

# Russian electric power sector overview.

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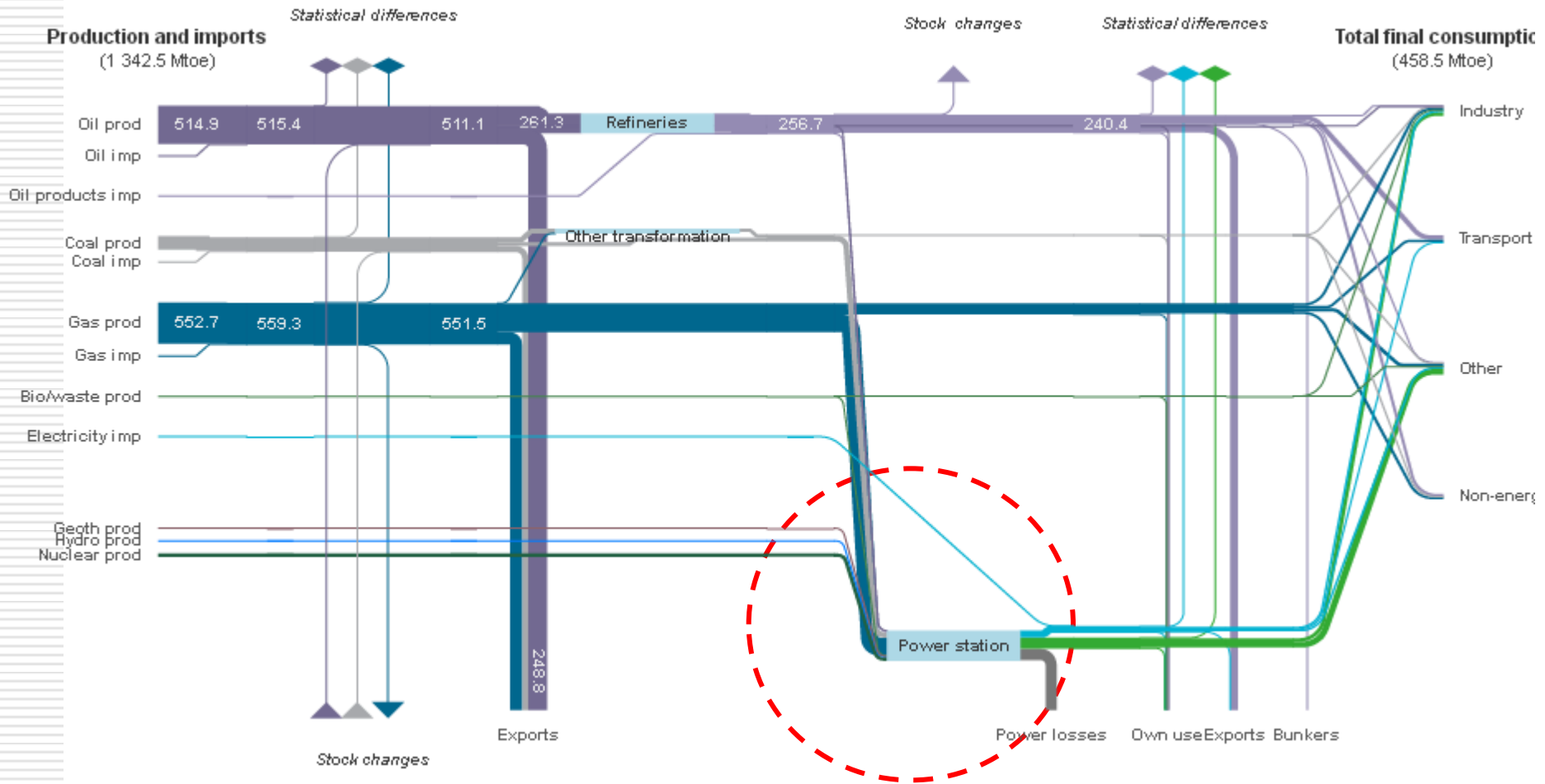


- ❖ **Current situation**
- ❖ Actual development trends to 2020
- ❖ Restructuring and market reform – results and new horizons
- ❖ Investment options and capacity market alternatives
- ❖ New pricing policy – effects from suppressing of gas and electricity tariffs

## Russian Electricity Market: a sector overview

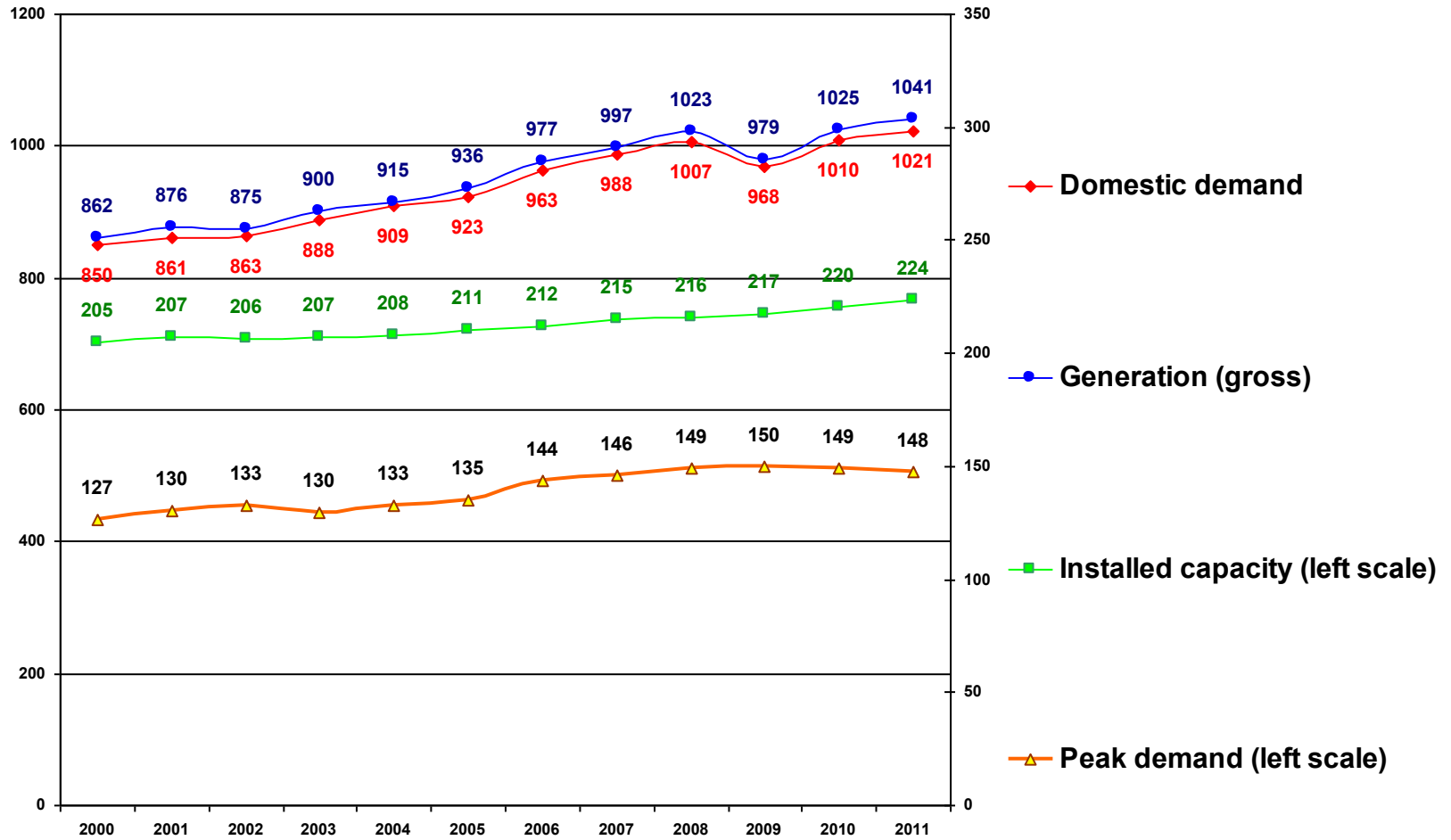
- ❖ One of the largest in the world - installed capacity in 2011 near 224 GW and annual generation near 1040 TWh
- ❖ Covers the largest area of electricity supply - total length of T&D lines exceeds 2.5 million kilometers
- ❖ Centrally dispatched – 500+ power plants (from St. Petersburg to Far East) are synchronized within the national-wide Unified Power System
- ❖ Highly integrated with regional heat markets – CHP plants represents near a half of total thermal generating capacities and 37% of total installed capacity.
- ❖ Diversified supply - 2/3 of total capacity are thermal plants, hydro forms 21% and nuclear 11%, but other renewables are negligible (less than 1%)
- ❖ Highly gas depended – near 70% of total fuel consumption, over 85% in the European Russia
- ❖ Low thermal efficiency – 37% in average

# Electricity as an integrated part of Russian energy sector



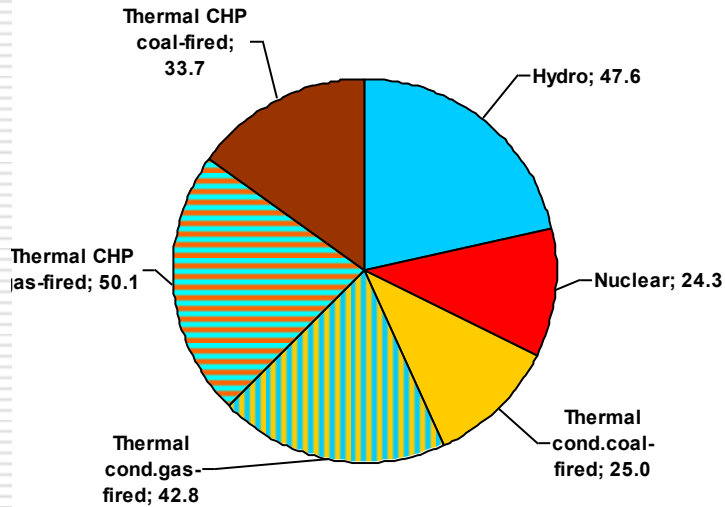
RF energy flow diagram (2011)

