

The Electric Power System

- **Russian Federation** –

Basic facts

- ❑ Area: **17 125 407 km²**
- ❑ Population: **146 267 288** (2015)
- ❑ Number of TSOs: **1 - Federal Grid Company of Unified System (95 %)**
- ❑ Number of DSOs: **3500**
- ❑ Peak load: **155 GW**
- ❑ 9 time zone, 69 regional power systems forming 7 interconnected power systems (IPS).



Grid facts and characteristics

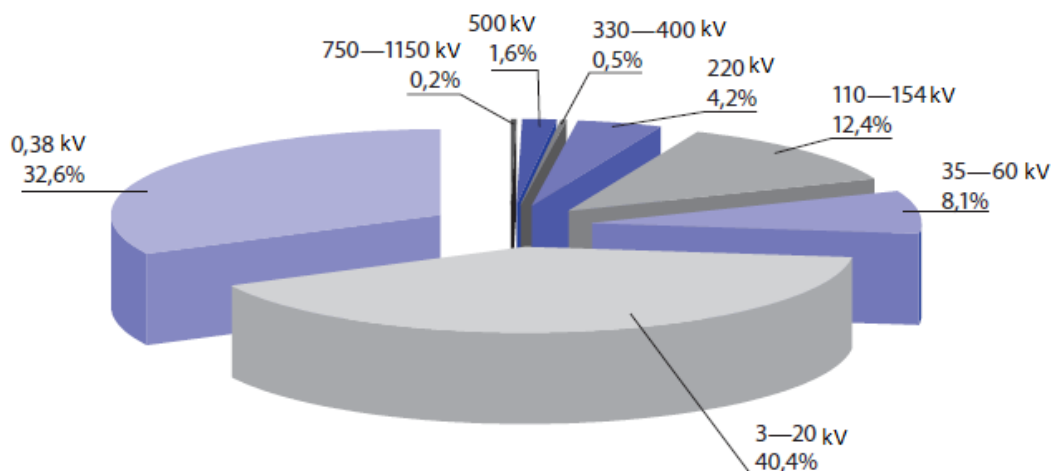
- All power systems are interconnected by HV lines 220–750 kV and operate in synchronous mode (in parallel), except IPS of the East.

Distribution: 0.22, 0.38, 6, 10, 35, 110 kV

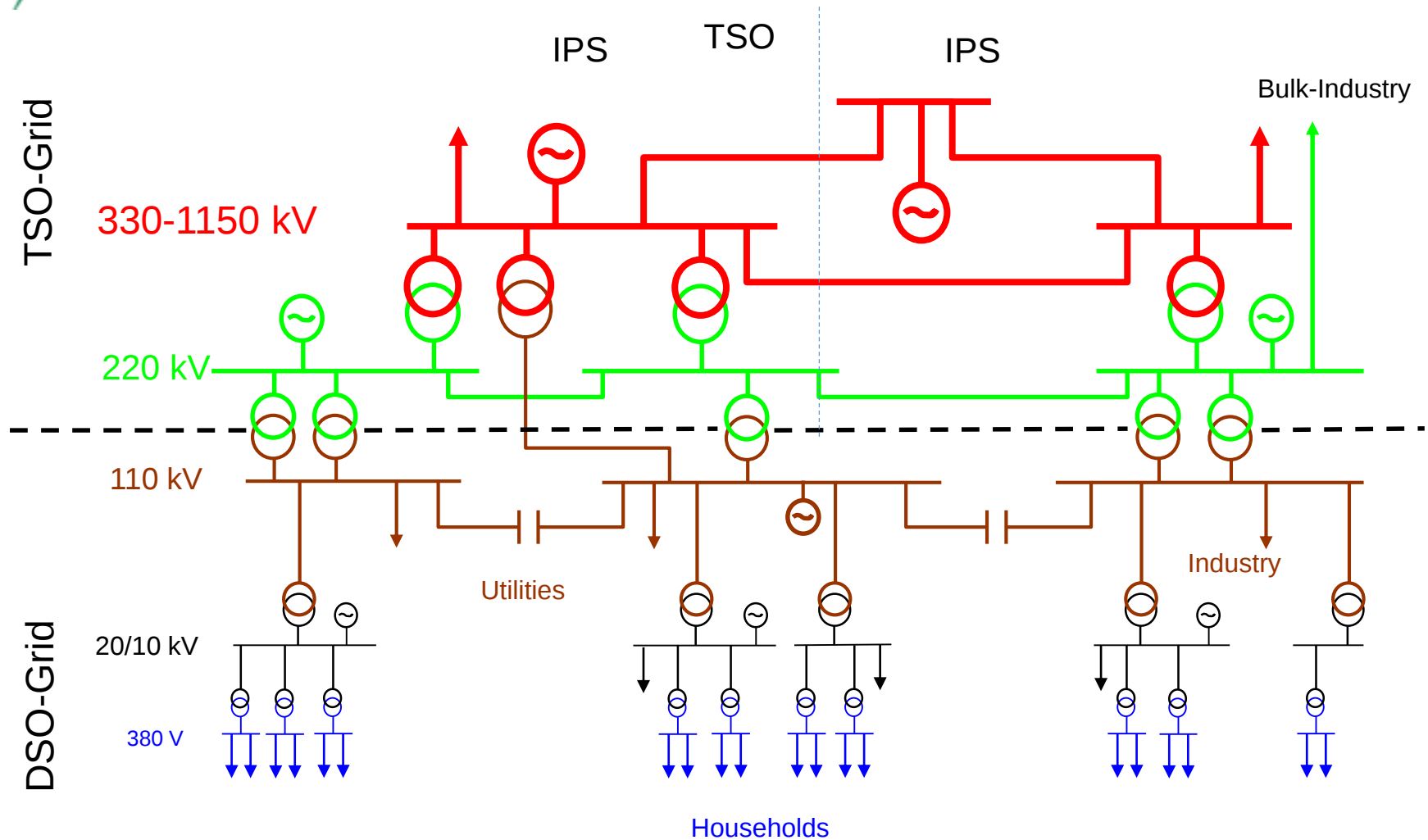
- Lines – 2 200 000 km
- 480 000 substations
- total capacity 750 000 MVA

