



The Electric Power system

Croatia



cigre

For power system expertise

Power system of Croatia

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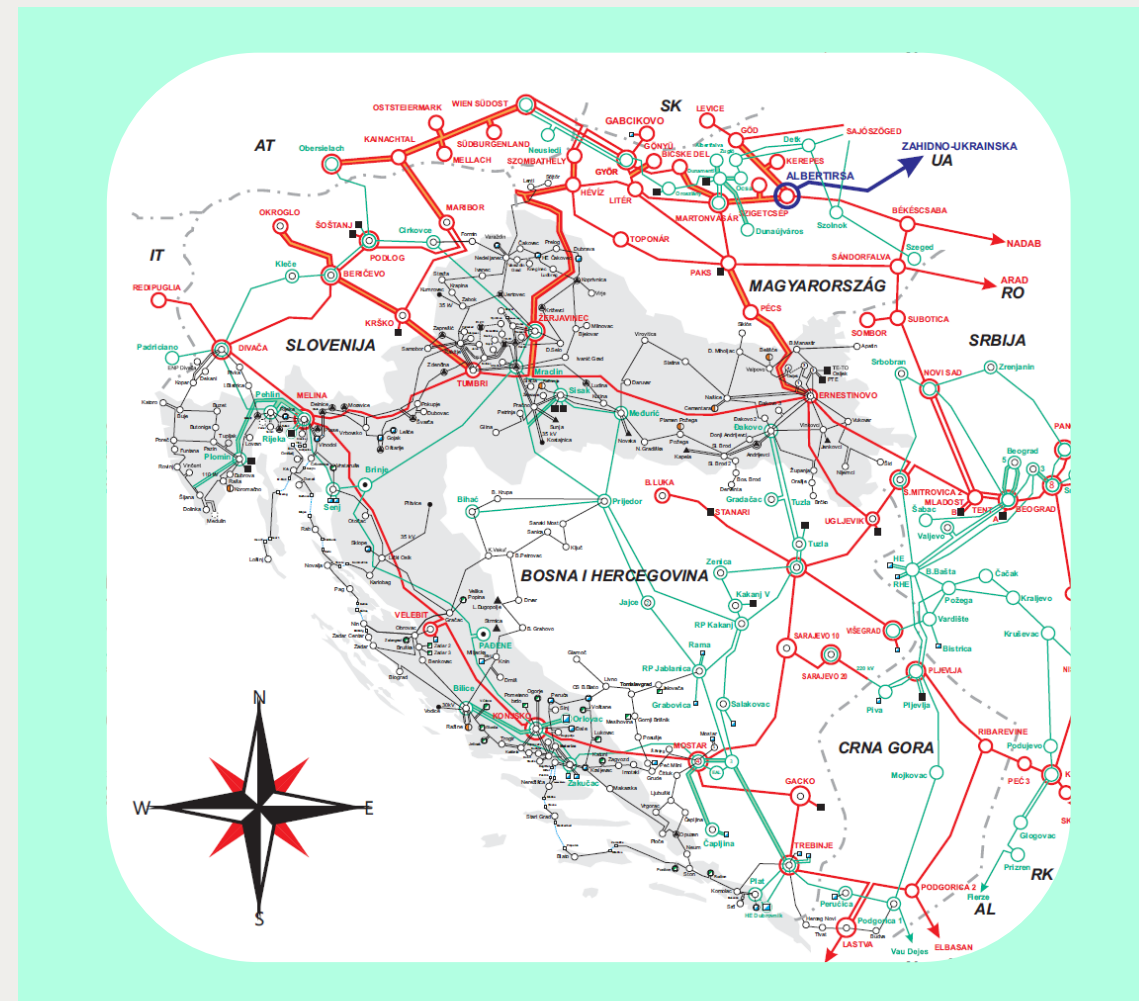


Basic facts

- Area: 56 594 km²
- Population: around 4.1 million
- Number of electricity consumers: around 2.4 million
- Number of TSOs: 1
- Number of DSOs: 1
- Peak load: 3193 MW (February 2012)
- Average interruption of electricity (2019): 80 min/interruption

Global map of the grid and of its interconnections

- Interconnectors with:
 - *Bosnia and Herzegovina;*
 - *Hungary;*
 - *Serbia;*
 - *Slovenia.*