# Production and demand growth

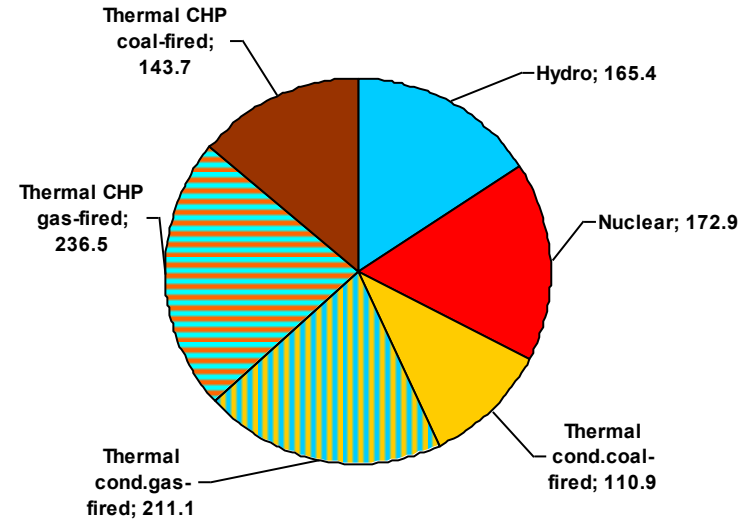


# Capacity and generation structure

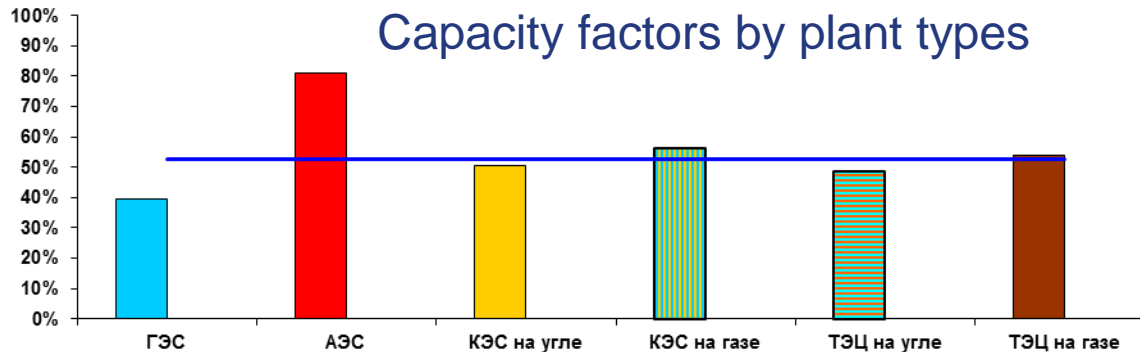
## Installed generation capacities, GW



## Electricity production, TWh

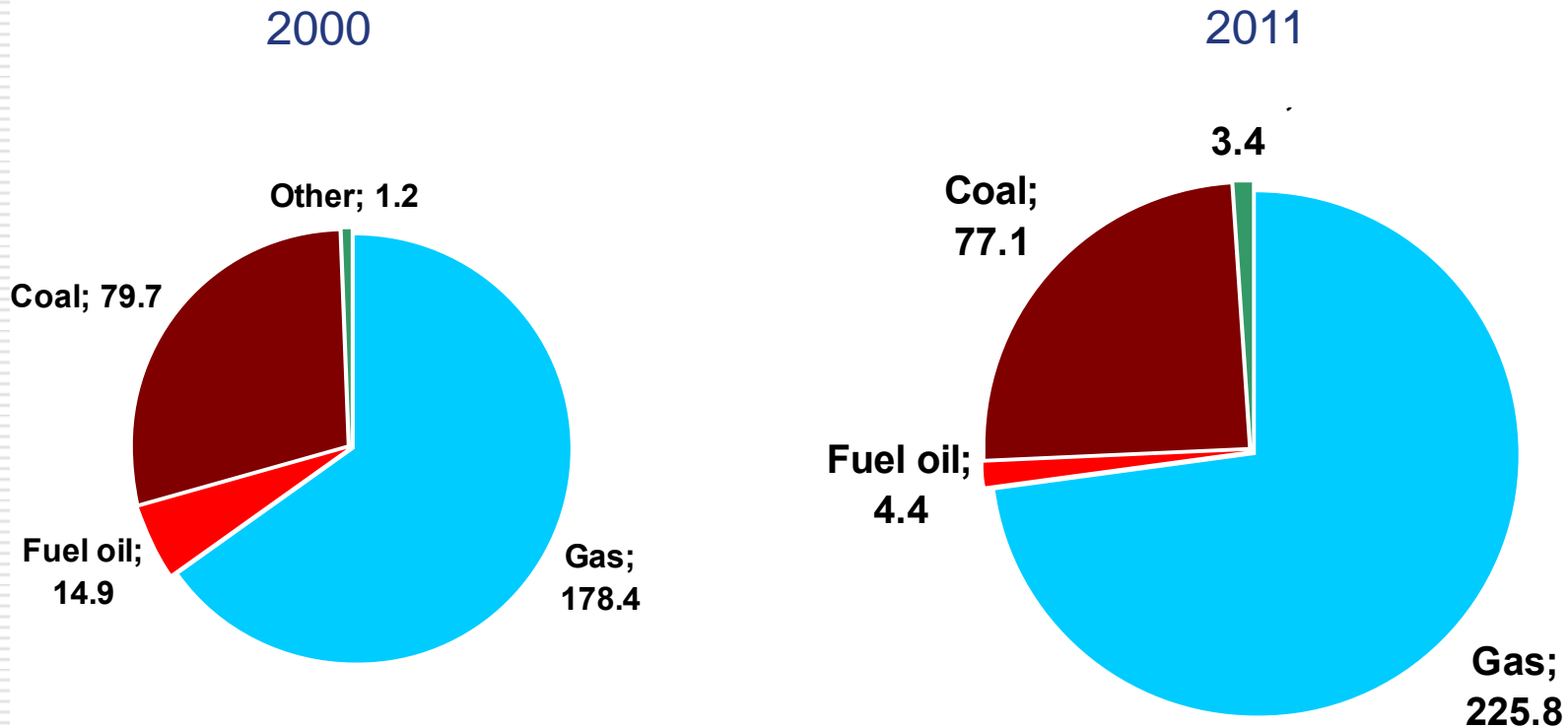


## Capacity factors by plant types



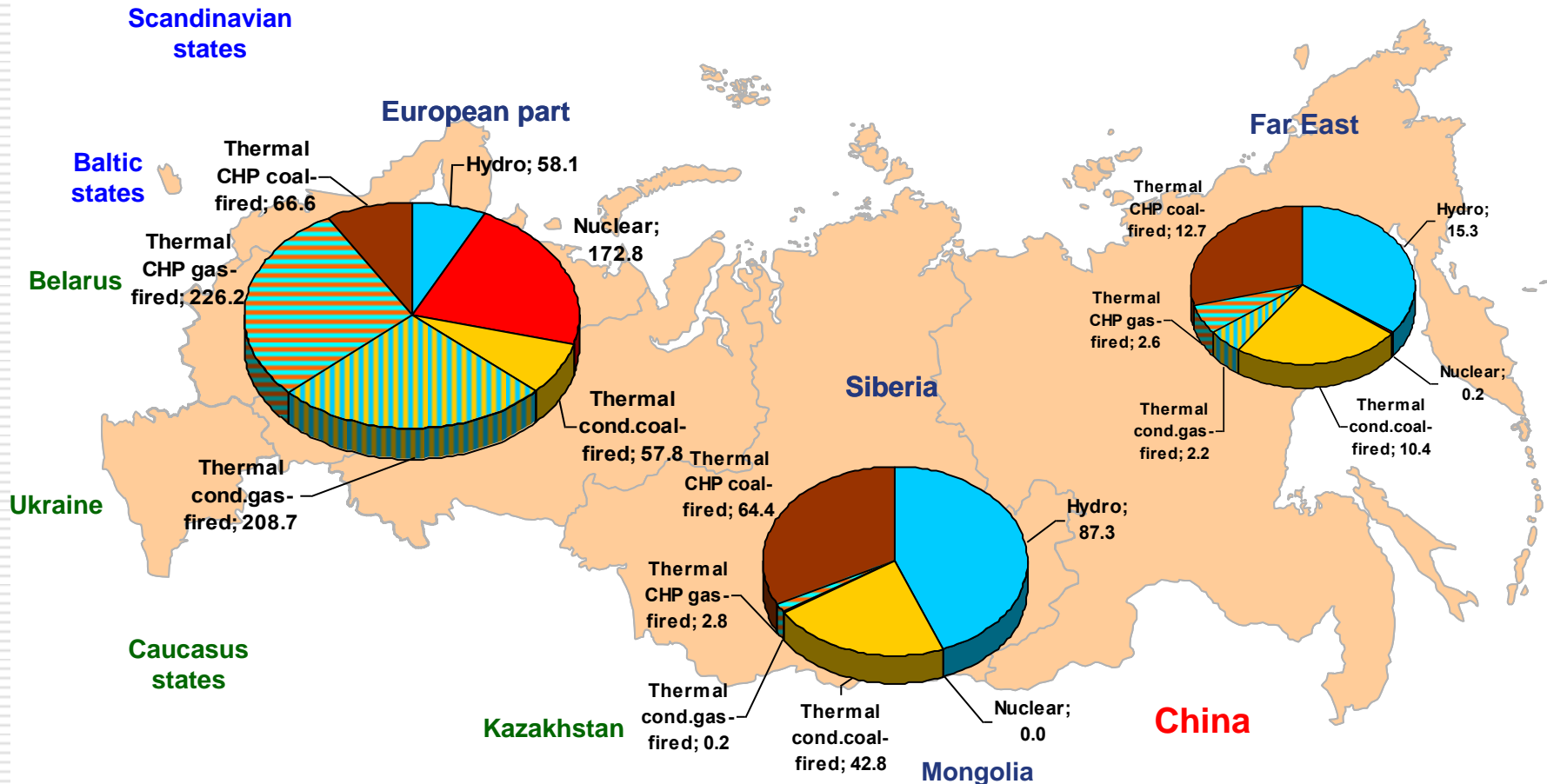
# Fuel consumption for electricity and heat