Transmission: 220, 330, 500, 750, 1150 kV

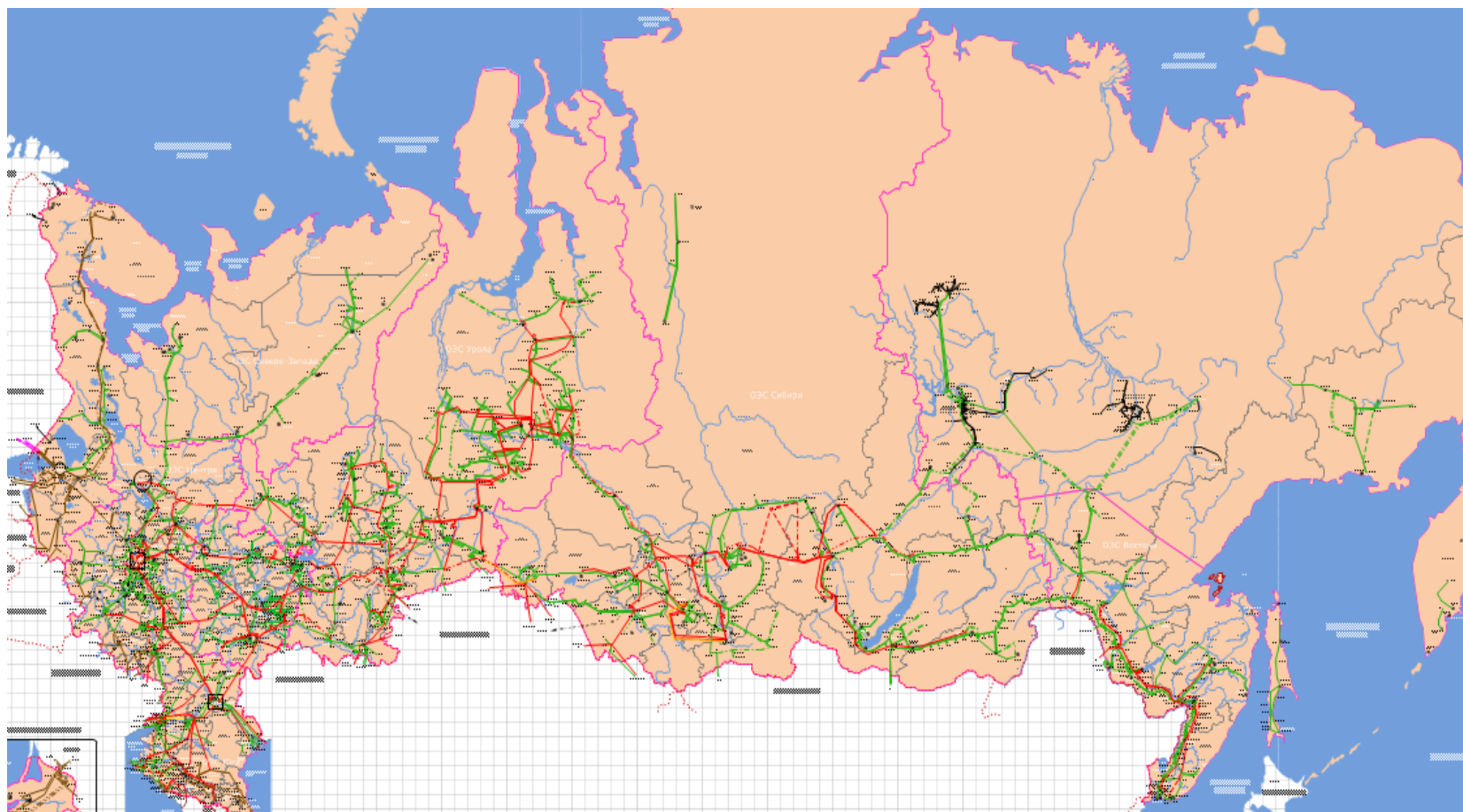
- total length lines 139 586 km
- 947 substations
- total capacity 382 788 MVA



