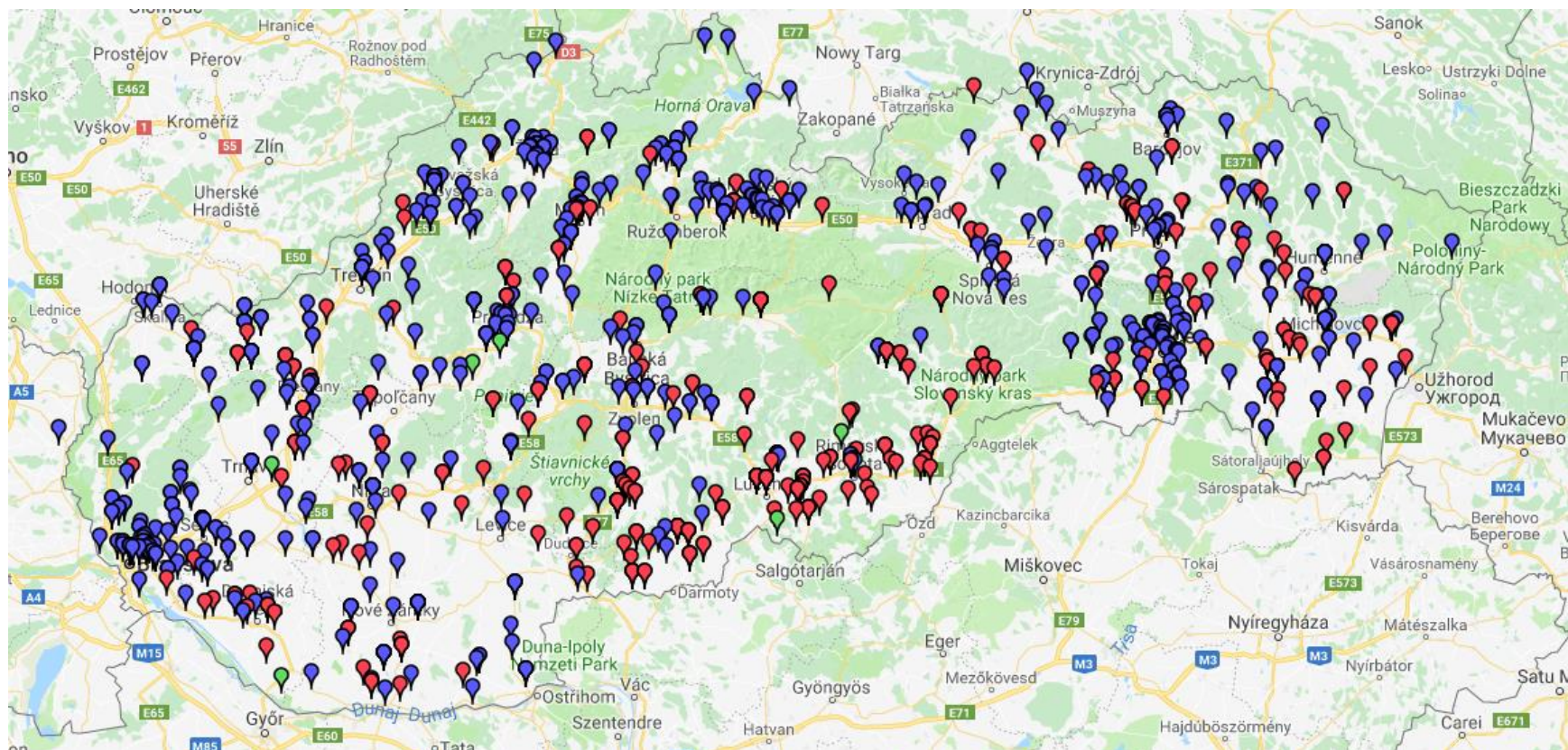
Location of wind power plants



 installed capacity of a park more than 500 kW

www.geography.upol.cz
www.atlasoze.sk