Thermal plants' fuel demand, Mtce



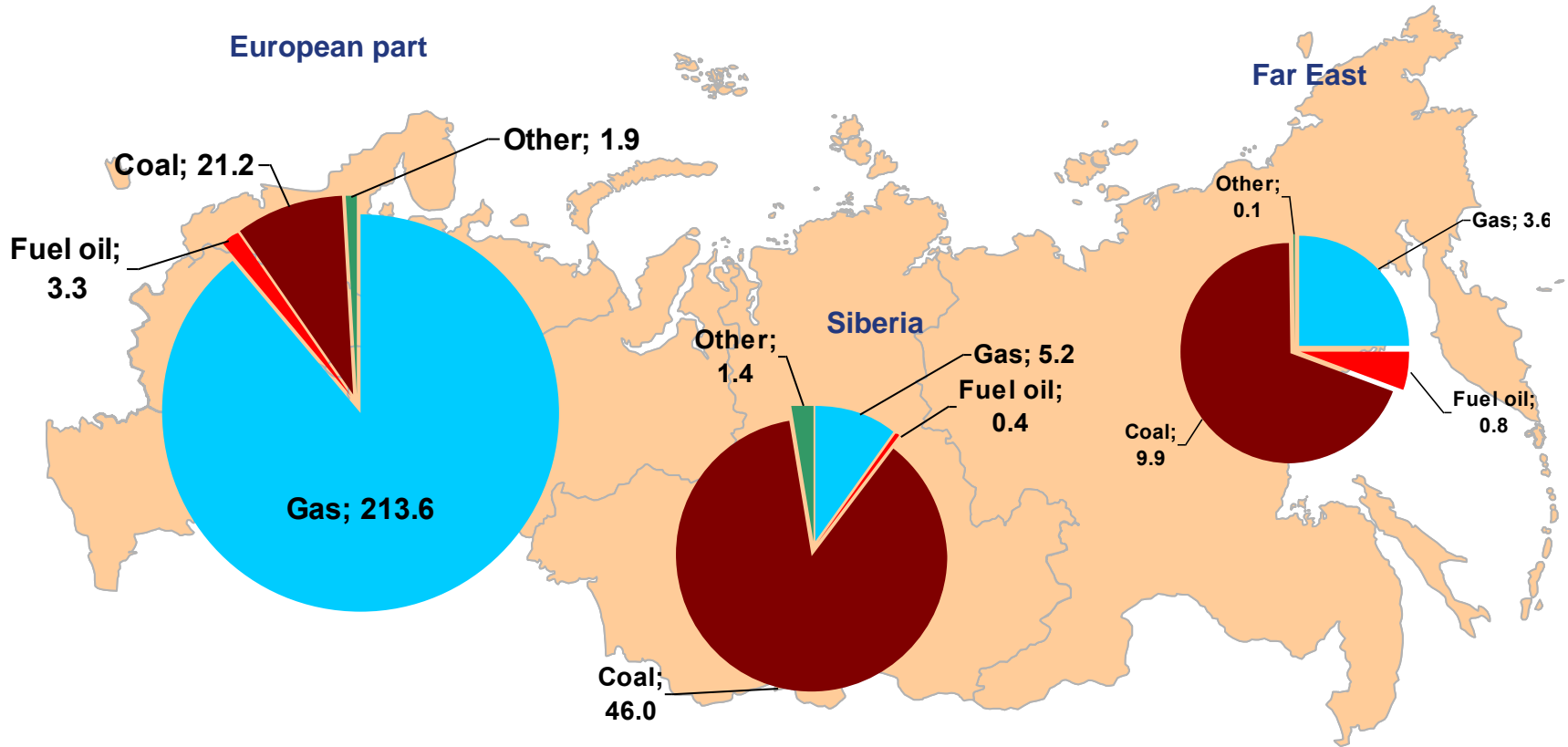
Gas is dominating in the fuel mix of Russian electric power sector. Its share increased from 65 to 73 % together with the decrease of fuel oil (from 5% to 1,4%) and steam coal (from 29% to 25%)

# Regional differences in production structure (2011 production, TWh)

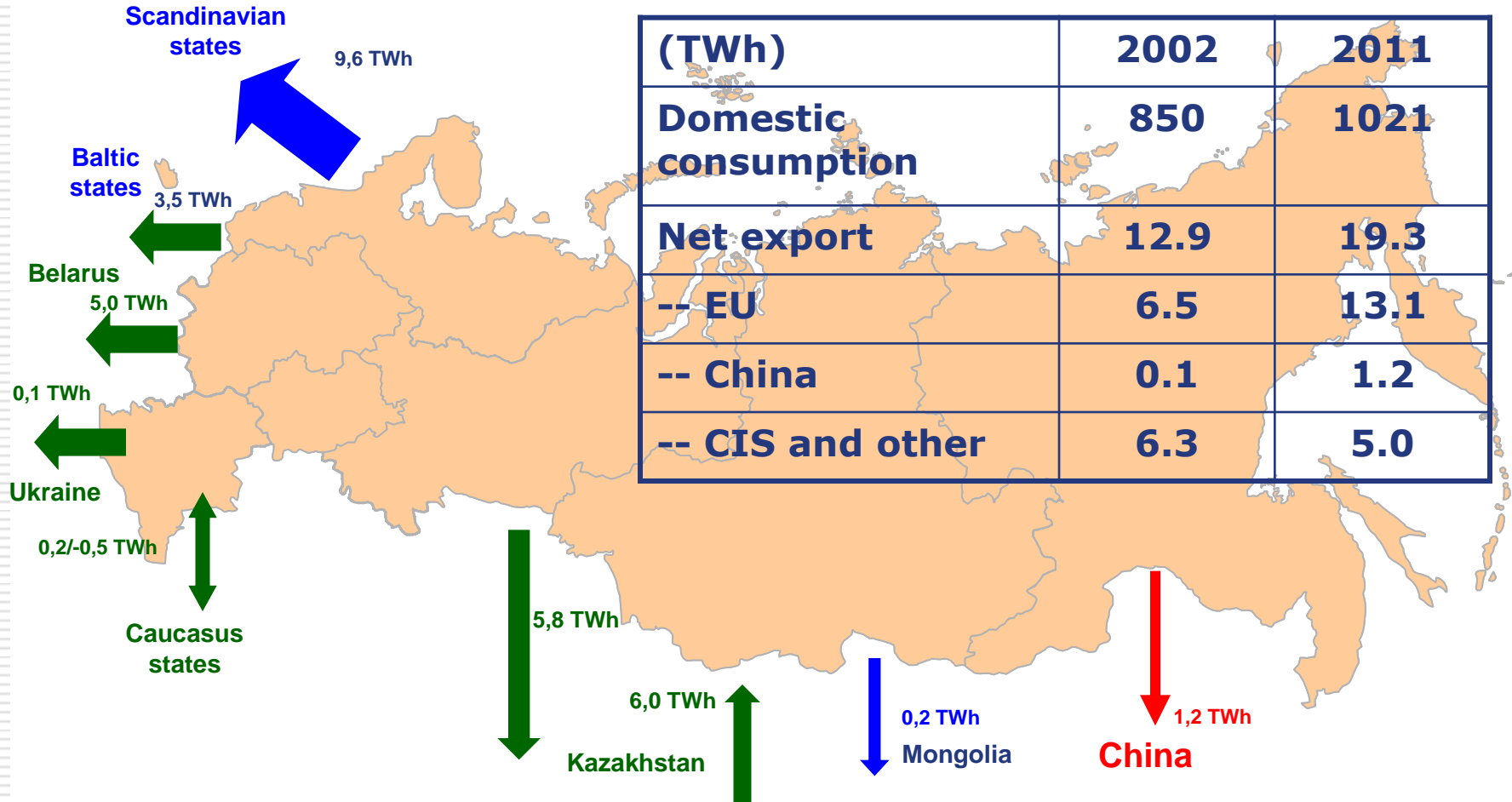


In the European part generation is based on gas and nuclear, whereas in Eastern parts hydro and coal plants dominate