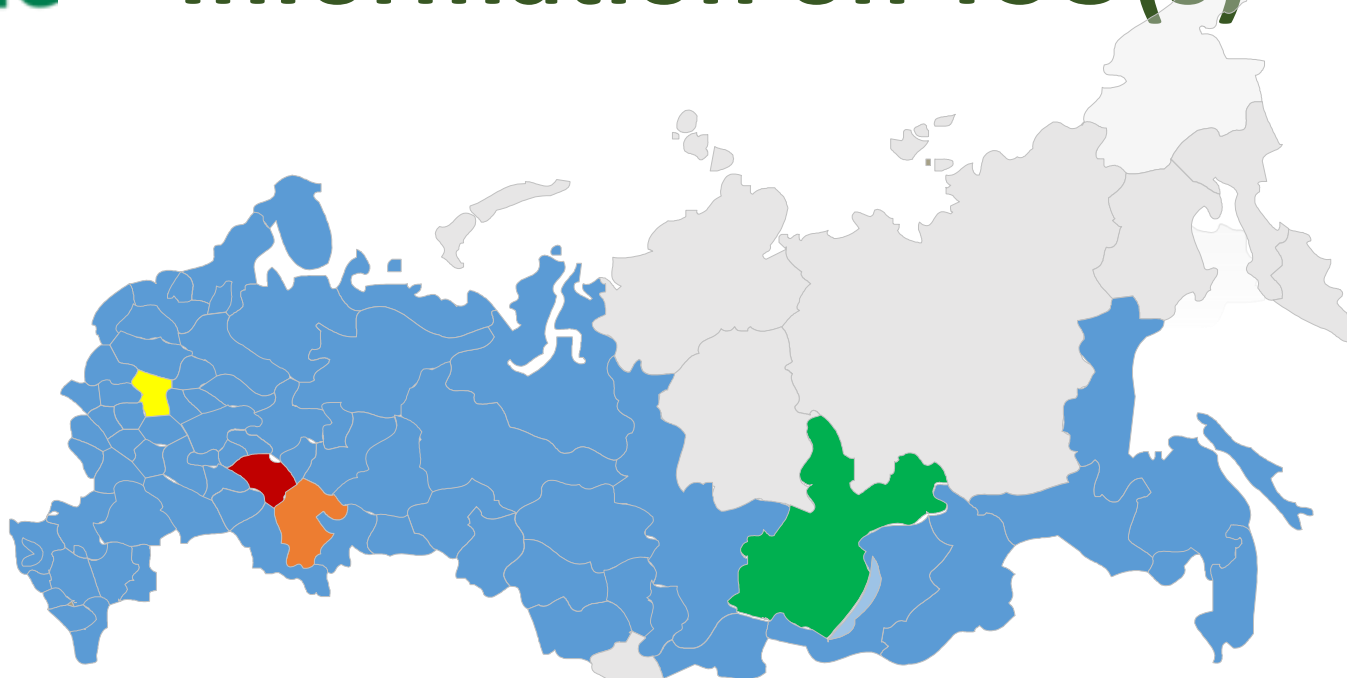
Structure of electrical power system



Map of the high voltage grid

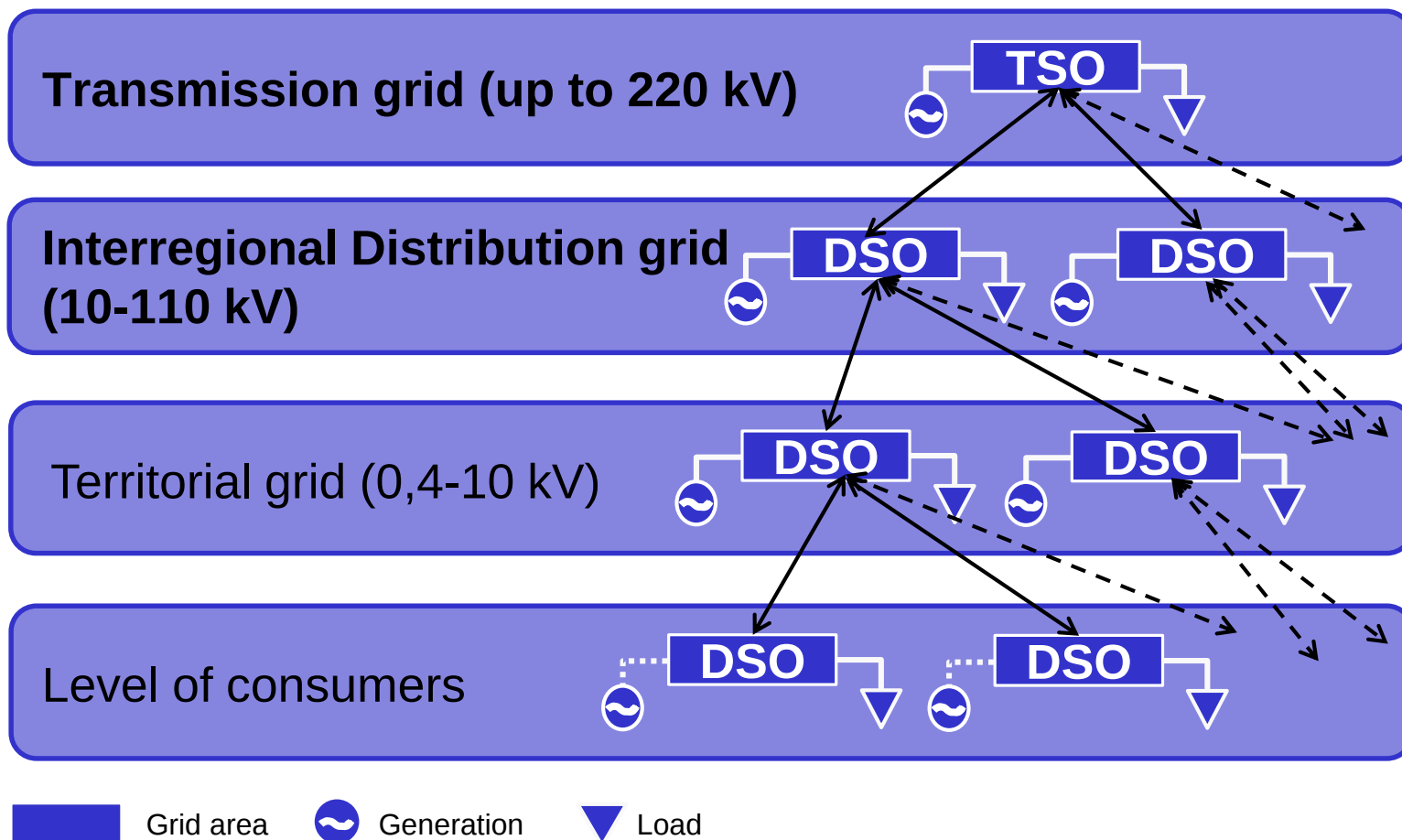


Information on TSO(s)



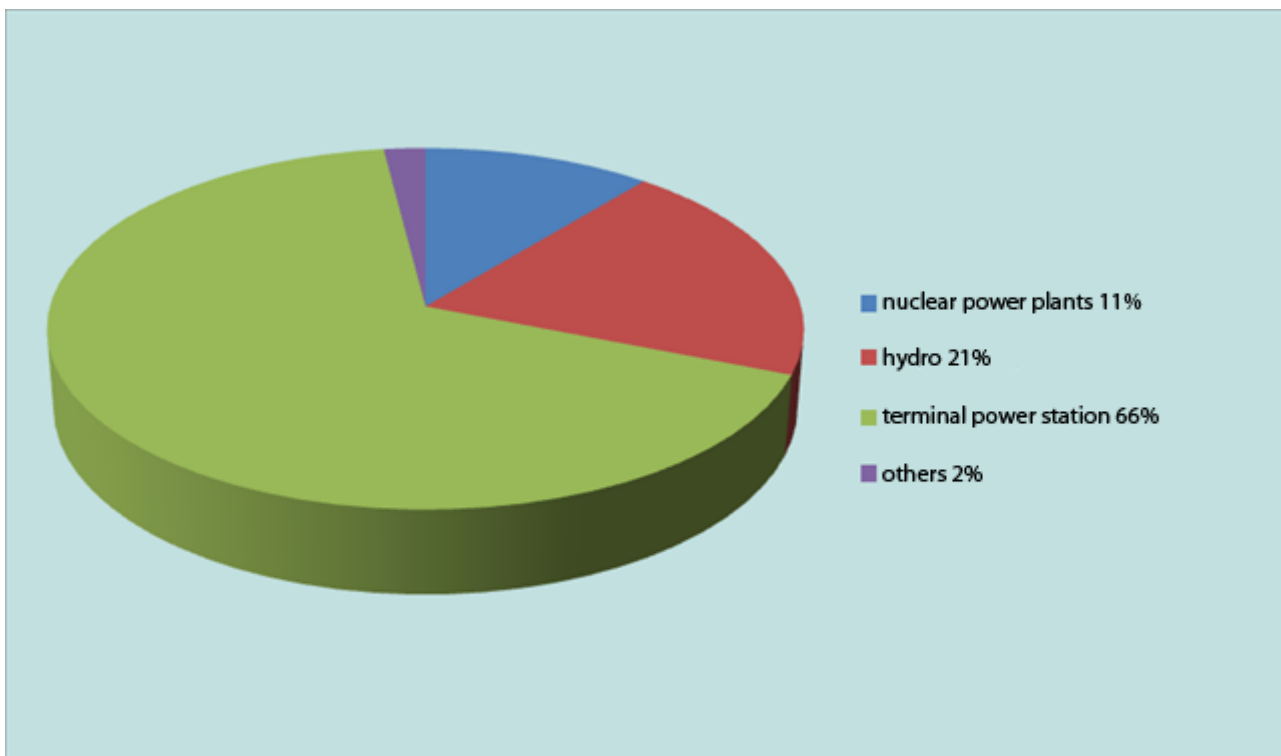
	Federal Grid Company of Unified System	DSO includings transmissions lines and substations 220-500 kV			
		Bashkirian Power Grid Company	Grid Company of Tatarstan	Irkutsk electronetwork company	Moscow United Electric Grid Company
Network length [km]	138 800	2 000	1 905	3 770	1 503
Served area [km ²]	151 000 000	142 947	67 836	744 846	46 900
Annual transmission [TWh]	518,09	20,987	20,157	45,314	71,884
Website	http://www.fsk-ees.ru	http://bash.es.ru	http://www.gridcom-rt.ru	http://www.irk-esk.ru	http://www.moesk.ru/