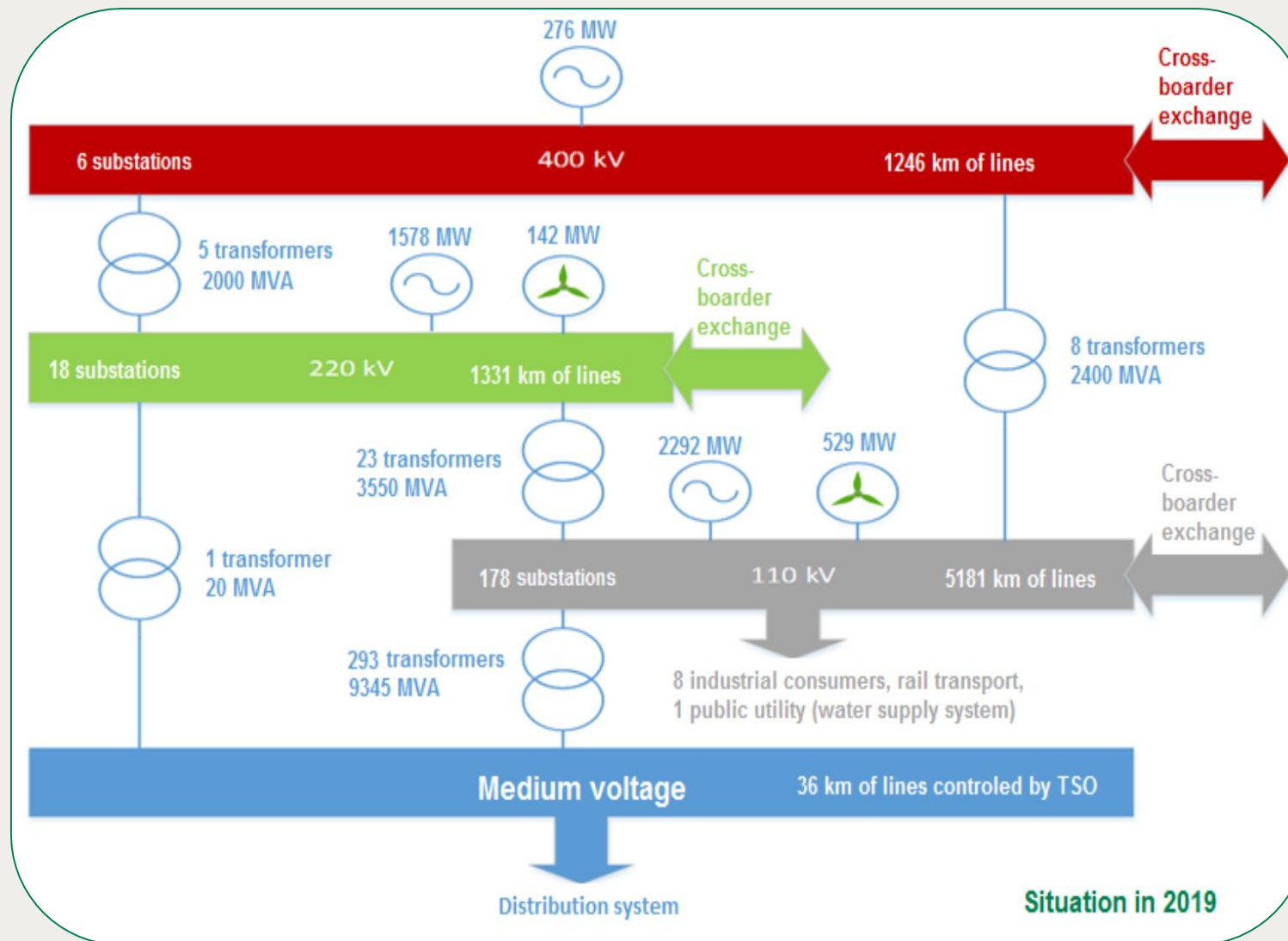
Grid facts and characteristics

- Transmission network (part of network operated by TSO)

Substations	Voltage ratio	Number of substations	Installed capacity of power transformers (MVA)
	400/x kV	6	4400
	220/x kV	15	3570
	110/x kV	162	5145
	All ratios	183	13115

Lines	Voltage level	Length (km)
	400 kV	1246
	220 kV	1331
	110 kV	5181
	Under 110 kV	36
	All levels	7794

Structure of electrical power system





- ## Power system of Croatia

Information on TSO(s)

- Name: Hrvatski operator prijenosnog sustava d.o.o.
- Network length (km): 7794
- Served area (km²): 56 594
- Annual transmitted energy (TWh): 23.9 TWh in 2018, 22.2 TWh in 2019
- website: <http://www.hops.hr>



Title: Croatian Transmission System Operator Ltd.
Headquarters: 10 000 Zagreb, Kupska 4
Date of Incorporation: 2nd July 2013
Registration: Electricity Transmission Activity
Number of employees: 1.127