Location of PV power plants



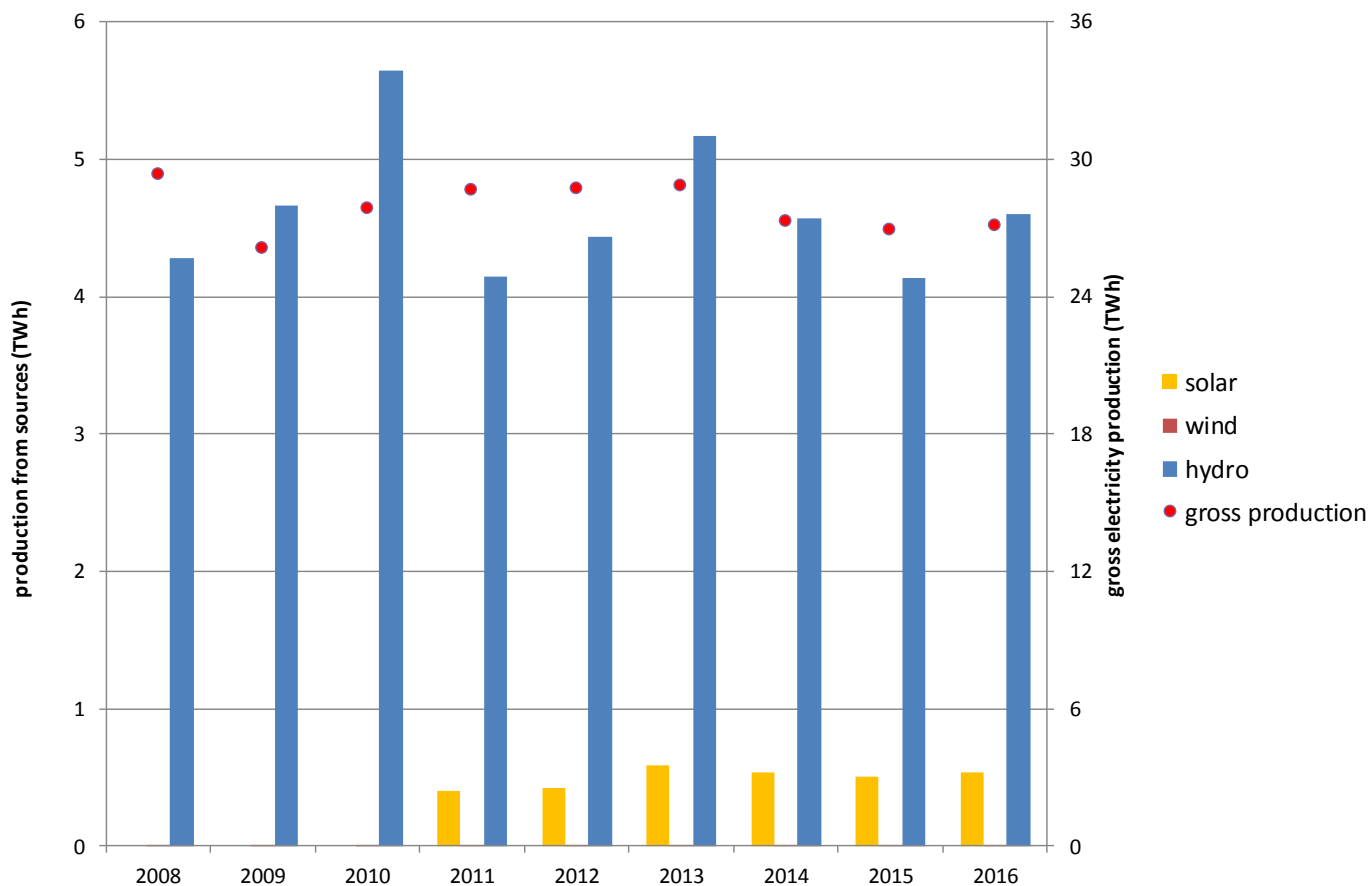
 installed capacity < 0.1 MWp

 installed capacity 0.1 – 1.0 MWp