Cooperation of TSO and DSOs



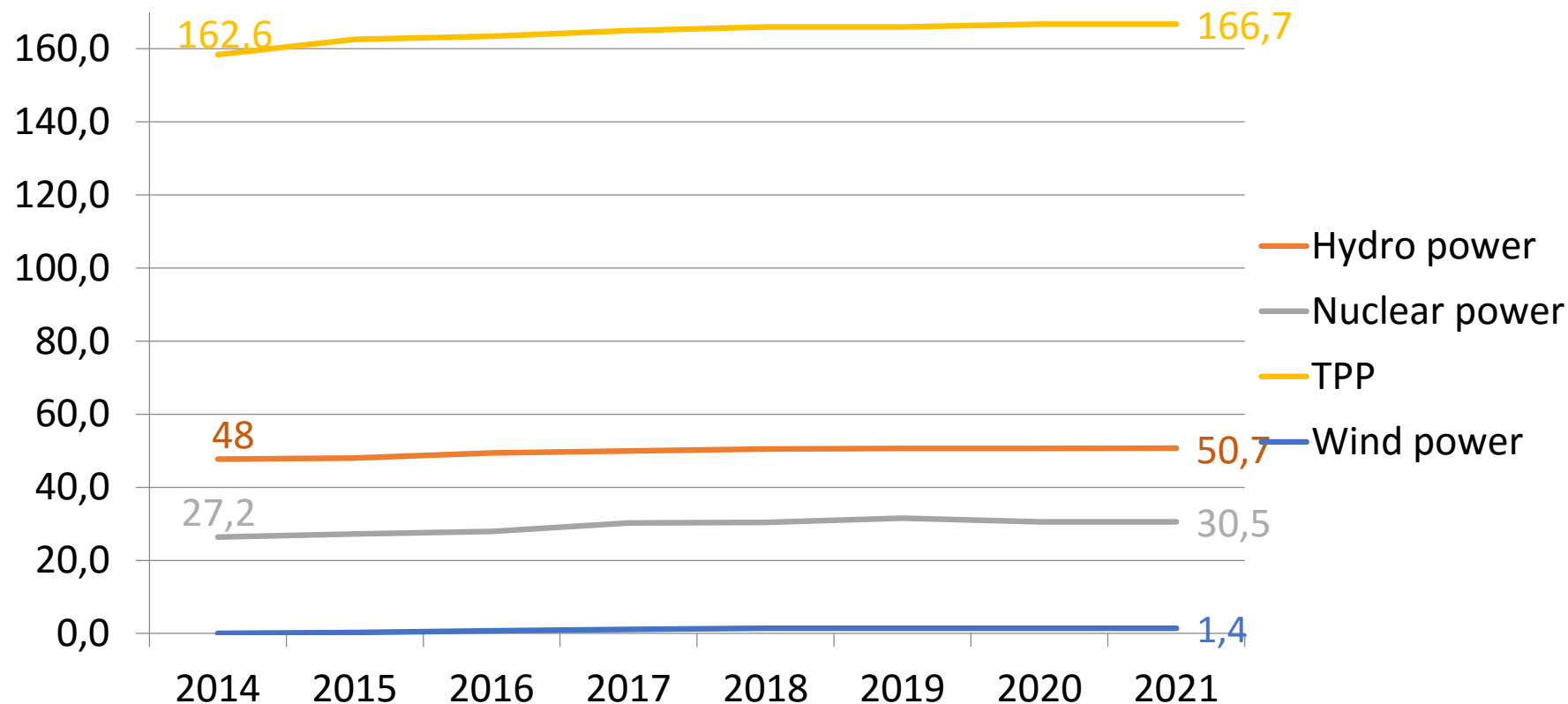
Installed capacity with reference to primary resources

□ Installed capacities (%)



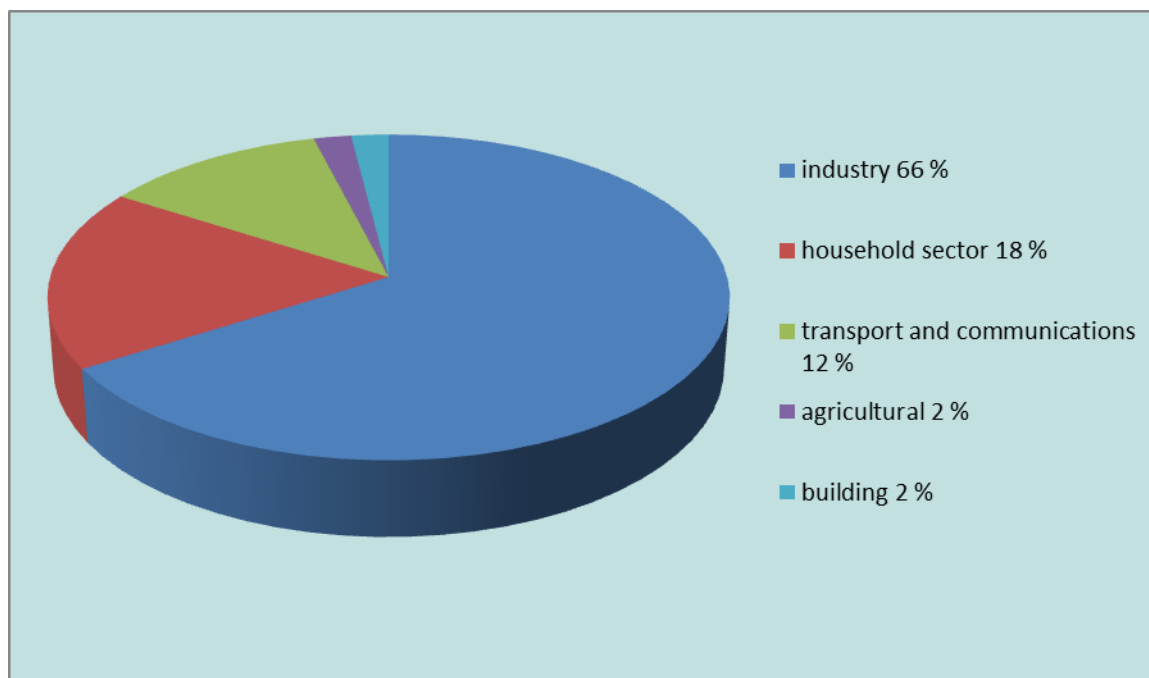
Electricity generation

[GW]



Thermal power plant (TPP): 71% gas-fired, 24% coal-fired, 5% oil.

Power consumption by consumer groups



In 2014 it connected electricity grid companies 370 thousand new customers with an overall capacity of over 6 GW. And in just 3 years connected of more than 750 thousand of consumers with a connected load of 15 GW

Location of renewable energy sources

- ❑ In July of this year the Russian Federation joined the International renewable energy Agency

The IRENA logo, consisting of the word "IRENA" in white, uppercase, sans-serif font inside a blue speech bubble shape.