# Regional differences in fuel mix (2011 demand, Mtce)



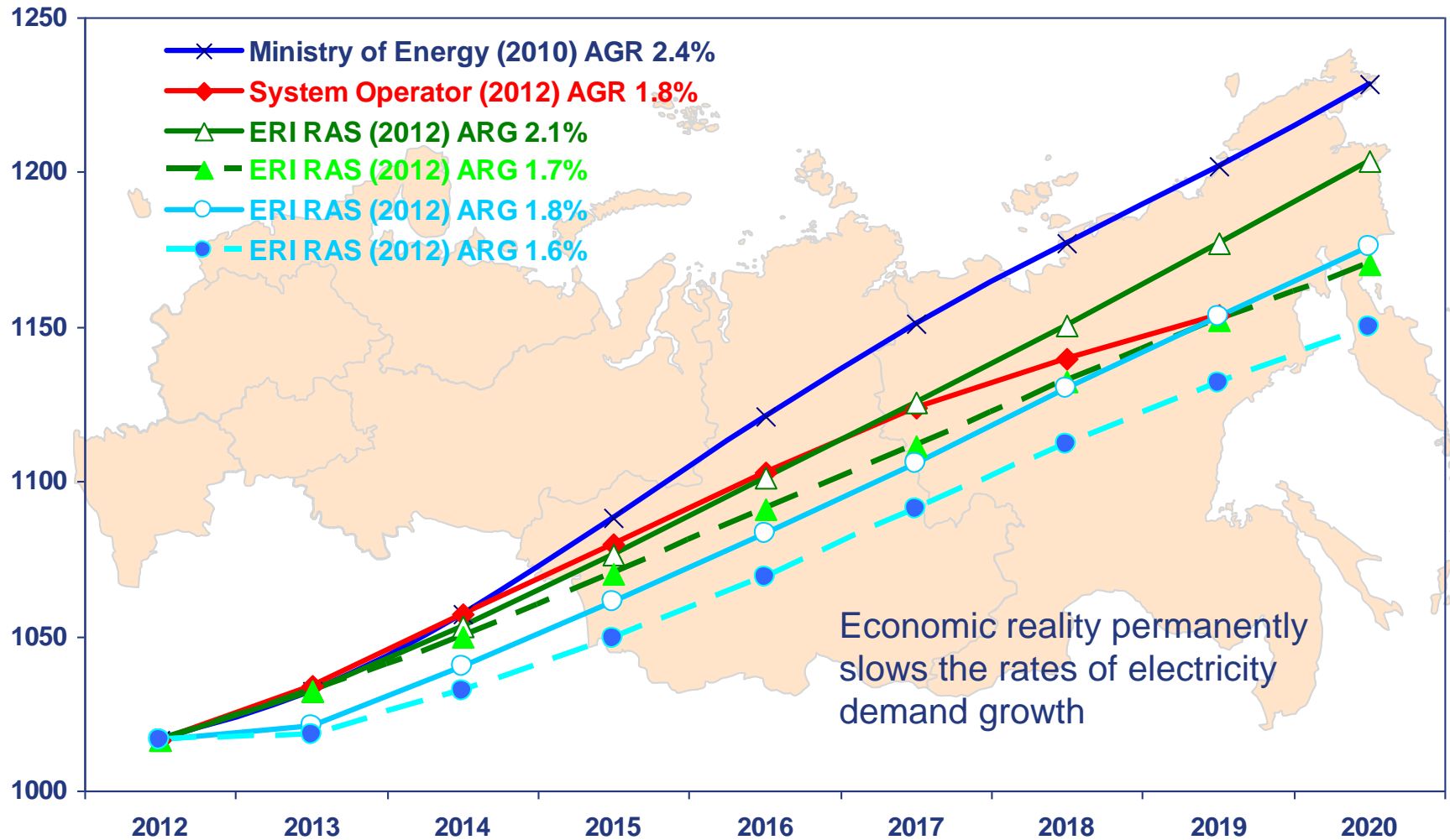
# Electricity export routes



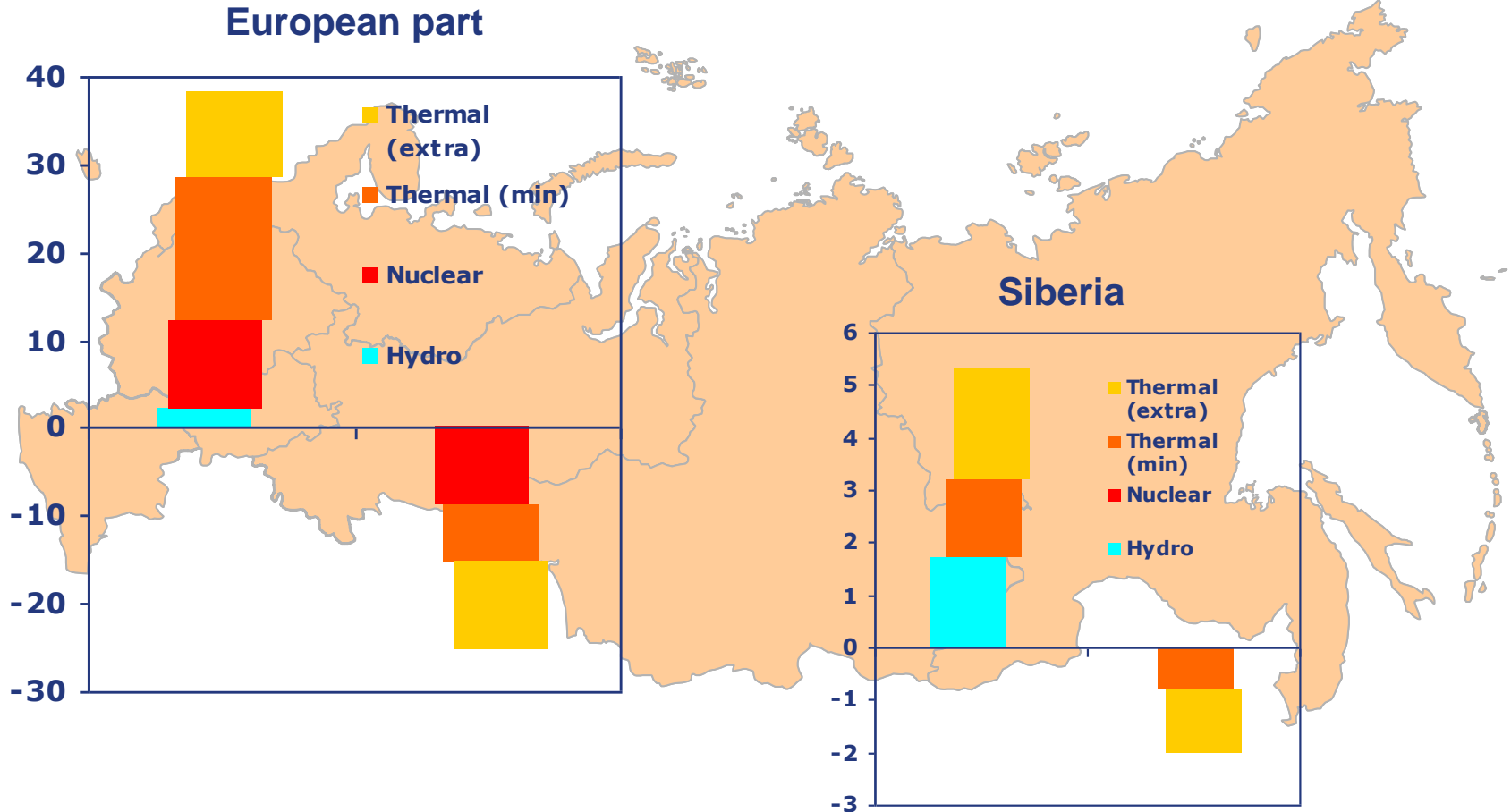
Domestic wholesale prices already create risks for the export possibilities. In 2012 the flow to Finland became reversed at the hours of high prices

- ❖ Current situation
- ❖ **Actual development trends to 2020**
- ❖ Restructuring and market reform – results and new horizons
- ❖ Investment options and capacity market alternatives
- ❖ New pricing policy – effects from suppressing of gas and electricity tariffs