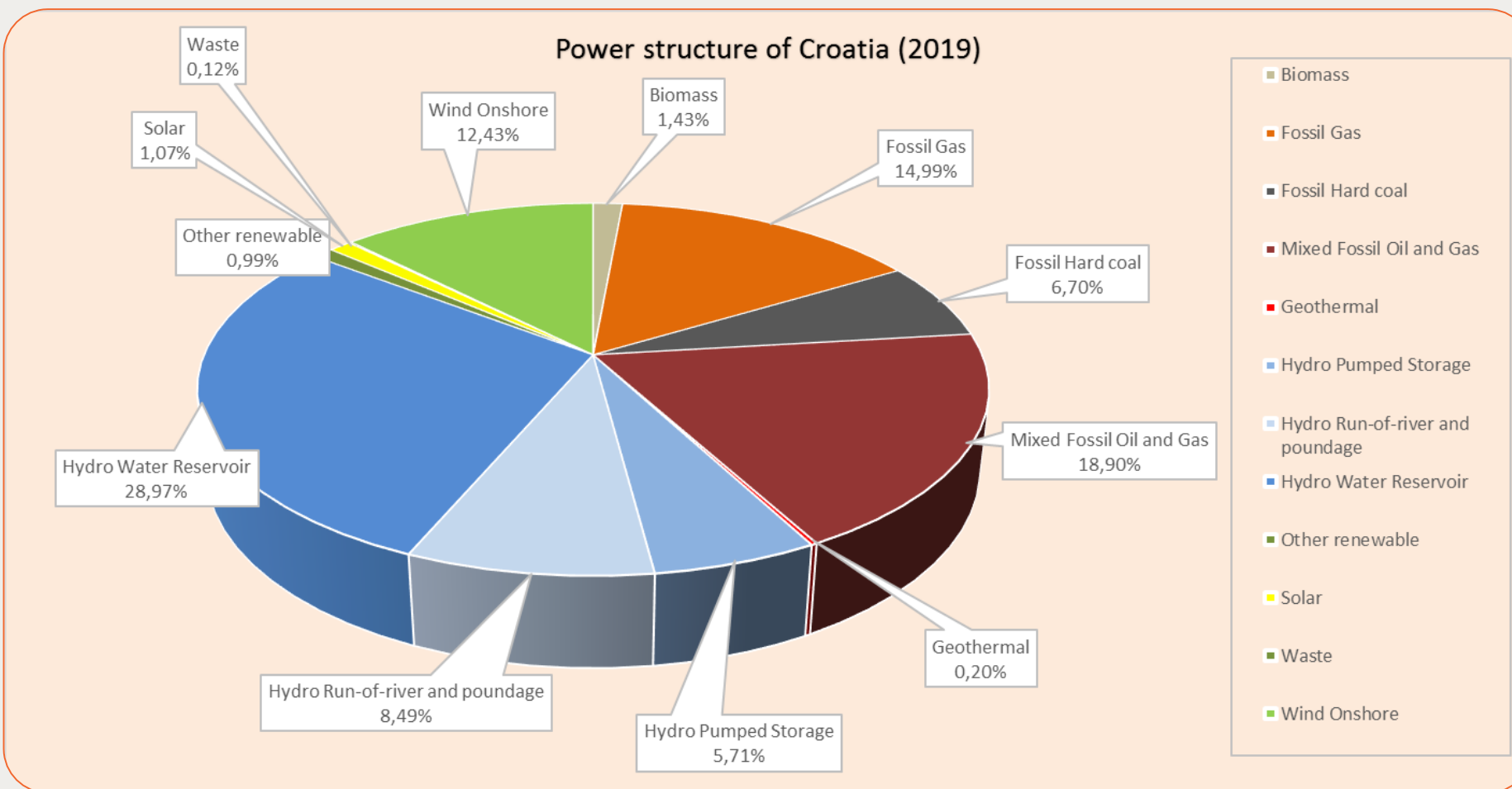
Cooperation of TSO and DSO

- Hrvatski operator prijenosnog sustava d.o.o. (HOPS - Croatian Transmission System Operator Ltd.) and HEP Operator distribucijskog sustava d.o.o. (HEP ODS - Distribution System Operator) are providers of public services of electricity transmission and distribution, respectively, for the needs of participants in the Croatian market.
- Scope of HOPS and HEP ODS cooperation is defined by a national legislative, and corresponding agreements and contracts between two system operators.

Responsibilities of TSO & DSO

- Responsibilities of TSO
 - Transmission of electricity generated in power plants connected to transmission grid or imported from adjacent power systems, at least cost while maintaining electricity quality standards and safety of the power system at the highest possible level;
 - Control, maintenance and development of high voltage grid.
- Responsibilities of DSO
 - Safe supply to customers. Distribution of electricity generated in power plants connected to distribution grid or delivered from transmission grid, at least cost while maintaining electricity quality standards and safety of the power system at the highest possible level;
 - Control, maintenance and development of medium and low voltage grids.

Power structure of the country / countries



Installed capacity with reference to primary resources

Nr.	Primary resource	Installed capacity (GW) 2019	Remark
1.	Biomass	0.071	
2.	Coal	0.332	
3.	Gas	0.743	
4.	Hydropower	2.140	
5.	Lignite	0.000	
6.	Nuclear	0.000	
7.	Oil	0.937	including mixed oil and gas
8.	Solar power	0.053	
9.	Wind power	0.738	
10.	Others	0.065	

Energy production with reference to primary resources

Nr.	Primary resource	Energy production (TWh)
		2019
1.	Biomass	0.432
2.	Coal	1.490
3.	Gas	2.218
4.	Hydro power	5.765
5.	Lignite	0.000
6.	Nuclear	0.000
7.	Oil	0.000
8.	Solar power	0.072
9.	Wind power	1.462
10.	Others	0.425