IRENA

- ❑ By 2035, in accordance with our new Energostrategia electricity production based on renewable energy should be increased in

The text "15 times" in white, bold, sans-serif font inside a red rounded rectangle.

15 times

Renewable energy sources

By 2020 the share of RES and NPPs in total amount of electricity generation is planned to be increased:

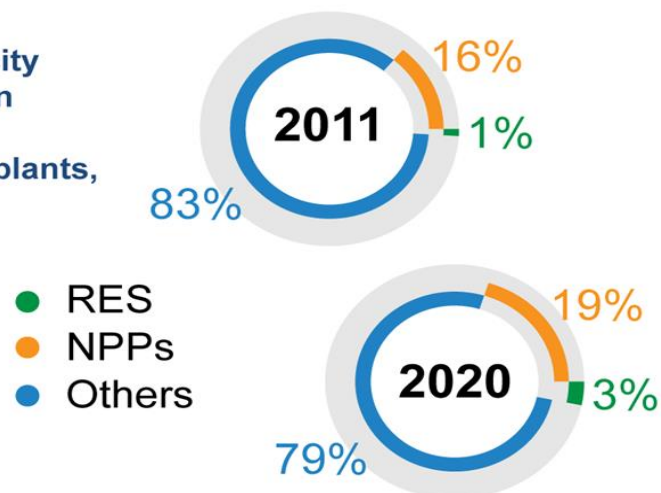


RES development will provide with energy the territories which are isolated from the Unified Energy System through the use of local fuel resources and renewable energy

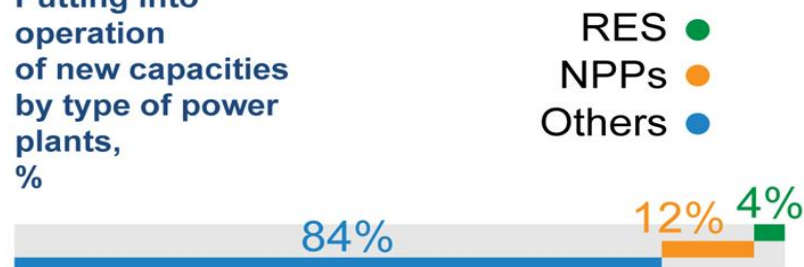
It is planned to modernize the existing type of commercial power-generating units of NPPs and put into operation new ones in order to ensure energy security of the country



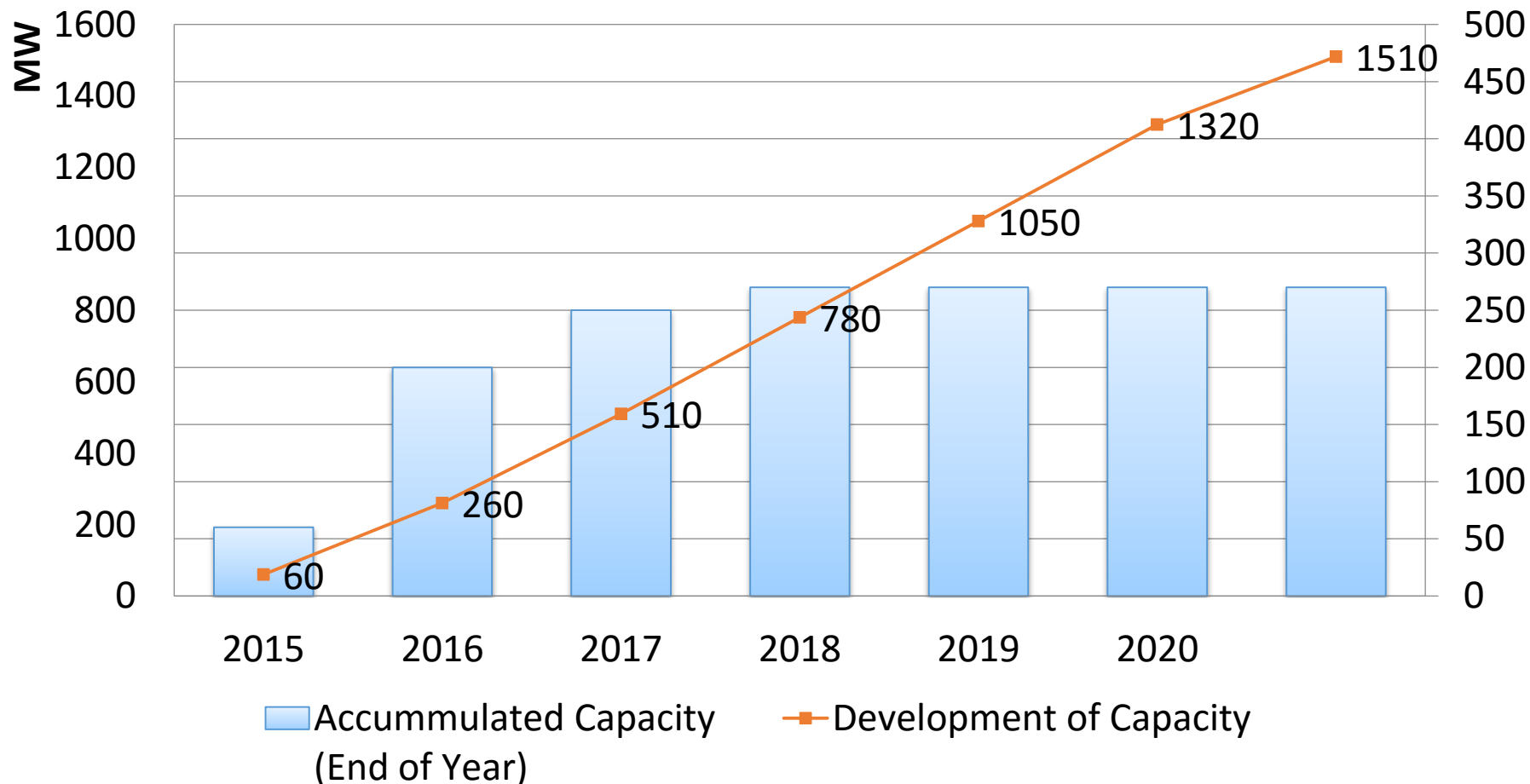
Structure of electricity generation by type of power plants, %



