

Russian Wholesale Power Market

Description of the wholesale market model, its peculiarities and functioning



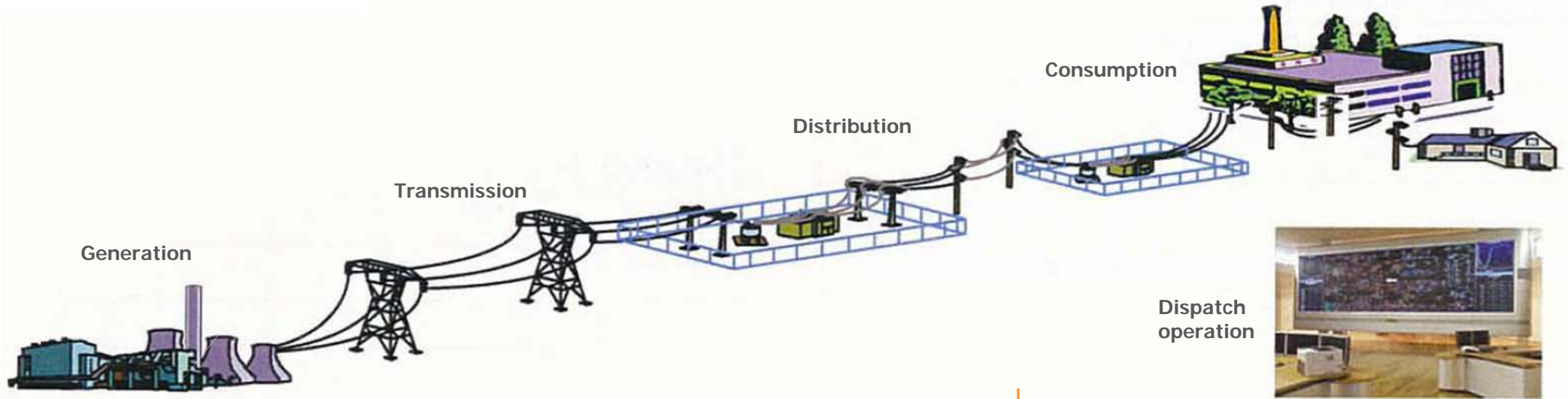
ENERGY BEYOND BORDERS

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Structure of the Power Industry in Russia



- **Generation:** Thermal Power Plants – 149 GW;
Hydro Power Plants – 44.5 GW;
Nuclear Power Plants – 24.5 GW.
- **Consumption:** Small-scale customers (connected to distribution networks, served by power supply companies);
Large-scale customers.

Competitive sector

- **Infrastructure:** Transmission – Federal Grid Company of Russia (220 kV and above network + cross-border interconnectors);
Dispatch – System Operator of Russia;
Distribution network operators;
Market operator – Administrator of the Trading System, Financial Settlements Center.

Two Levels of the Power Market



Capacity market

- System of economic incentives for the long-term availability of generation capacities for power generation;
- *Payments are meant to cover a part of fixed generation costs.*

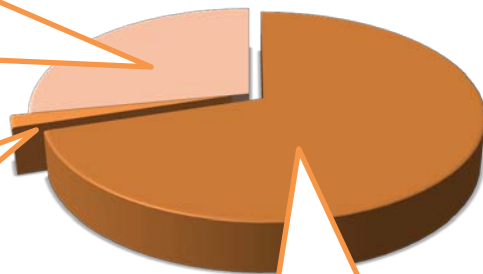
Ancillary services market

- Ensures system reliability by supporting additional equipment and technological functions.