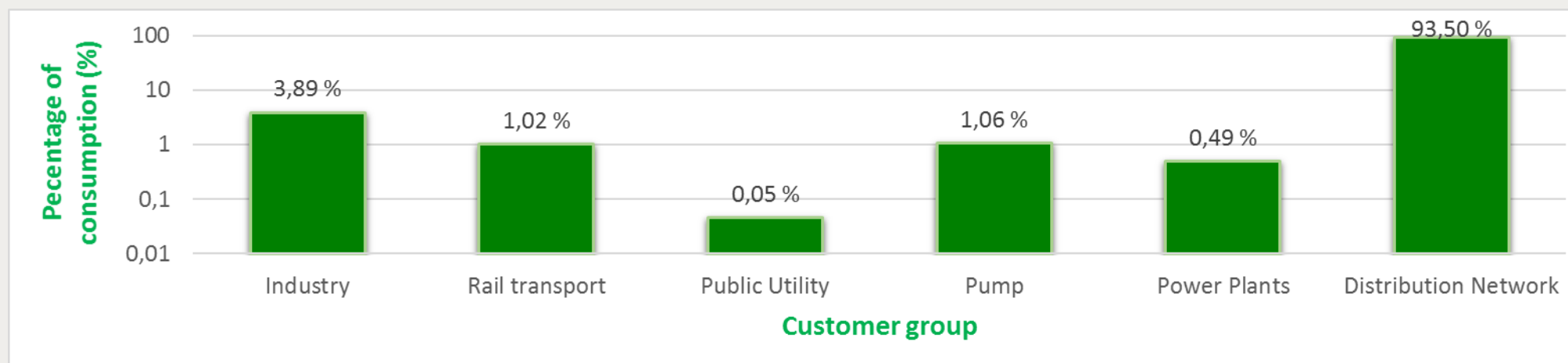
Development of generation capacity

Nr.	Primary resource	Generation capacity in particular year (GW)					Remark
		2015	2016	2017	2018	2019	
1.	Wind	0.429	0.489	0.537	0.582	0.616	
2.	Solar	0.044	0.049	0.051	0.052	0.053	
3.	Hydro	2.140	2.140	2.140	2.140	2.140	
4.	Coal	0.332	0.332	0.332	0.332	0.332	
5.	Lignite	0.000	0.000	0.000	0.000	0.000	
6.	Gas	0.743	0.743	0.743	0.743	0.743	fossile fuels
7.	Mixed Oil and Gas	0.937	0.937	0.937	0.937	0.937	fossile fuels
8.	Nuclear	0.000	0.000	0.000	0.000	0.000	
9.	Biomass	0.025	0.026	0.036	0.058	0.071	
10.	Biogas	0.021	0.030	0.036	0.041	0.043	
11.	Geothermal	0.000	0.000	0.000	0.010	0.010	
12.	Others	0.010	0.010	0.010	0.010	0.012	