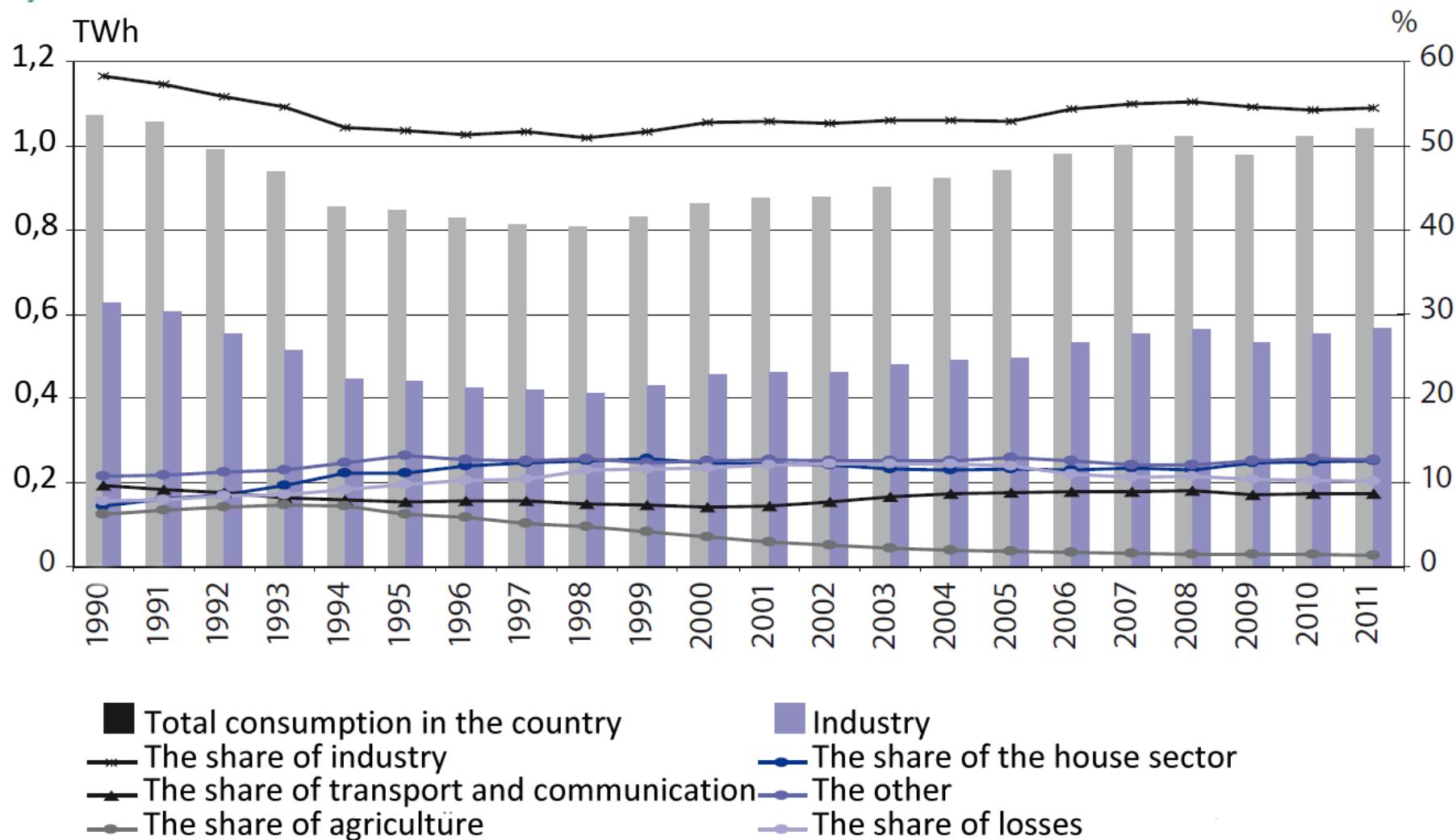
Putting into operation of new capacities by type of power plants, %