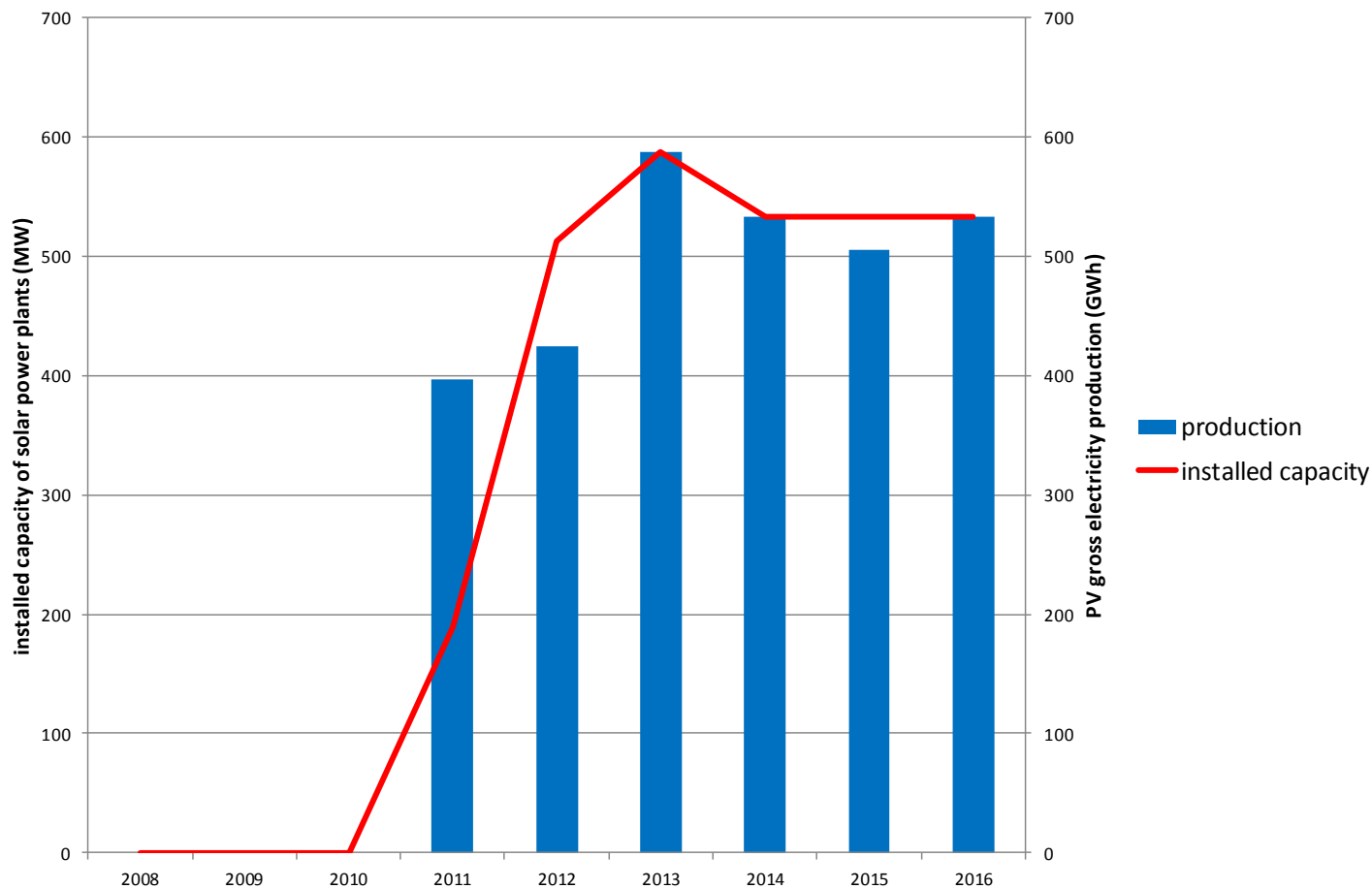
 installed capacity > 1.0 MWp

www.solarweb.sk

Development of solar, water and wind power generation