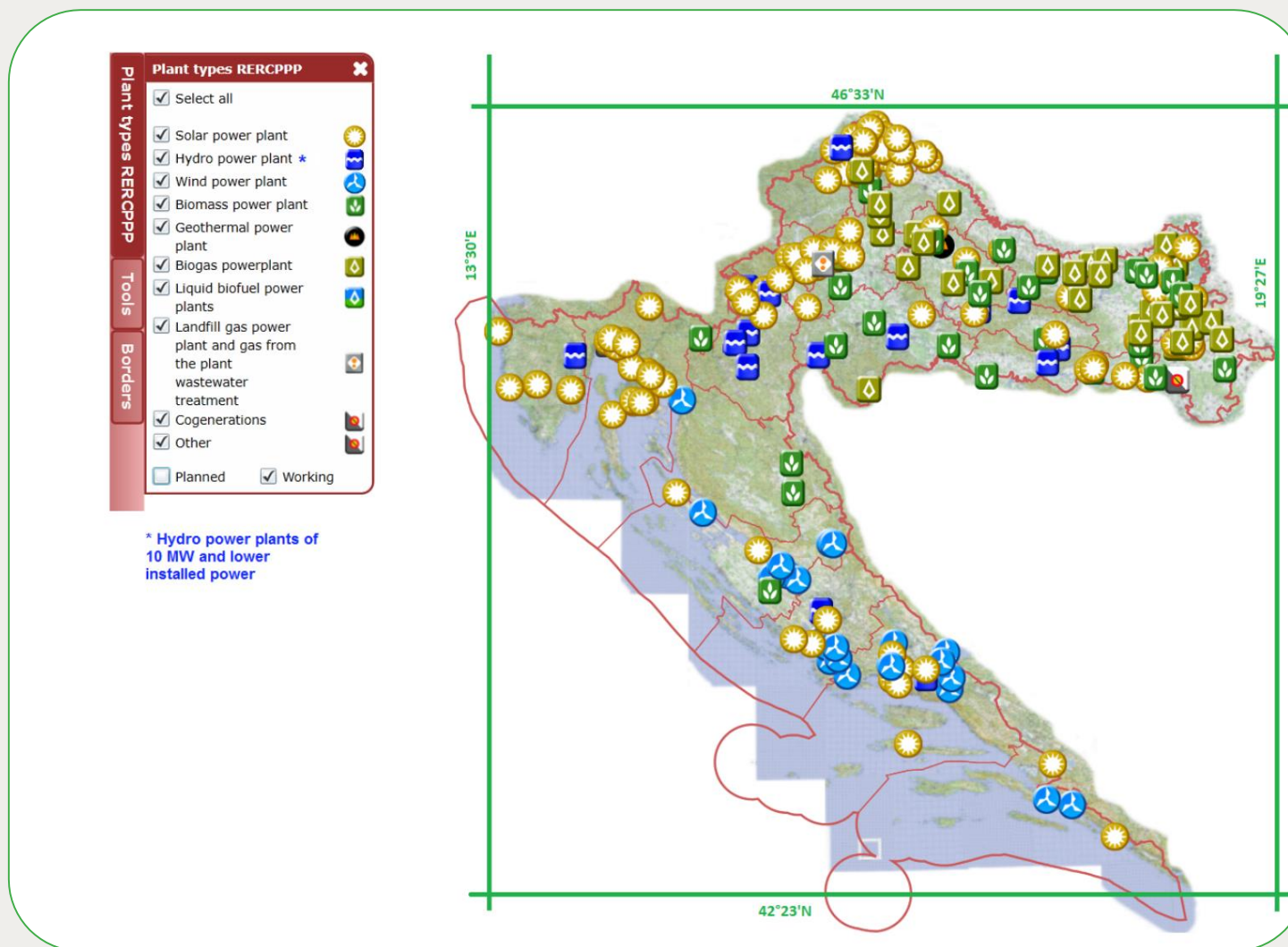
Consumption per customer groups

- Data for transmission network

Nr.	Customer group	Consumption in 2019 (TWh)
1.	Industry	0.645
2.	Rail transport	0.169
3.	Public Utility	0.008
4.	Pump	0.175
5.	Power Plants	0.081
6.	Distribution Network	15.496