Development of photovoltaic power

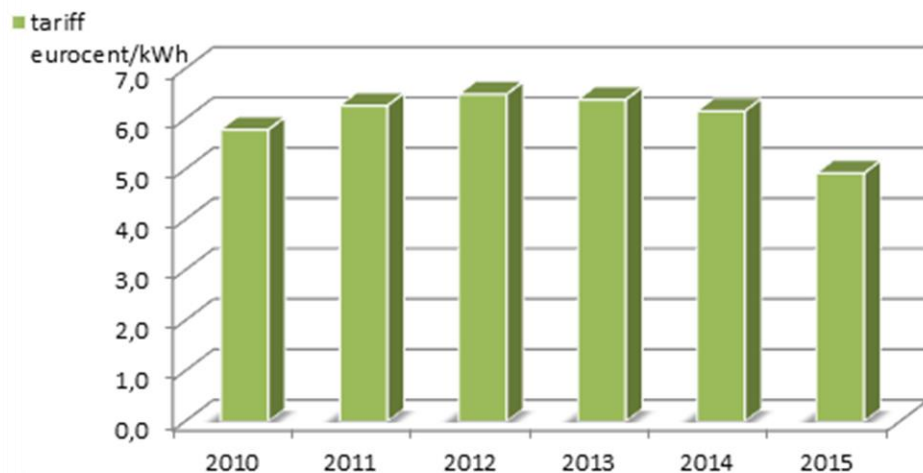


Consumption

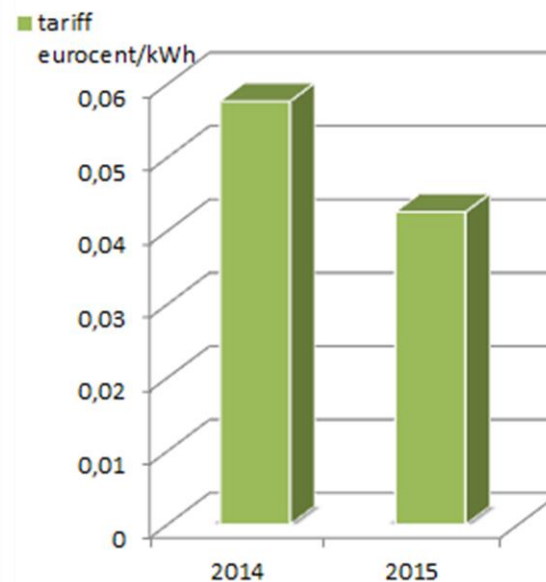


Price development

Price development for households



Price development for industry consumers

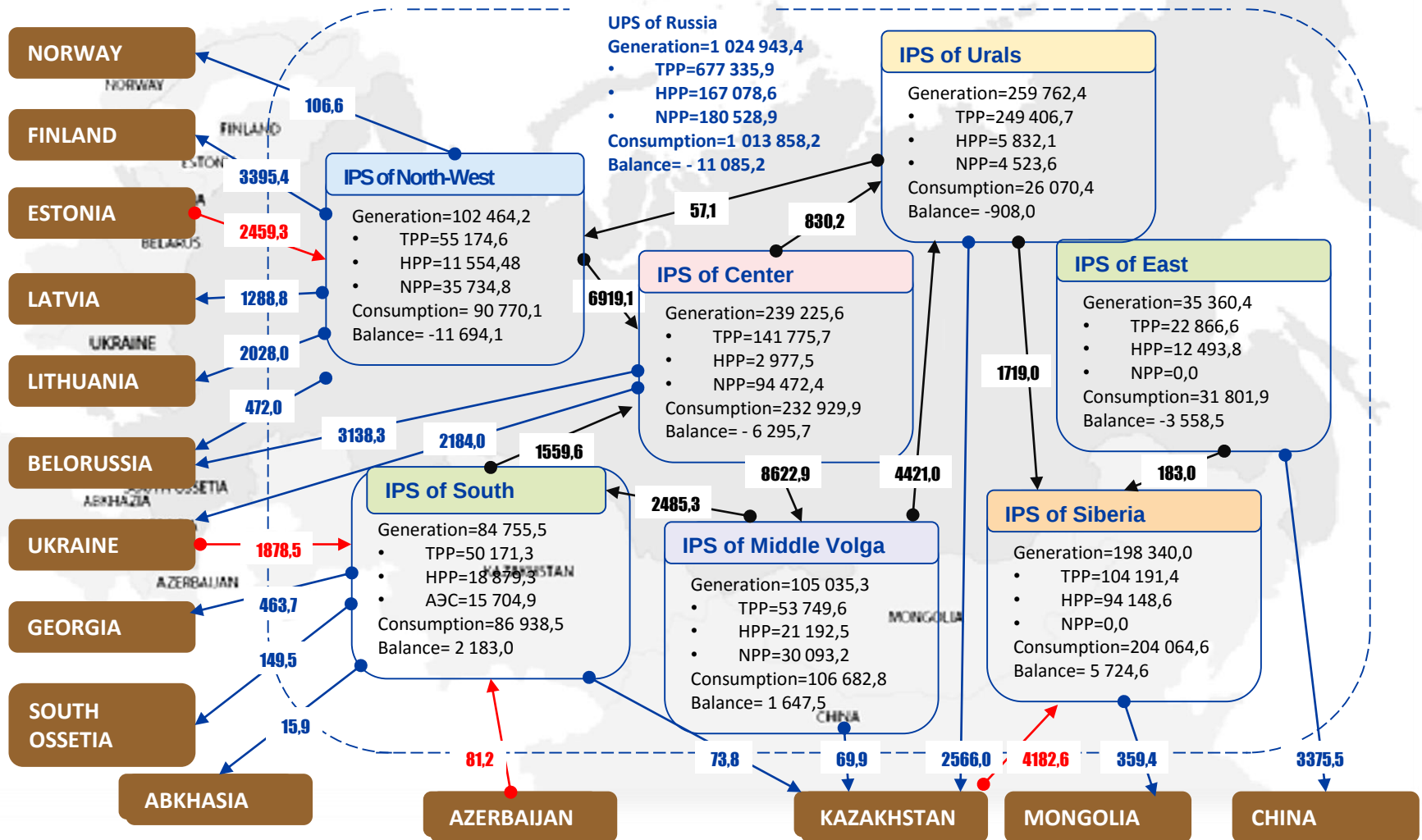


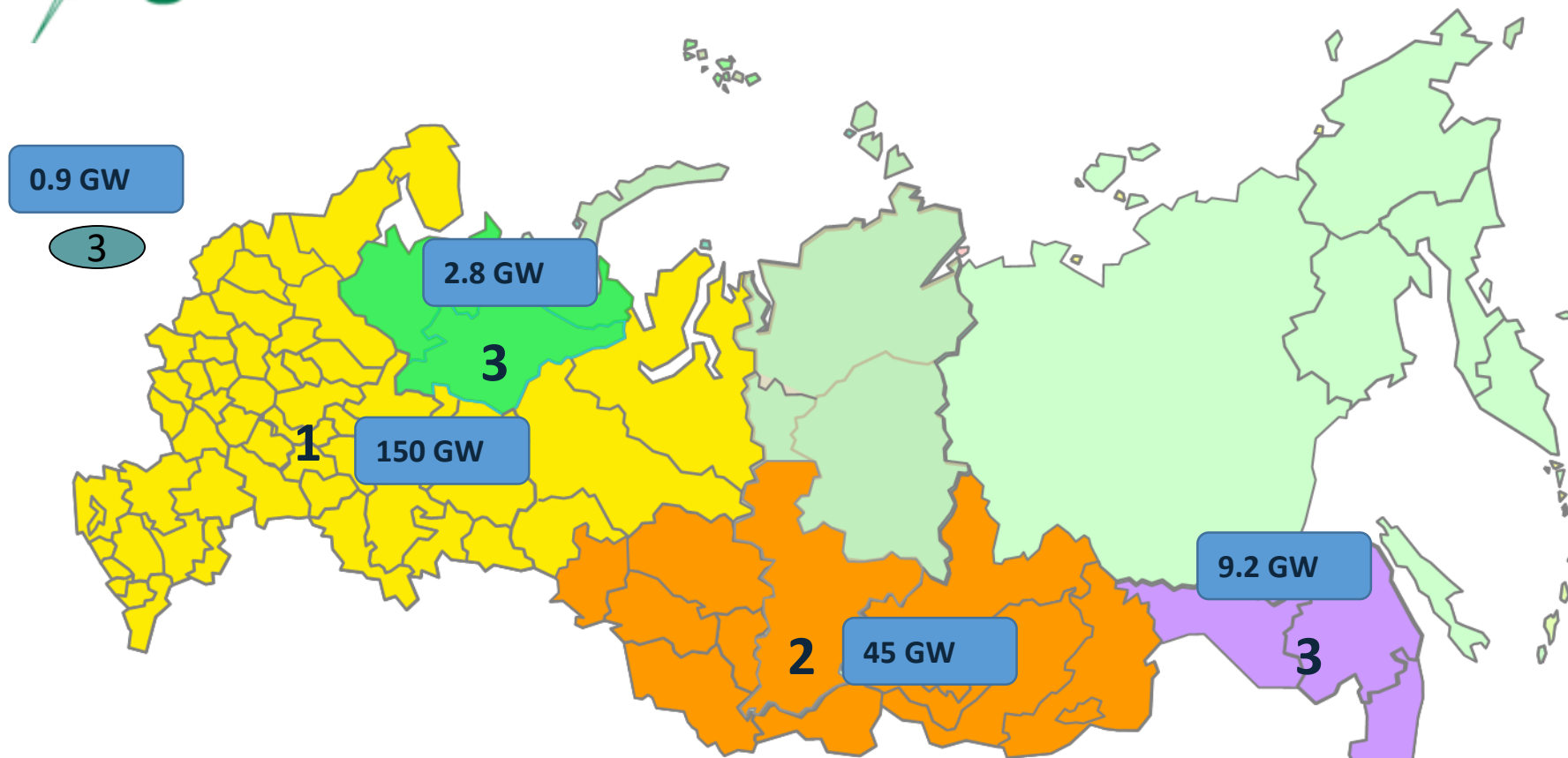
Power balance in 2014

- ❑ Generation 1 047,40 (TWh)
- ❑ Consumption 1 040,35 (TWh),
including Losses 106,66 (TWh)
- ❑ Imports 12,7 (TWh)
- ❑ Exports 23,8 (TWh)