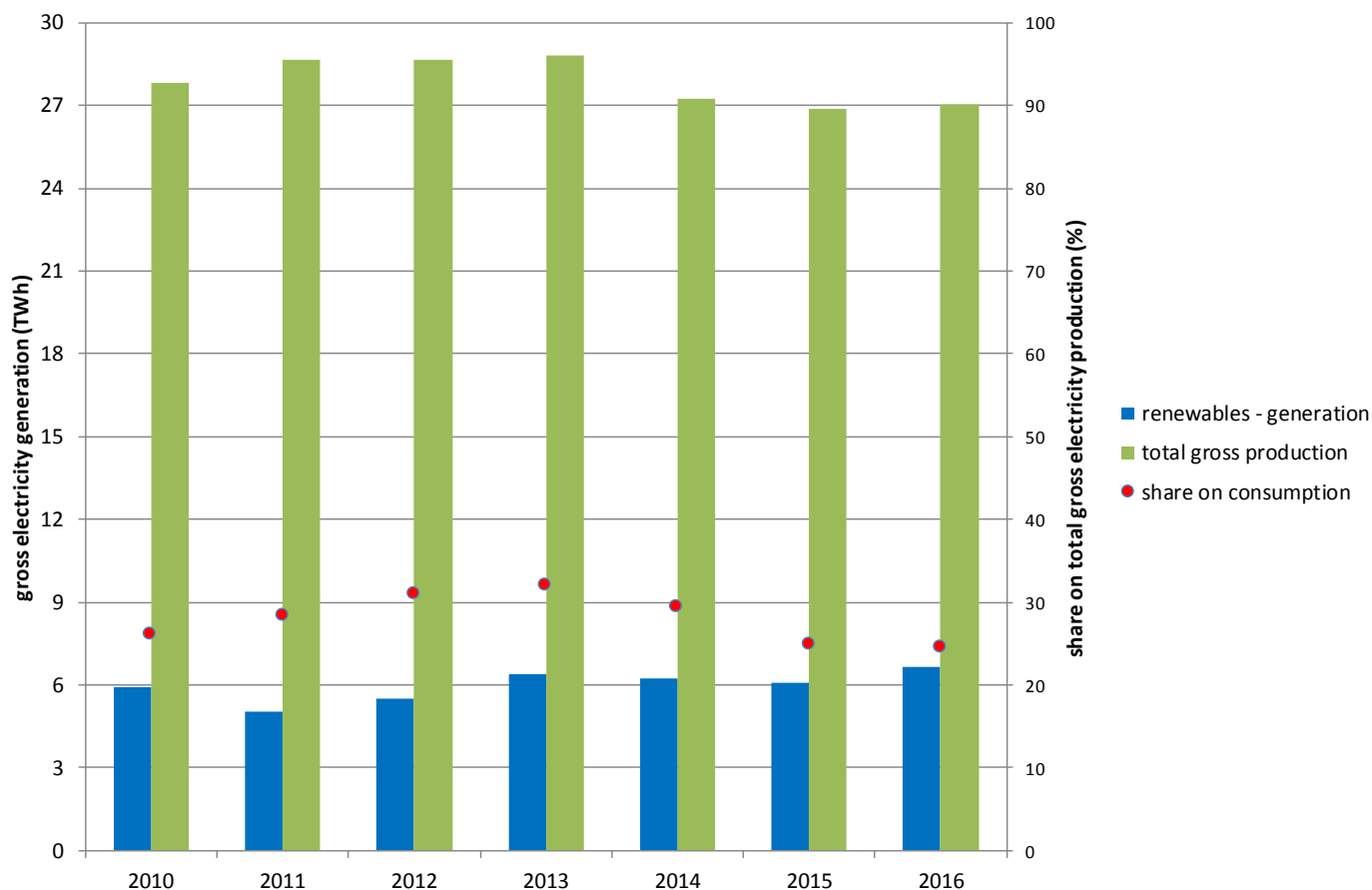


Development of PV power



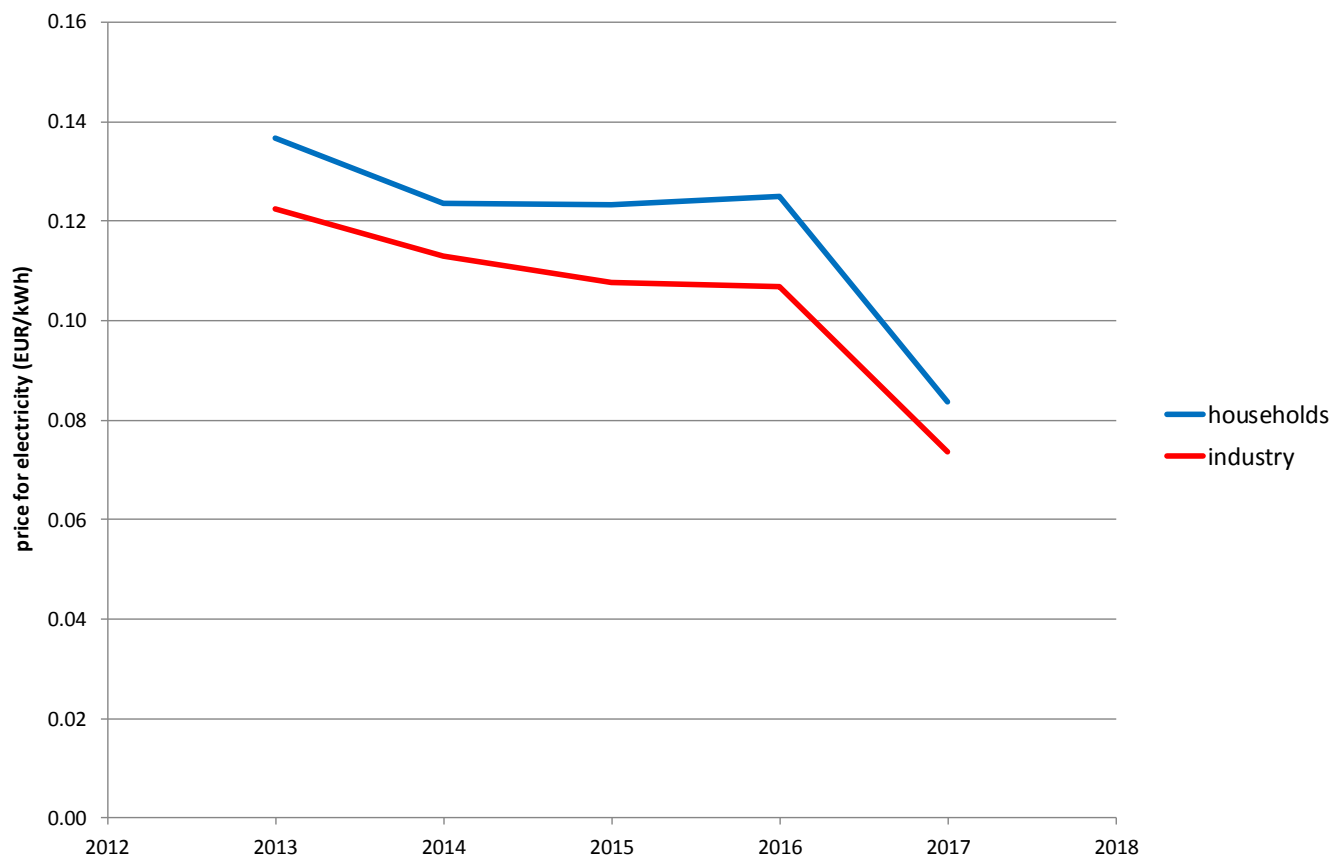


RES production since 2010 excluding PSHPP



www.statistics.sk