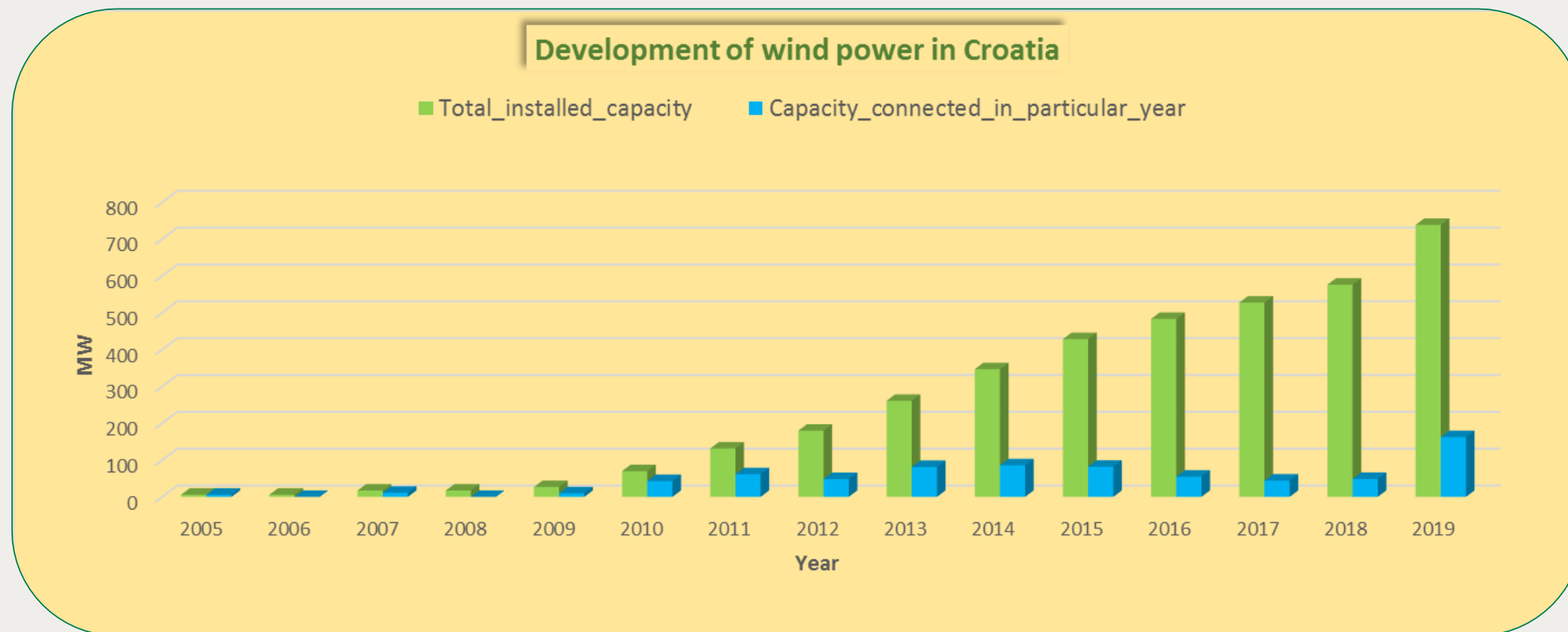


Location of renewable energy sources



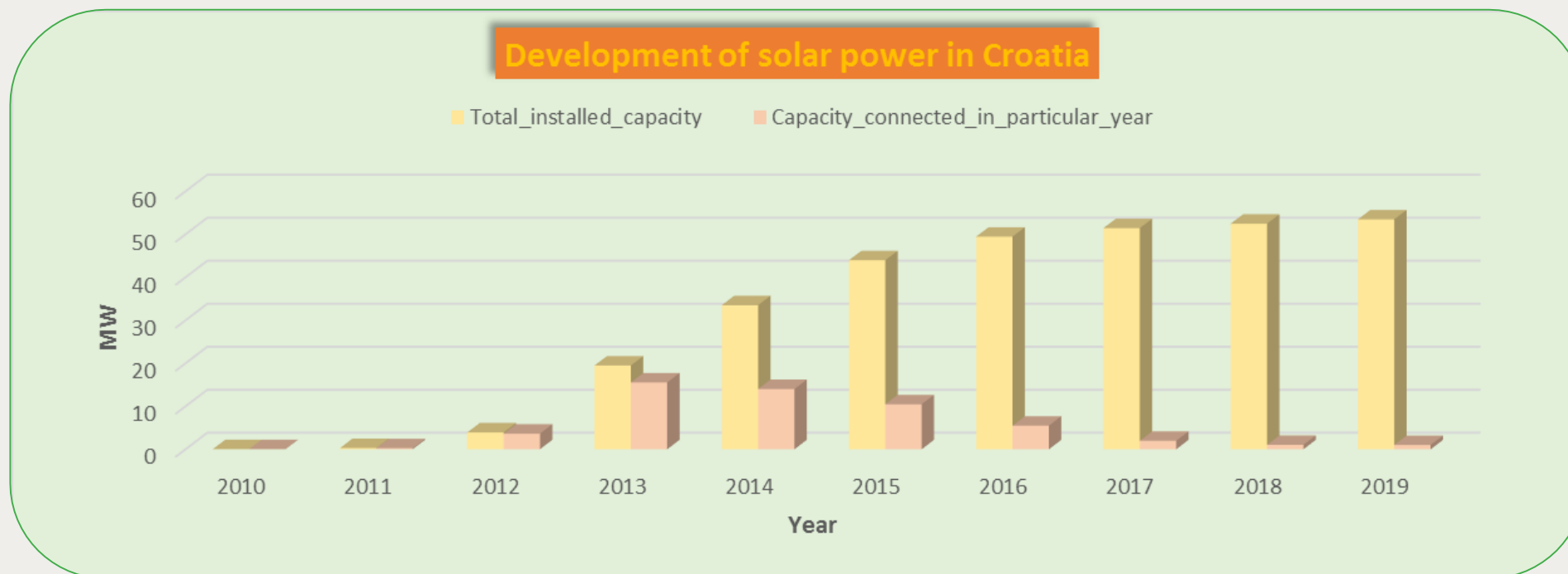
Development of wind power

- Development began in 2005



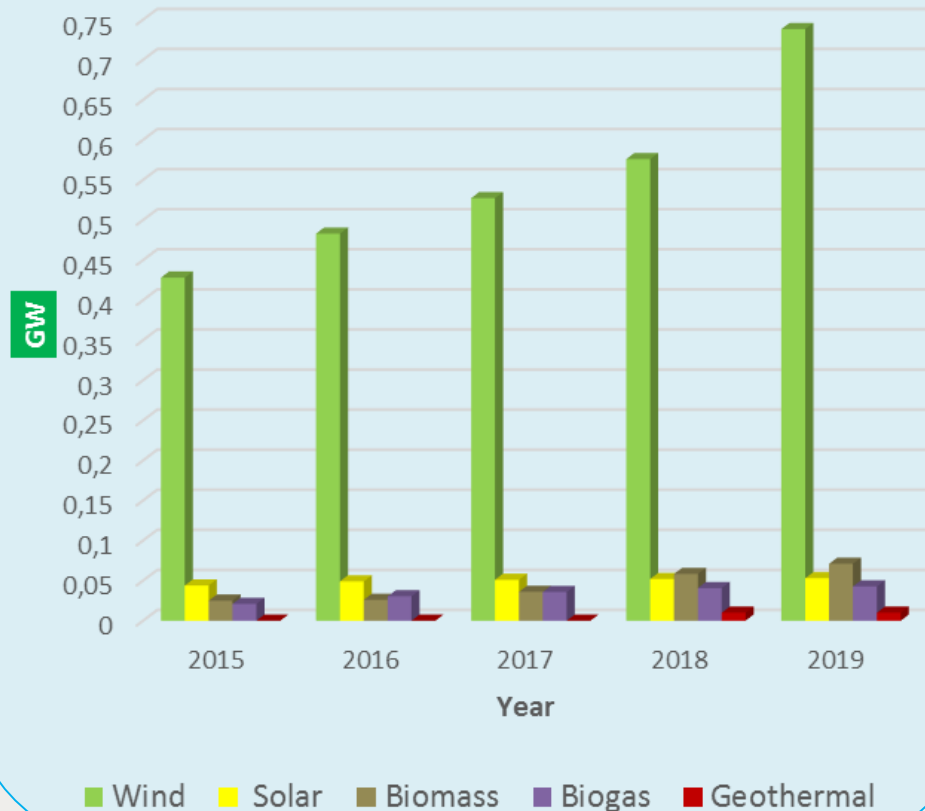
Development of photovoltaic power & CSP