Federal State Statistics Service

Cross-Border Interconnections for 2014 (GWh)





Territory of the wholesale market:

1 – I price area – European Russia, Ural region

2 – II price area – Siberia

3 – tariff regulation areas (East region, Kaliningrad region, North-West region)

Energy market milestones

Regulated Market



Competitive Market

Market System in the Electric Power Industry of Russia

Capacity market (Total value in 2014: ~ 4,16 bln. Euro)

- Provides long-term adequacy preventing generation supply shortage
- Forms economically effective generation structure (with the lowest total costs)
- Provides price signals for consumption development in the regions depending on sufficiency and cost of generation construction

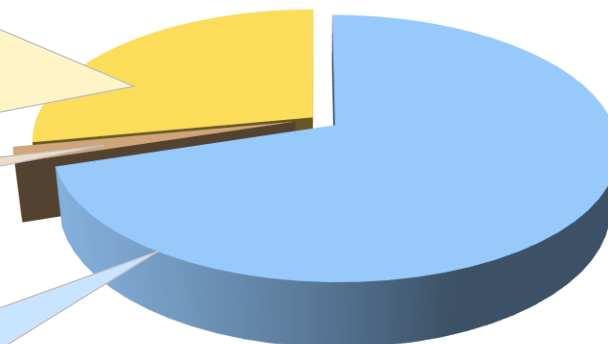
Ancillary Services Market (Total value in 2014: ~19, 6 mln. Euro)

Ensures system reliability providing proper maintenance of equipment complementary characteristics and components

Electricity Market (Total value in 2014: ~ 12,52 bln. Euro)

- Provides short-term reliability and economic efficiency
- Form the most efficient existing generating resources load
- Provides electrical modes feasibility
- Provides price signals for energy efficient consumption

Federal level
Wholesale market



Price
translation



Regional level
Retail market



Market Regulators and Participants

Regulators

Ministry of Energy of Russia – a federal executive body responsible for drafting and implementing government policy and legal regulation in the fuel and energy sector.

Federal Anti-Monopoly Service – a federal executive body responsible for exercising control, supervision over the observance by the participants of anti-monopoly legislation and setting tariffs for infrastructural organizations and for the regulated forms of activities of the wholesale market participants.

Infrastructure organizations

System Operator – planning and control of the power system operation regime, technological support of electricity and capacity markets functioning

Commercial Operator – financial estimates in the wholesale market

Federal Grid Company – management of the Unified electricity transmission and grid system

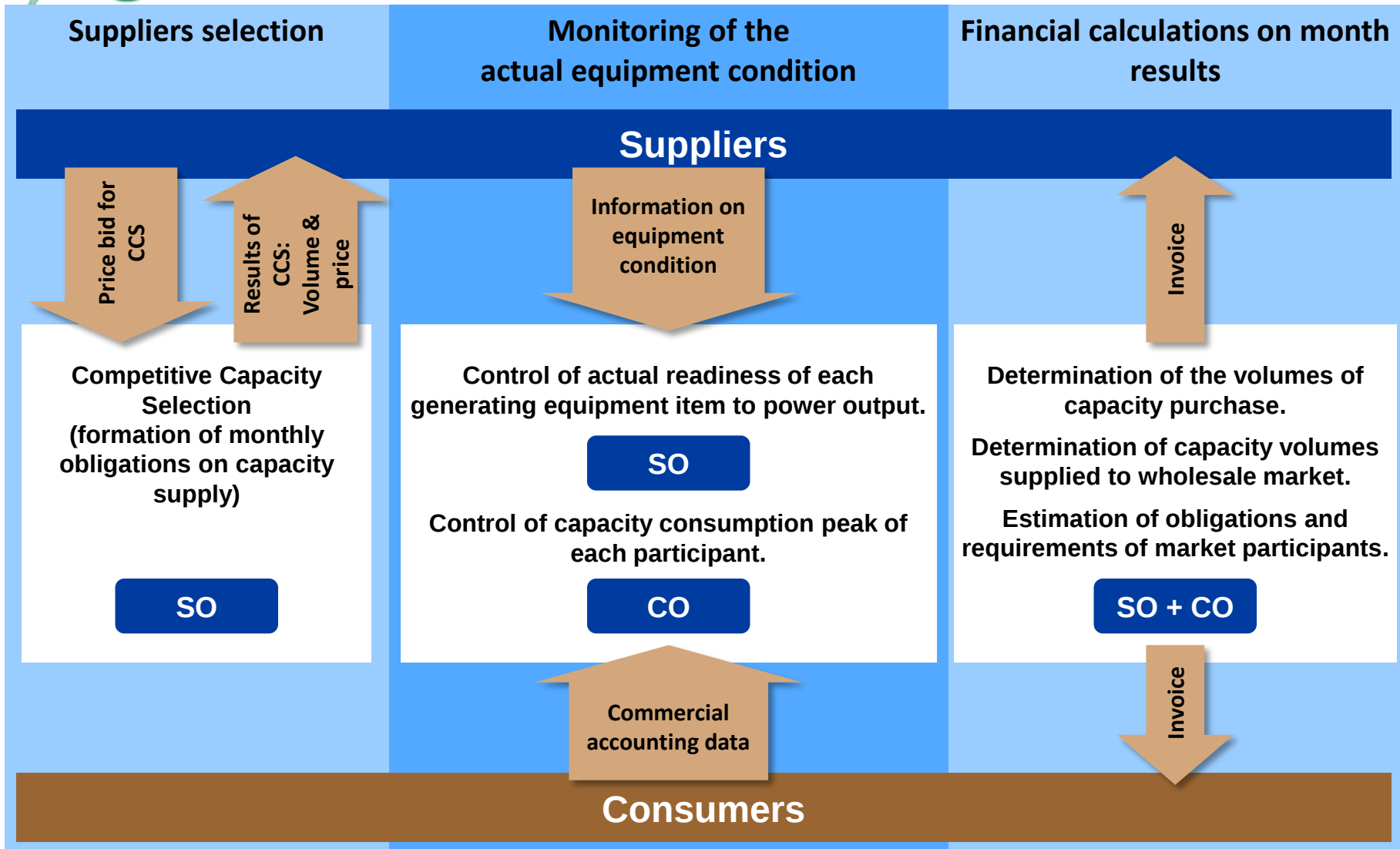
Market participants

Generating companies ~ 60, including:

- extraterritorial companies – OGK comprising large condensing power plants,
 - territorial companies – TGK comprising cogeneration power plants,
 - companies partially owned by the state comprising hydro power plants (JSC RusHydro) and nuclear power plants (RosAtom Group).
- **Consumers ~ 220, guaranteeing suppliers**



Wholesale Electricity Market Scheme



Capacity Market Scheme