# Electricity demand forecasts

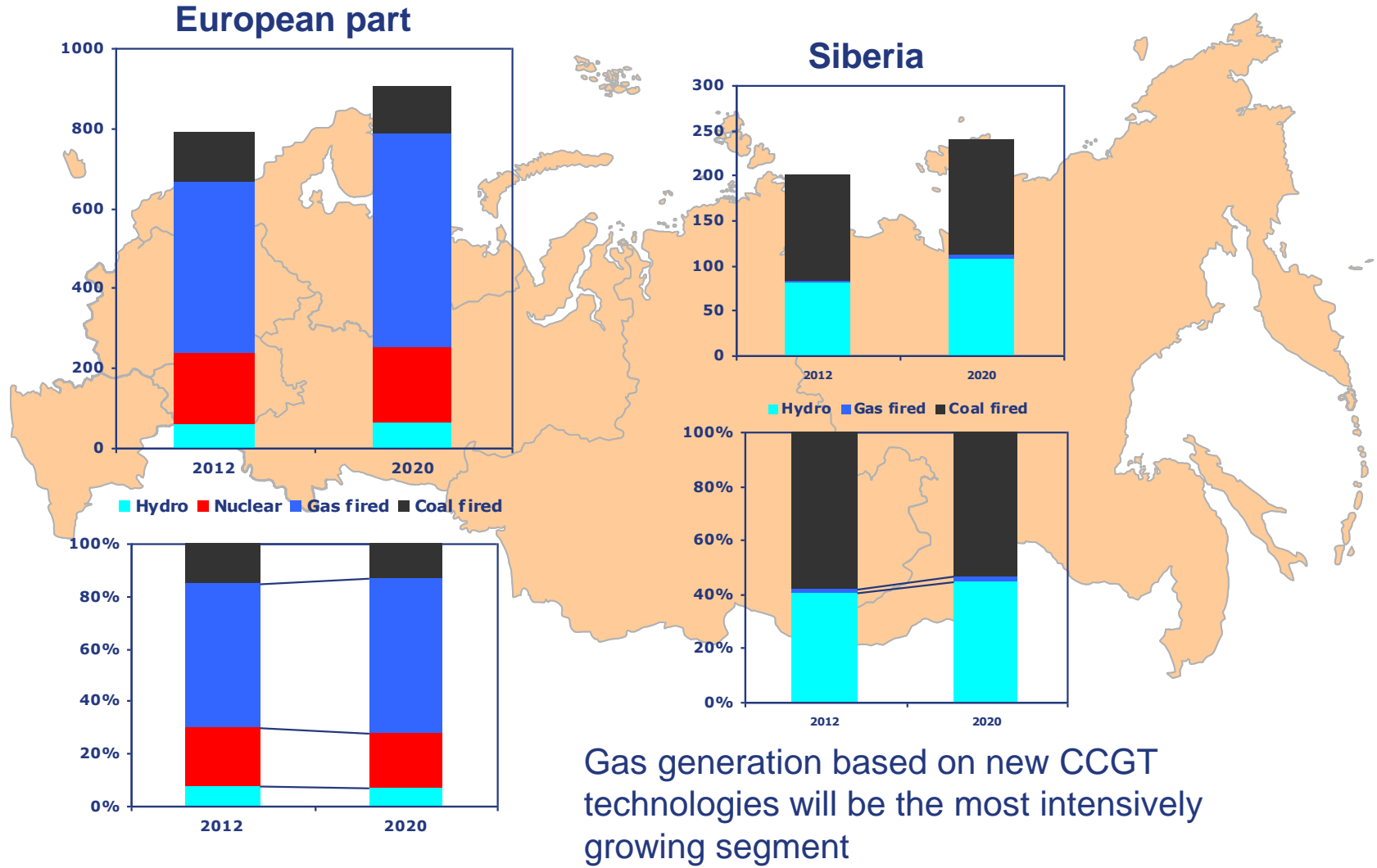


# Capacity additions and deteriorations, GW

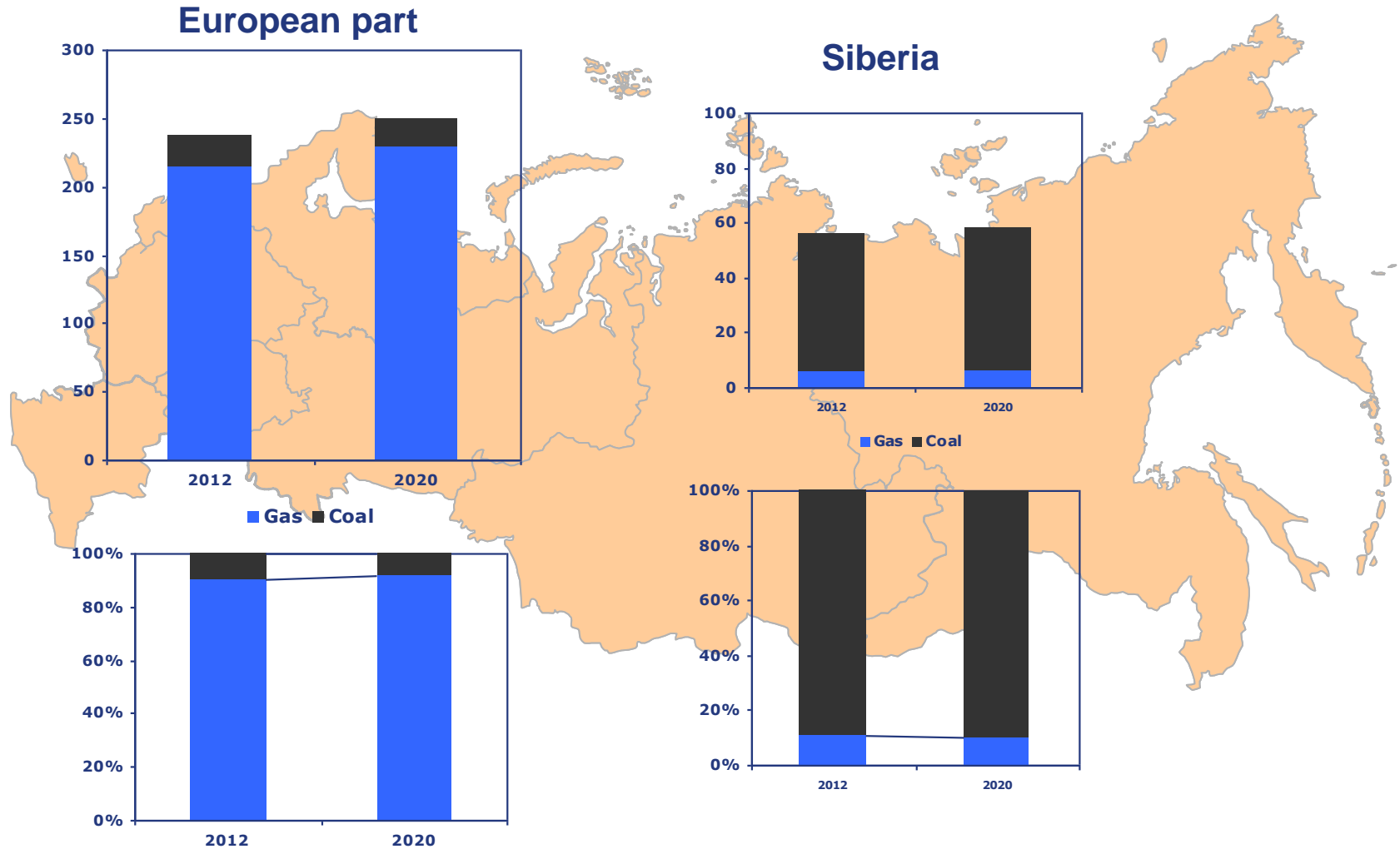


Most capacity additions are required to substitute the deteriorated old plants. But “extra” investment decisions are contained by the market rules’ uncertainties, mainly - the mechanism of the return on additional investments (capacity market, contracts, etc.)

# Changes in generation structure, TWh



# Changes in fuel consumption, Mtce



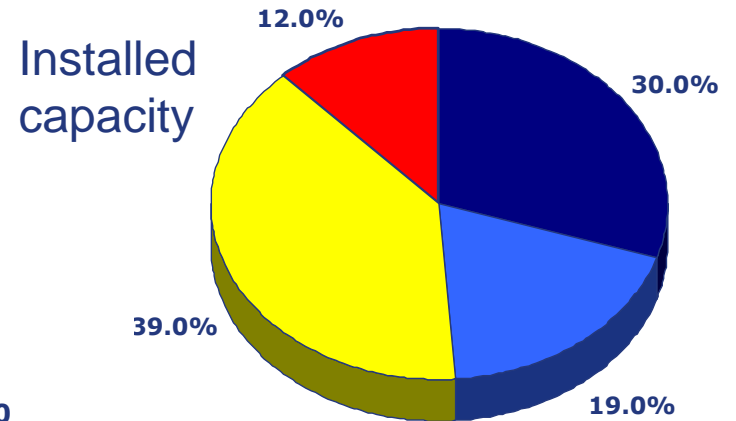
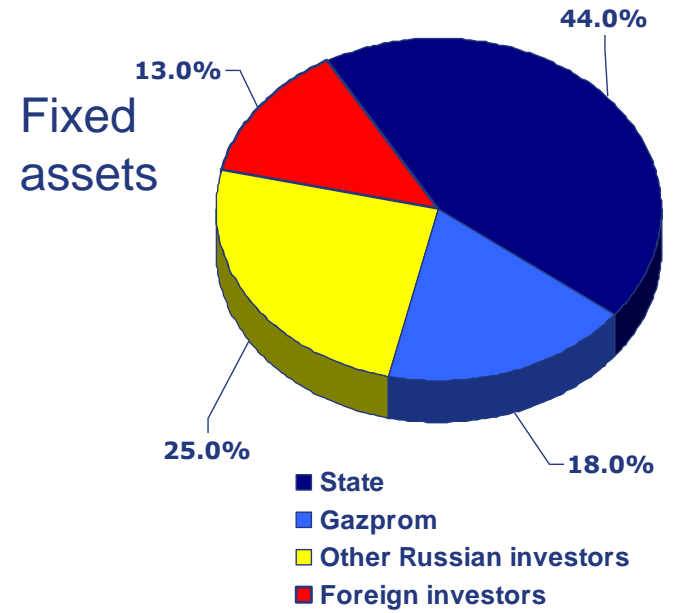
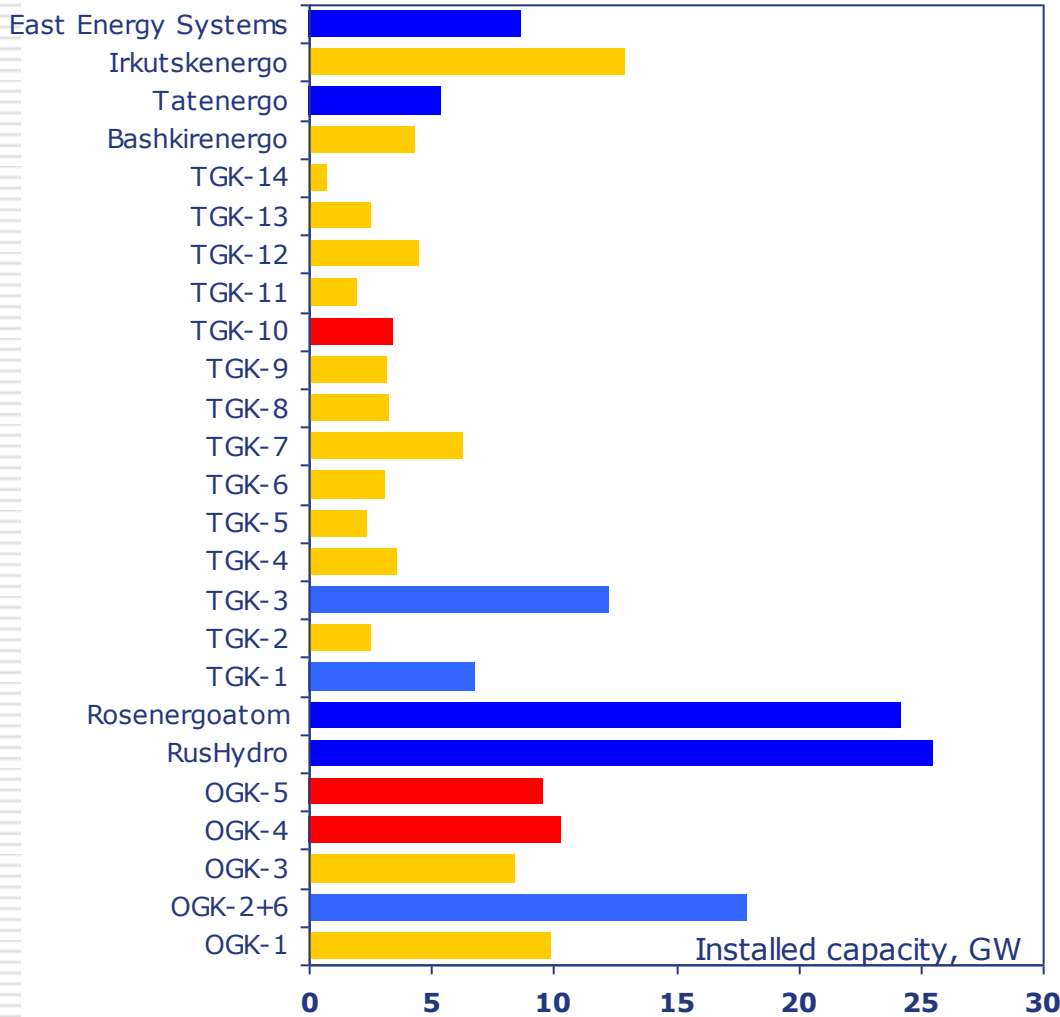
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## Restructuring process

Type of activity	Market agents	Degree of state control
Thermal generation	~30 GenCos	Private investors control < 25% of generating assets (~50 GW)
Hydro generation	Rushydro	> 50%
Nuclear generation	Rosenergoatom	100%
Dispatching	System Operator	100%
Grid	Federal Grid Company	>75%
Distribution	~ 60 Regional Grid companies integrated in 8 regional holdings	>50%
Retail	240 electricity supply companies	Most are privatized

Over 70% of fixed assets in the power sector are concentrated in the state-owned or state-controlled companies.

# Thermal generation – privatized but state controlled



## Pricing mechanisms in the power sector

**Electricity generation  
(hydro, nuclear, thermal,  
incl. CHP)**

- Competitive electricity markets (day ahead and balancing)
- Competitive capacity market (year ahead)
- Capacity supply obligation (DPM) RAB-based tariffs for capacity additions
- Electricity and capacity supplied at regulated tariffs (limited amount for households only)
- Competitive market of ancillary services

**Transmission and  
distribution**

- RAB-based regulated tariffs for transmission services and distribution of electricity