- Significant development began in 2010

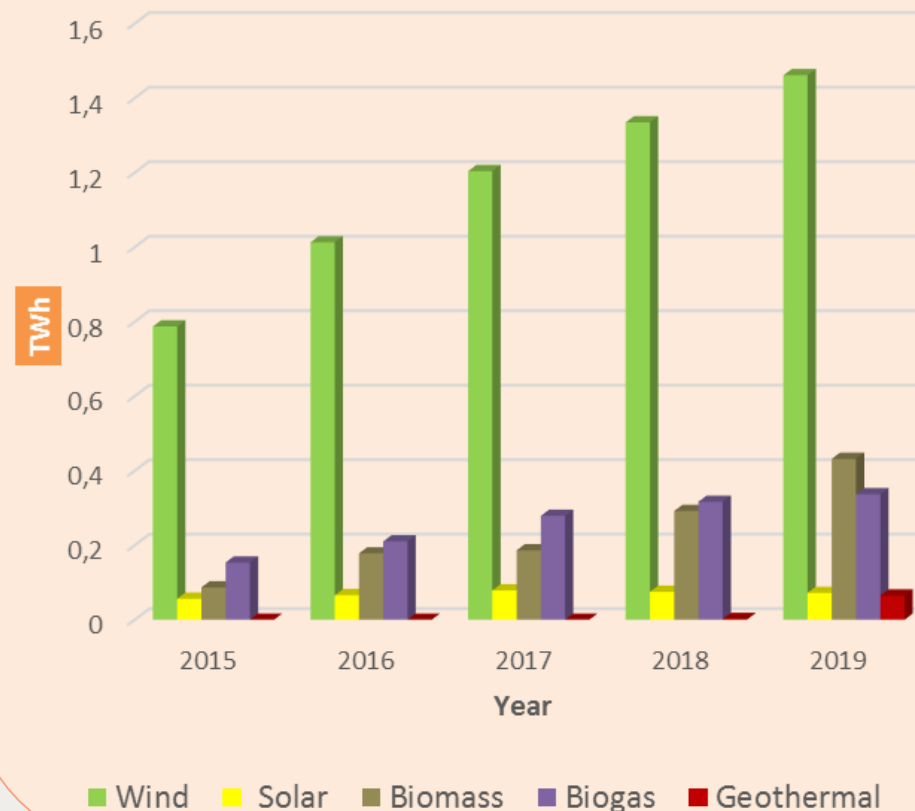


RES installed capacity and production per annum

RES installed capacity



RES production per annum



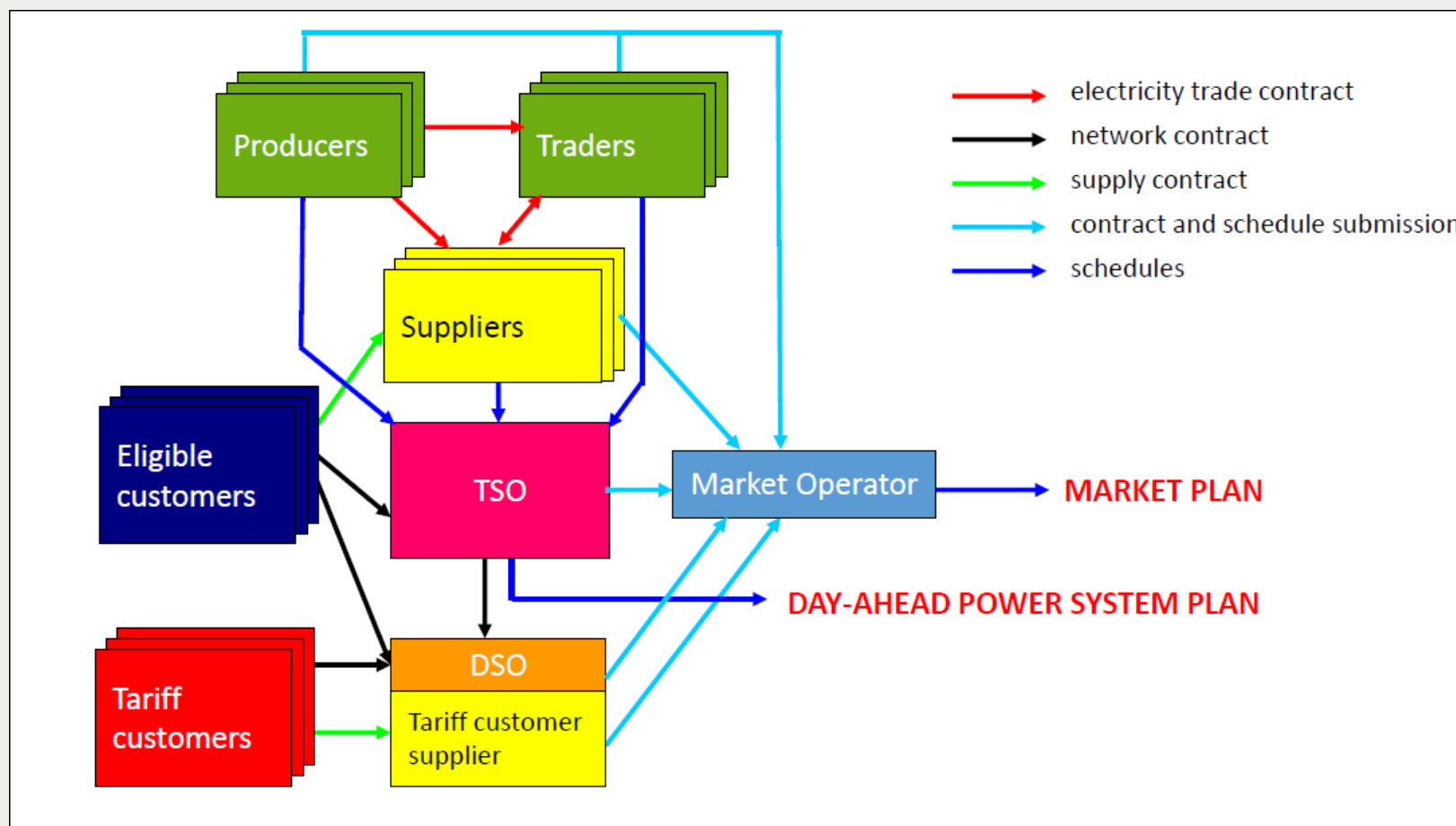
Price development for industry consumers