Price development for industry and households



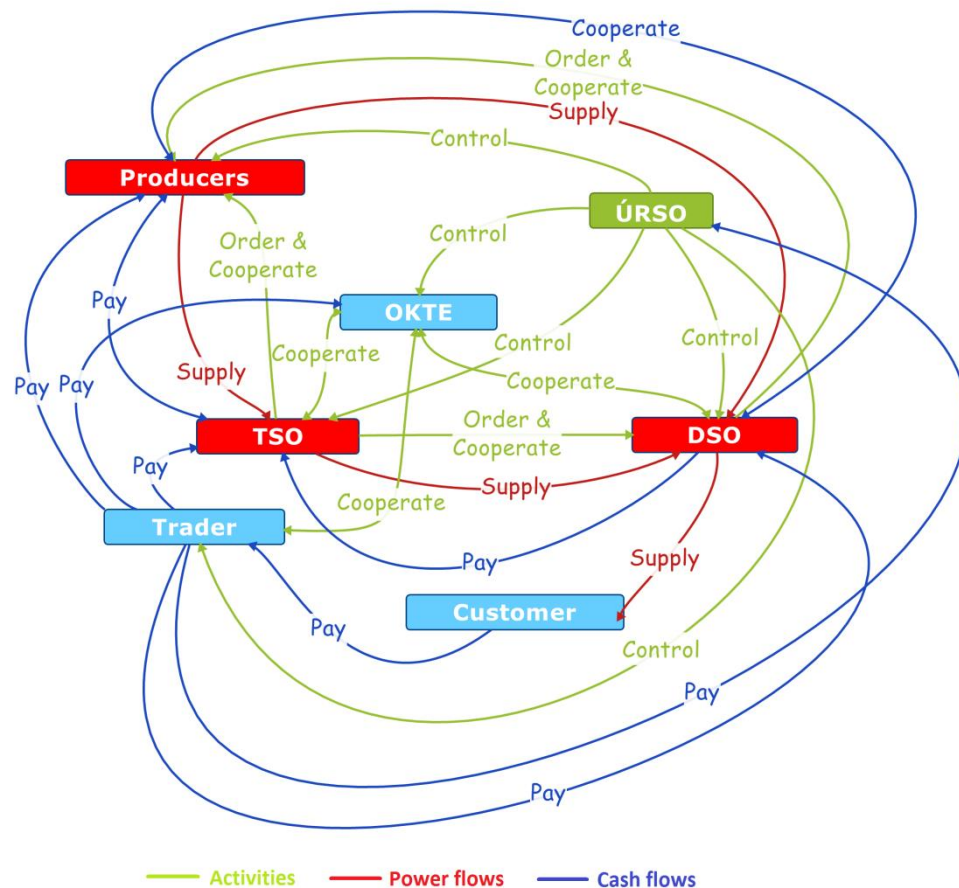
* excluding taxes and levies, price for S2 of the year