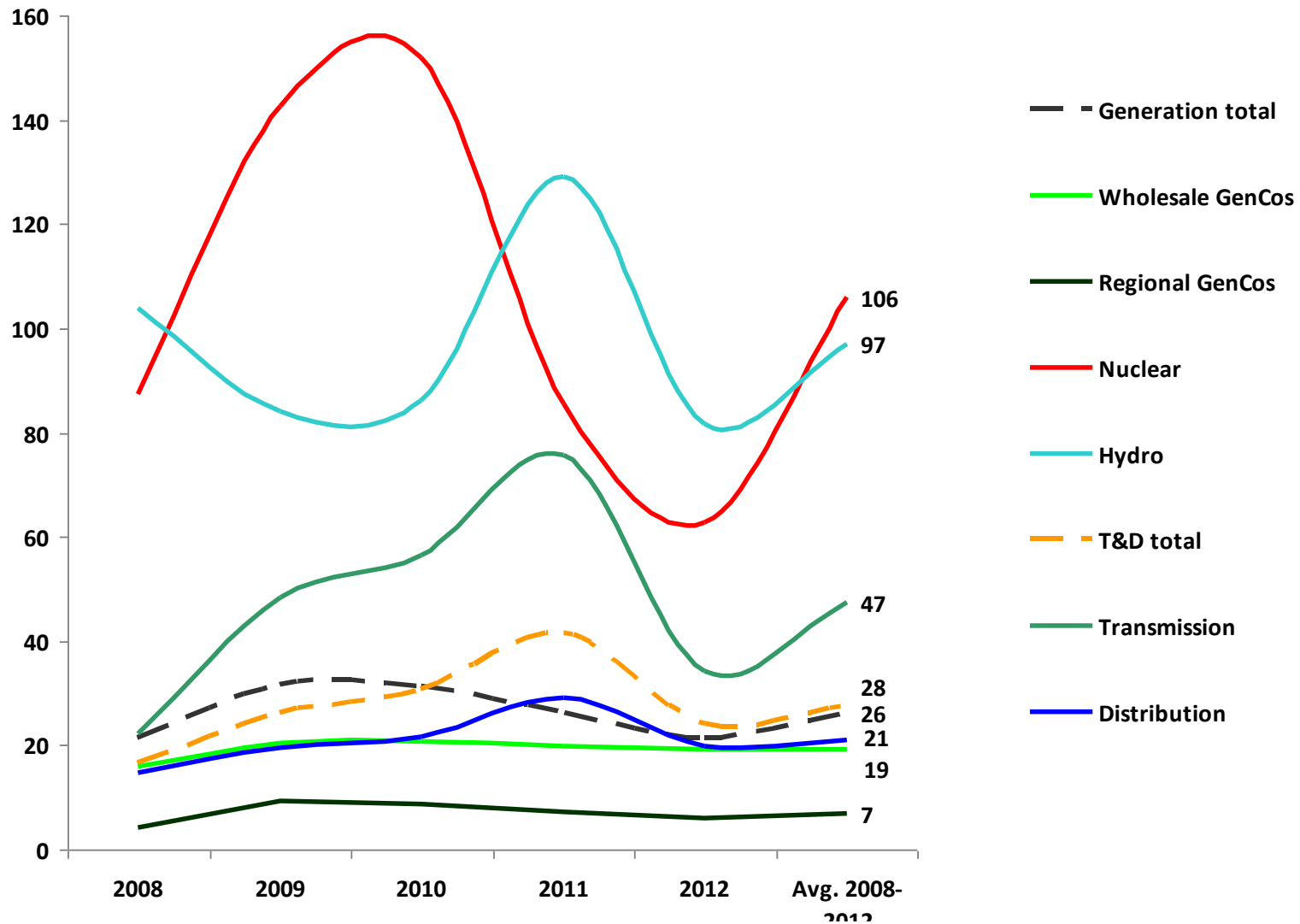
**Electricity supply**

- regulated tariffs for the supplier of last resort (guaranteed supplier)
- non-regulated fee for other suppliers

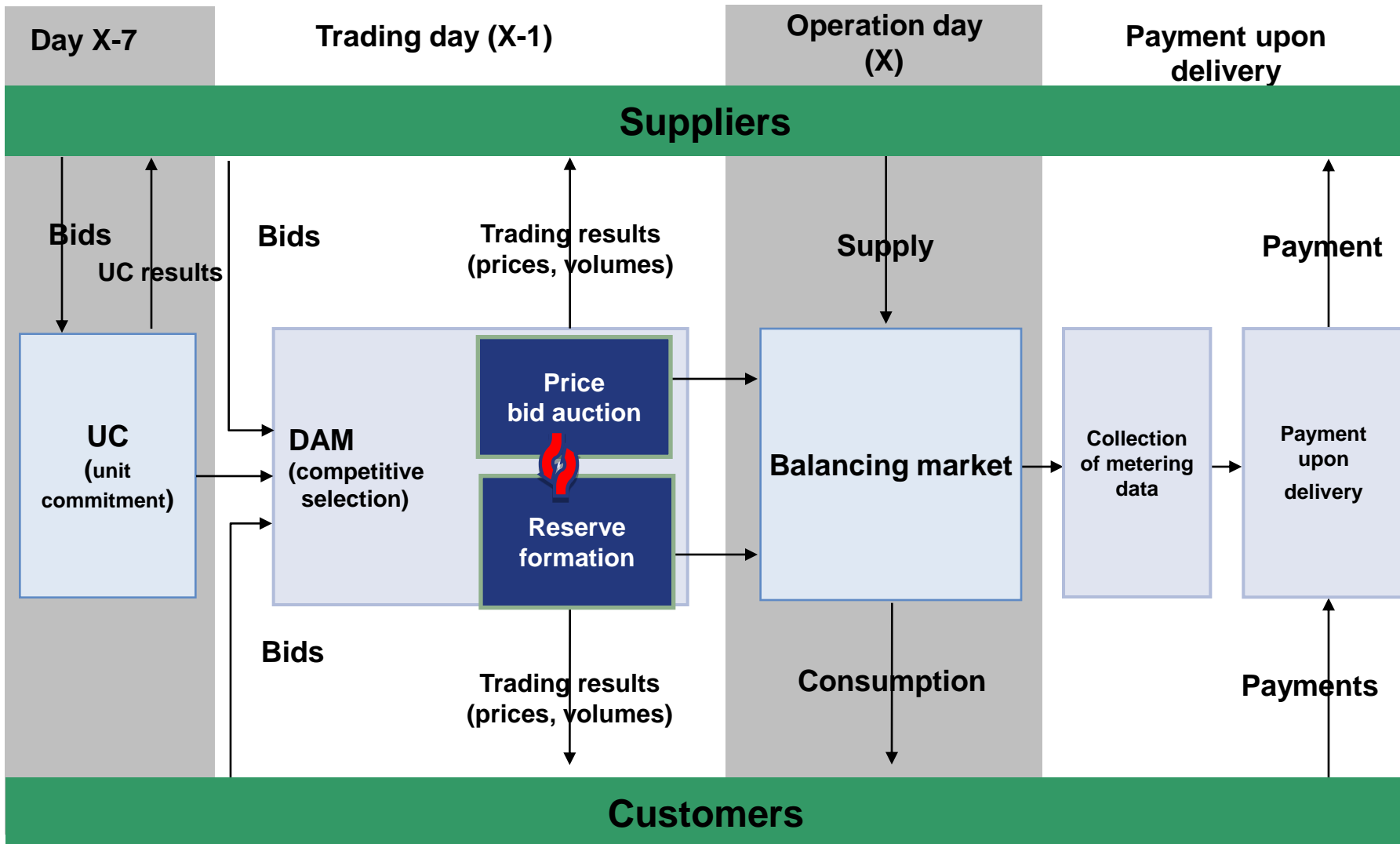
**Heat supply (incl. CHP)**

- regulated tariffs for the centralized heat supply at regional level (often inadequate to the real cost of supply)

# Current mix of pricing mechanisms provide unequal profitability within the power sector (earnings to costs ratio)



# Operation of the Competitive Wholesale Electricity Market (DAM+BM)

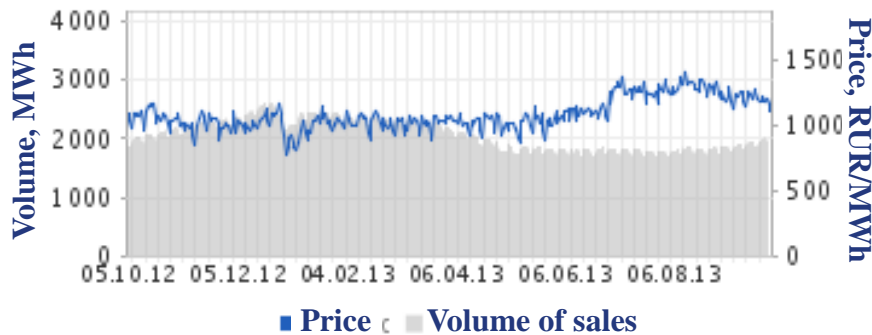


# DAM: Nodal pricing, hubs and zones

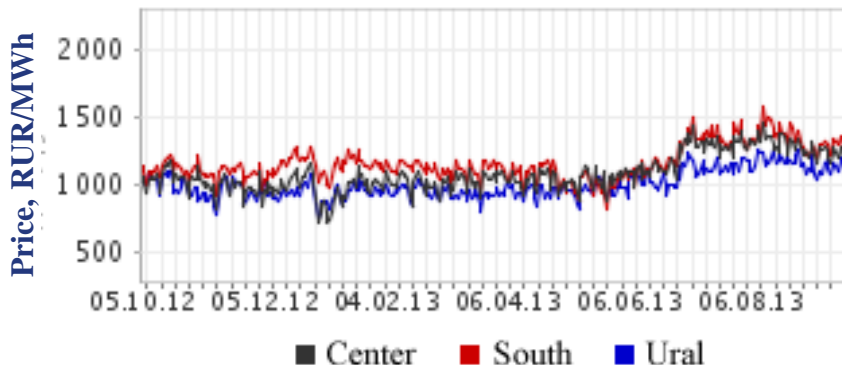
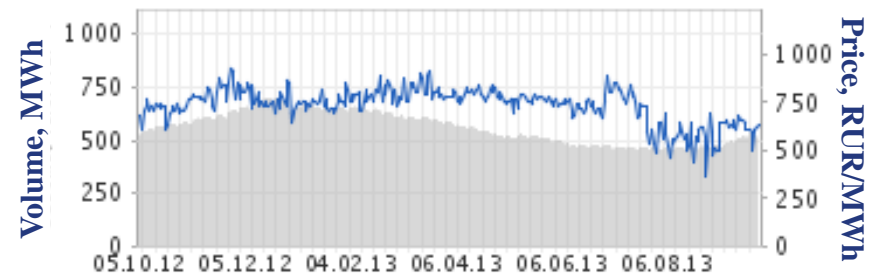
DAM is normally organized and functioning as a market with nodal pricing (over 8000 nodes). 2 pricing zones (European and Siberian) are considered separately in the market analysis due to the different price levels caused by the capacity mix and fuel prices

Nodes with high statistical correlation of prices are integrated into 5 price hubs. Hub price is considered as a reference index for the bilateral contracts for electricity as well as for the futures