Nr.	Consumer category	Voltage level	Average energy price in particular year (€/kWh)					
			2013	2014	2015	2016	2017	2018
1.	Industry	medium	0.08	0.08	0.08	0.07	0.07	0.07
2.	Industry	low	0.10	0.10	0.10	0.10	0.09	0.09

Price development for households

Nr.	Consumer category	Voltage level	Average energy price in particular year (€/kWh)					
			2013	2014	2015	2016	2017	2018
1.	Households	low	0.11	0.10	0.10	0.10	0.10	0.10

Electricity market organization



Power balance in 2018 / 2019

- Data for transmission network

Nr.	Item	Amount in 2018	Amount in 2019
1.	Generation (TWh)	11.137	10.658
2.	Consumption (TWh)	17.298	16.433
3.	Imports (TWh)	12.692	11.400
4.	Exports (TWh)	6.532	5.237
5.	Losses (TWh)	0.534	0.388

Energy exchanges in 2018 / 2019

- Commercial flows

Commercial flows	Nr.	Direction	Country	Unit	2018	2019
	1.	Import from...	Hungary	TWh	6.028	7.399
	2.	Import from...	Slovenia	TWh	4.681	6.629
	3.	Import from...	Bosnia and Hercegovina	TWh	5.161	3.525
	4.	Import from...	Serbia	TWh	2.108	1.108
	5.	Export to...	Hungary	TWh	4.537	5.557
	6.	Export to...	Slovenia	TWh	5.148	2.317
	7.	Export to...	Bosnia and Hercegovina	TWh	1.211	2.825
	8.	Export to...	Serbia	TWh	0.942	1.802
	9.	Import from...	all countries	TWh	17.978	18.661
	10.	Export to...	all countries	TWh	11.838	12.501
	11.	Balance (Import - Export)	all countries	TWh	6.140	6.160

- Physical flows

Physical flows	Nr.	Direction	Country	Unit	2018	2019
	1.	Import from...	Hungary	TWh	2.750	4.236
	2.	Import from...	Slovenia	TWh	2.180	3.979
	3.	Import from...	Bosnia and Hercegovina	TWh	5.963	2.767
	4.	Import from...	Serbia	TWh	1.799	0.417
	5.	Export to...	Hungary	TWh	0.725	0.154
	6.	Export to...	Slovenia	TWh	4.774	2.904
	7.	Export to...	Bosnia and Hercegovina	TWh	0.986	1.809
	8.	Export to...	Serbia	TWh	0.047	0.369
	9.	Import from...	all countries	TWh	12.692	11.400
	10.	Export to...	all countries	TWh	6.532	5.237
	11.	Balance (Import - Export)	all countries	TWh	6.161	6.163

Specific aspects of the electricity market

- Bilateral and organized Day-ahead and Intraday Market
- Coordinated Cross-border capacity allocation:
 - HR-SI, HR-RS and HR-HU border: JAO (Joint Allocation Office) Luxembourg
 - HR-BA: SEE CAO (South East Europe Coordinated Auction Office) Podgorica, Montenegro
- Power exchange CROPEX operational since February 2016,
- Market coupling:
 - Croatian day-ahead market is coupled with European SDAC market via HR-SI border
 - European Single Intraday Coupling - SIDC (ex. XBID project)
 - Croatian organized intraday Market successfully coupled with European Intraday Market via HR-SI and HR-HU borders since 19th November 2019,
- Core flow based market coupling development in progress, current go-live foreseen Q2-Q3 2021
 - if regional concept approved, first long-term auctions of cross-border financial transmission rights options (FTR Options) would be introduced on all Core CCR borders (except HR-SI) after the operational go-live of the Core Flow-based Market Coupling Project, replacing currently mainly used long-term PTRs (PTR – Physical Transmission Rights)
 - Note: Croatian Core CCR borders: HR-HU and HR-SI