www.ec.europa.eu/eurostat



Electricity market organisation

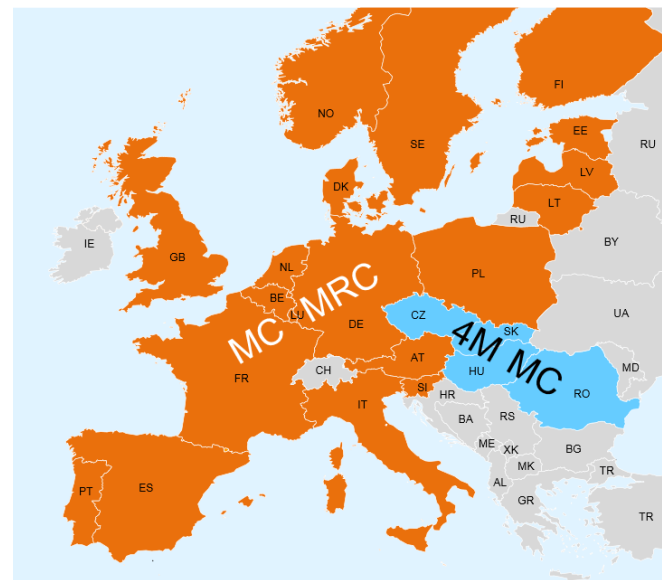
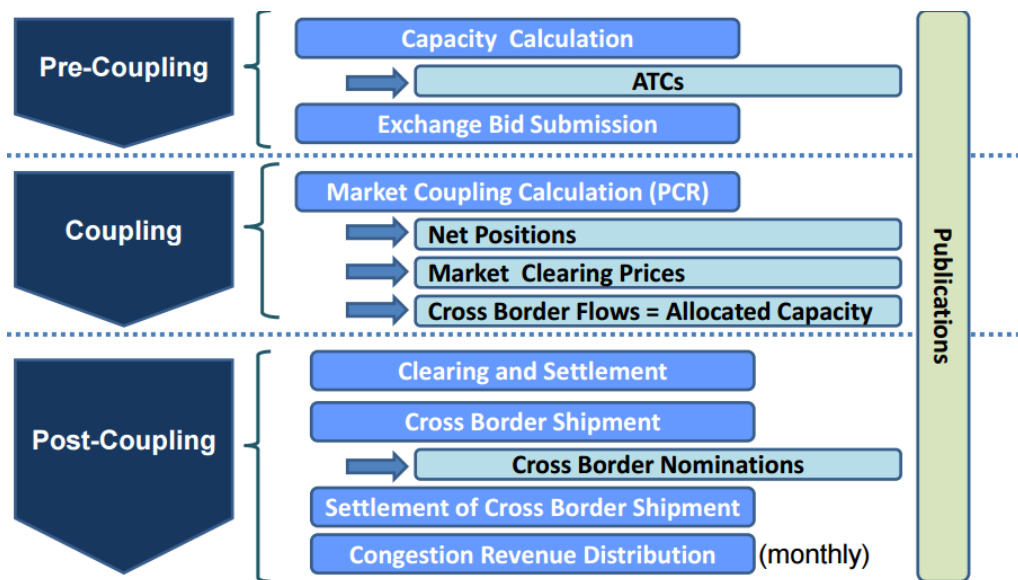
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- ❑ OKTE, a. s. (Slovak Market Operator) organizes the short-term electricity and short-term gas market. Provides evaluation, billing and settlement of imbalances



EGÚ Brno, a.s.

Specific aspects of the electricity market

- ❑ Slovakia is a member of 4M Market Coupling project
- ❑ In 2016 there was 46 registered cross-borders traders on OKTE short term market platform
- ❑ Total traded volume was 9.1 TWh – 4.9 GWh (purchase), 4.3 TWh (sale)



www.ote-cr.cz



The End