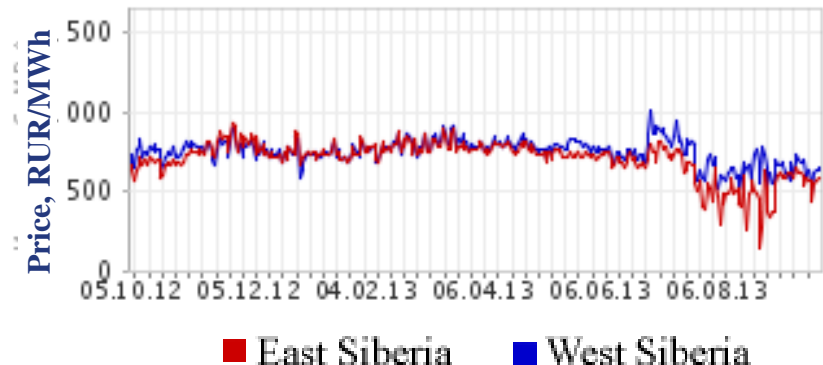
The first price



The second price

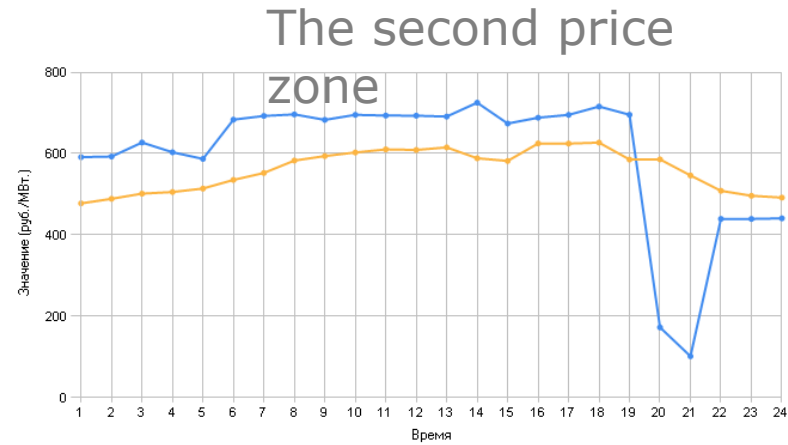
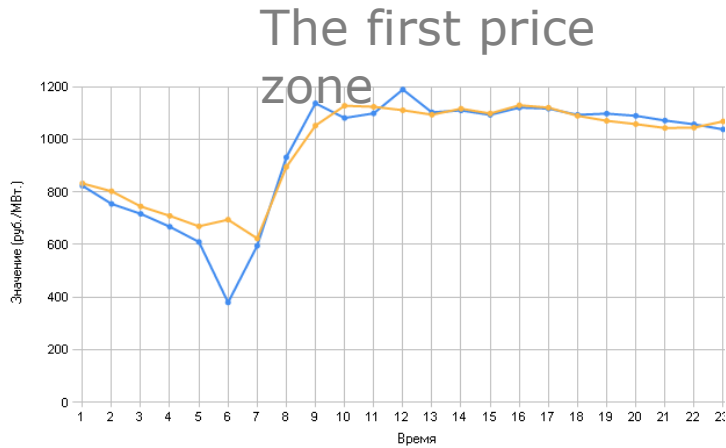


The second price sales



# Balancing Market price indicators

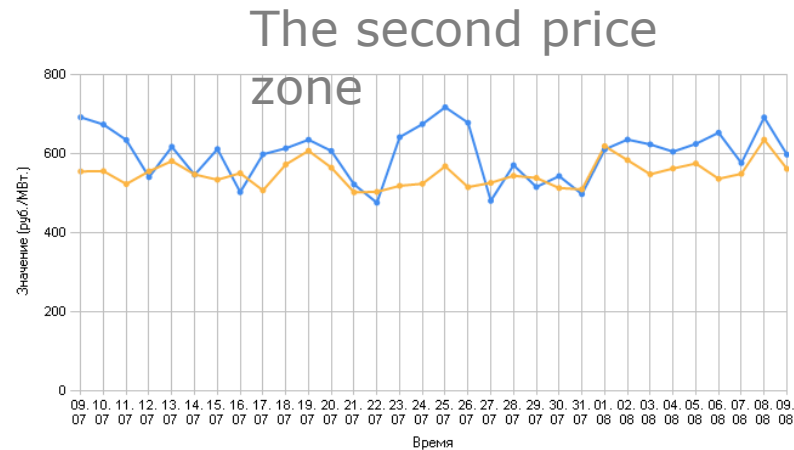
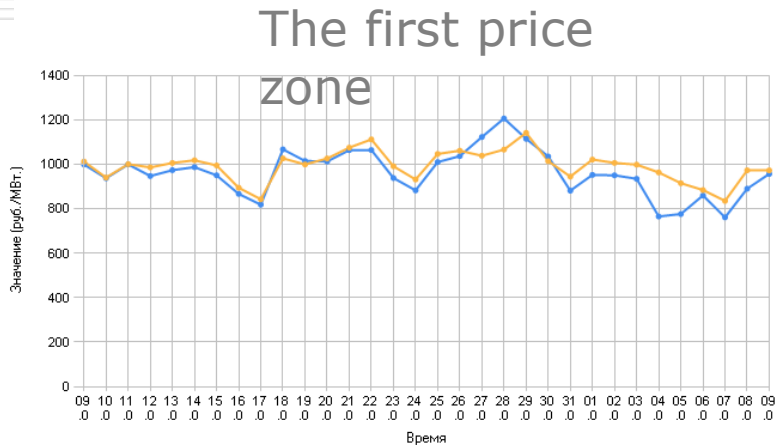
## Daily price profile by zones



BM price

DAM price

## Monthly price profile by zones



BM price

DAM price



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## Capacity Market: KOM

**Zonal pricing is used to take into account transmission constraints between Free Flow Capacity Zones (29 in 2008 and 25 in 2011 with further decrease to 4-8 zones)**

- 4-year ahead market bids (supply for year N+4)
- Unified price within each FCF zone based on the marginal bid
- 85% of supply rule for the pricing (15% of the most expensive bids are not accounted in price setting and obtain the individual capacity tariff)
- Market power control (overlapping limitations):
  - Cap price may be applied in the FCF zones with a lack of competition
  - Control for the affiliated generators (obligation to be price-takers up to 75% of cumulative capacity)
  - Control for the economical reasonability of capacity bids (incl. direct benchmarking of costs and estimation of revenues from electricity market)

## Capacity Market: KOM

### Actual progress – the process still not finalized

- only 1-year ahead (next-year) capacity market operates – **it does not form the balance/pricing prospects for new projects**
- competitive pricing is allowed in 3 largest zones only, cap prices are set in other Free Capacity Flow zones
- a lot of generators that were not pass the capacity bid optimization procedures and were not included in the balance, were qualified as must-run system generators and consumers must additionally pay for these capacities at higher prices
- heat market remains politically regulated – heat tariffs in the regions are still often lower than the true cost of heat supply; but revenue losses of CHP at the heat market are not allowed to account in the capacity bids – as a result, CHP have low (or negative) profitability.

## Capacity Market: DPM

**Capacity Supply Contracts (DPM): an obligation of the generator to introduce new capacity with specified characteristics within a set period with guaranteed payment for the commissioned capacity for a specified period**

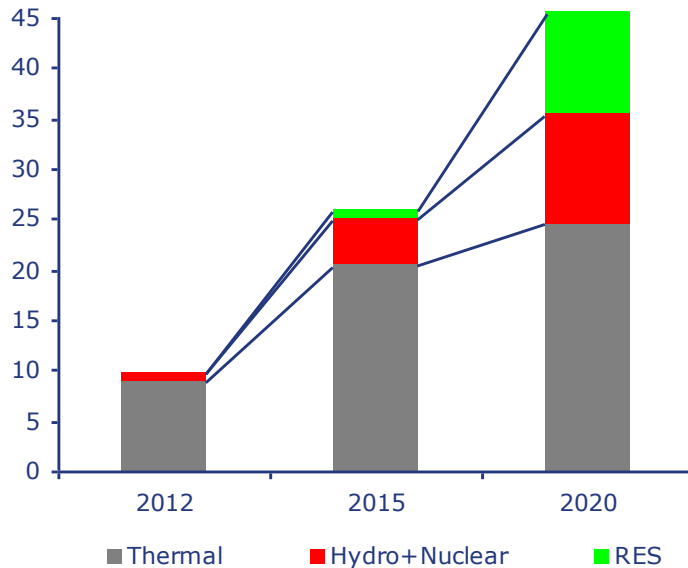
**To ensure the investment process under the weakness of competitive mechanisms new system of capacity supply contracts has been designed.**

- These contracts provide physical supply of additional capacity from generating companies
- Their implementation is controlled by SO and penalties up to 25% capex are assumed for the delay in commissioning obligations
- Guaranteed capacity price ensuring return the investment (10 year for thermal plants, 25 years – for nuclear and hydro)
- Cost parameters are fixed and excessive expenses will not be compensated (own risk of generators):
  - opex and capex by types of thermal plants
  - revenues from electricity market (spark spread)
  - rate of return on capital

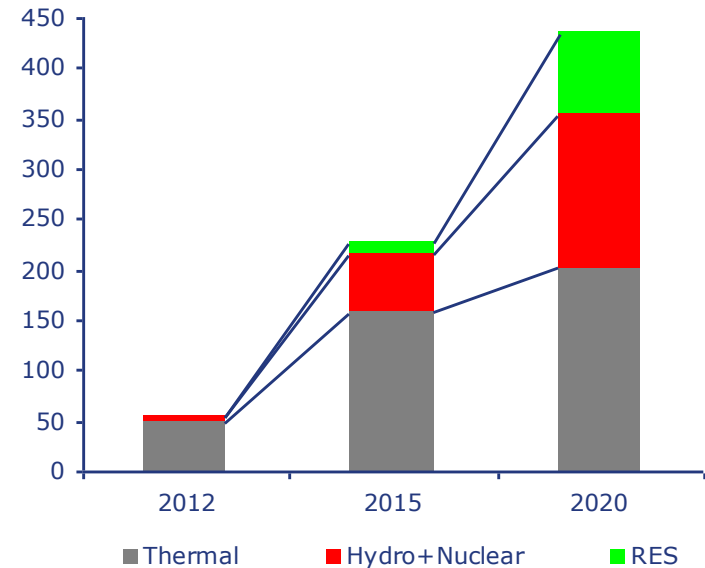
# Capacity Market: DPM

At present CSC are signed for 24 GW of thermal , 10 GW nuclear and 1.5 GW hydro capacities. In 2012 the same approach was adopted for RES plants

**Cumulative capacity additions under Capacity Supply Contracts, GW**



**Annual payments under Capacity Supply Contracts, bln Roubles**



✦ provides guaranteed return on investments

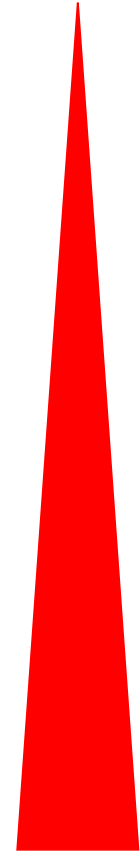
- non-competitive administrative not market-driven procedure
- overinvestment and excessive pressure to consumers

## Future developments of the market – impact on investments and prices. Capacity market development and alternatives

At the wholesale level the key uncertainties are related with the future of capacity market:

- Case 1 – centralized long-term capacity market with marginal pricing jointly for existing and new capacities
- Case 2 – separate centralized long-term capacity markets for existing and new capacities. Marginal pricing for existing capacities only, new capacities obtain prices at their bids or cap price (adequate to the RAB level based on typical capex, opex and a cost of capital)
- Case 3 – decentralized transactions based on the bilateral contracts between suppliers and consumers. Centralized market for the deficit of peak capacity requirements.

*Risk of double marginal pricing and excessive profit of generators*



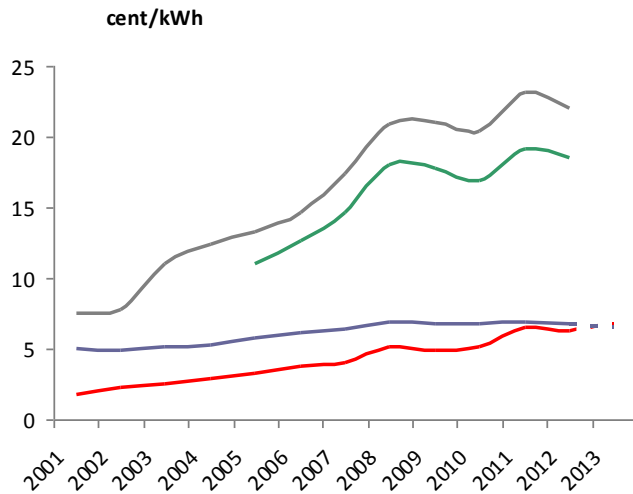
*Risk of inadequate signals from short-term contracts*

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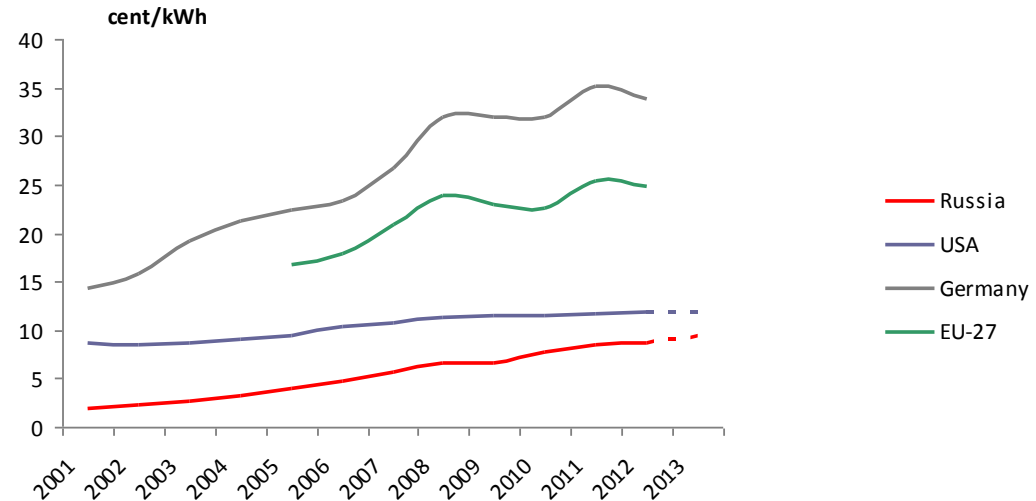
# Electricity prices as a factor of global competitiveness

In the last decade electricity prices for industrial consumers increased in 3 times due to the gas prices (4.5 times growth) and the existing pricing mechanisms in the electric power sector. This trend creates strong risks for the competitiveness of Russian economy because the prices for industrial consumers reach the US level

**Retail prices for industrial consumers**



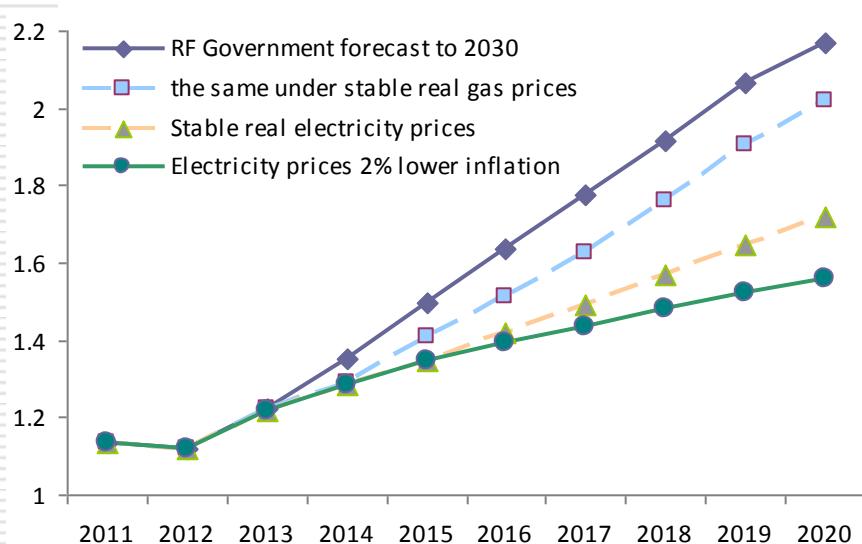
**Retail electricity prices for households**



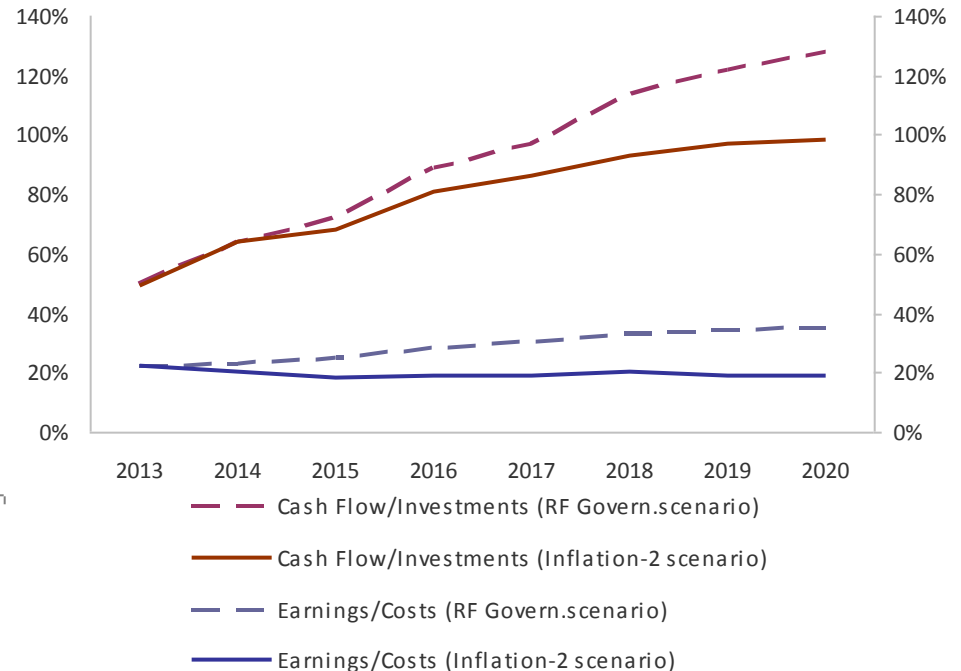
# Scenarios of the electricity prices suppressed growth and their impact on power sector

New pricing initiative assume to stable the growth of gas and electricity prices at the level of inflation (i.e. fixed in real terms) or even 2% lower for electricity. At this the power sector will maintain the good profitability and enough financial resources for the development with the better efficiency

**Scenarios of retail electricity prices, Roubles/kWh**

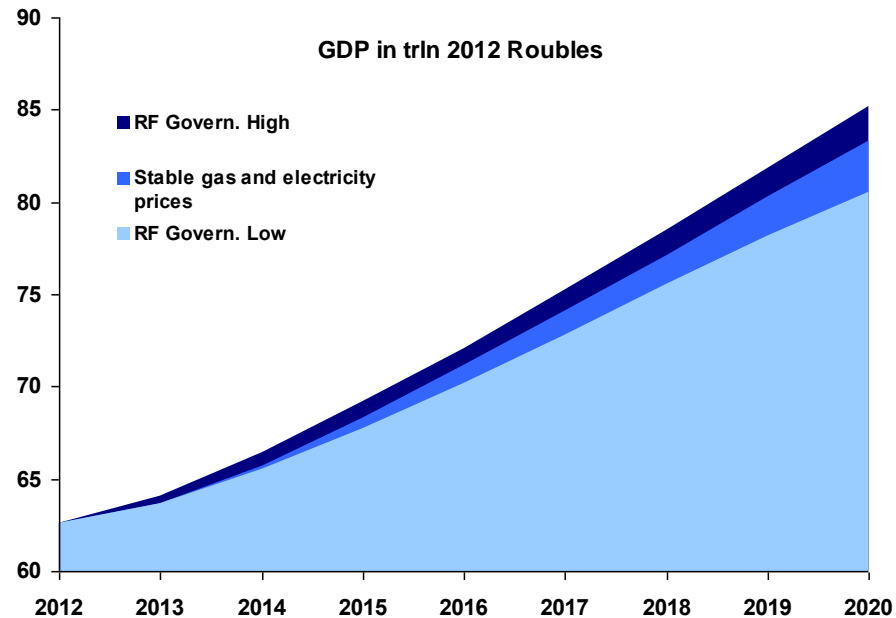


**Financial parameters of the electric power sector**



## Impact of new prices policy on GDP growth

Stabilization of electricity prices (in real terms) will lead to approach from the Low to High scenario of Russian economy development. Additional GDP growth will account >50% of the budget expenses on education or healthcare



### GDP growth rates

	2013	2014	2015	2016	2017	2018	2019	2020	2020/2012
<i>RF Govern. High</i>	2.4	3.7	4.1	4.2	4.4	4.3	4.2	4.1	<b>3.9</b>
<i>RF Govern. Low</i>	1.7	3.0	3.3	3.6	3.8	3.8	3.4	3.1	<b>3.2</b>
<i>Stable gas and electricity prices</i>	1.7	3.3	3.9	4.1	4.1	4.1	4.1	3.7	<b>3.6</b>

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**Thank you for attention**