Electricity Market

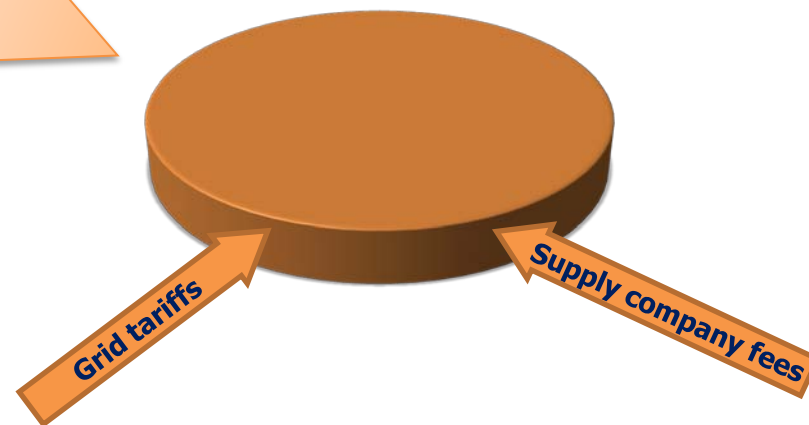
- Provides short-term reliability and cost efficiency;
- Enables the most efficient load of existing generating capacities;
- *Payments are meant to cover variable generation costs.*

Federal level Wholesale market



End customers cover costs of electricity generation, transmission, distribution and services buying electricity on retail market. Retail market price includes wholesale electricity price and additional charges (fees).

Regional level Retail market



- **Sellers:** Large Power Plants
- **Buyers:** Supply companies (including suppliers of last resort)
Large-scale consumers

- **Sellers:** Supply companies (including suppliers of last resort)
Small Power Plants
- **Buyers:** Consumers

Participants of the Wholesale Market



Demand side

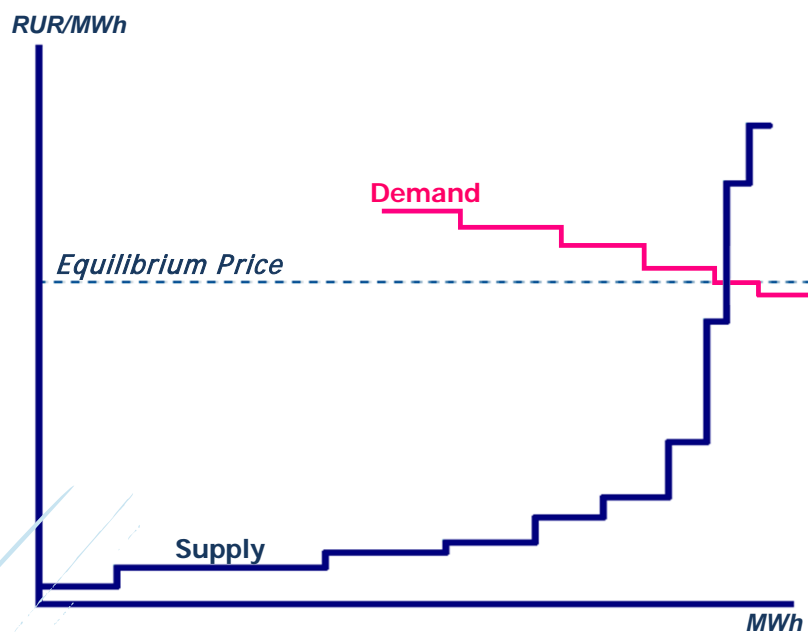
Power supply companies
(including suppliers of last resort)

Large industrial consumers

Export

Grid companies
(purchase electricity to compensate losses)

In total: around 220 buyers



Supply side

RusHydro
(owns most of the HPPs in Russia)

Rosenergoatom
(owns all NPPs in Russia)

INTER RAO UES

Gazprom Energoholding

Other generation companies

Import

In total: around 60 GenCos

Regulatory Authorities

Ministry of Energy
Federal Tariff Service
Federal Antimonopoly Service



The main element of the Electricity Wholesale Market is the **Day Ahead Market (DAM)**.

100% of electricity volumes that are anticipated to be generated/consumed during the next day are to be traded on the **DAM**.

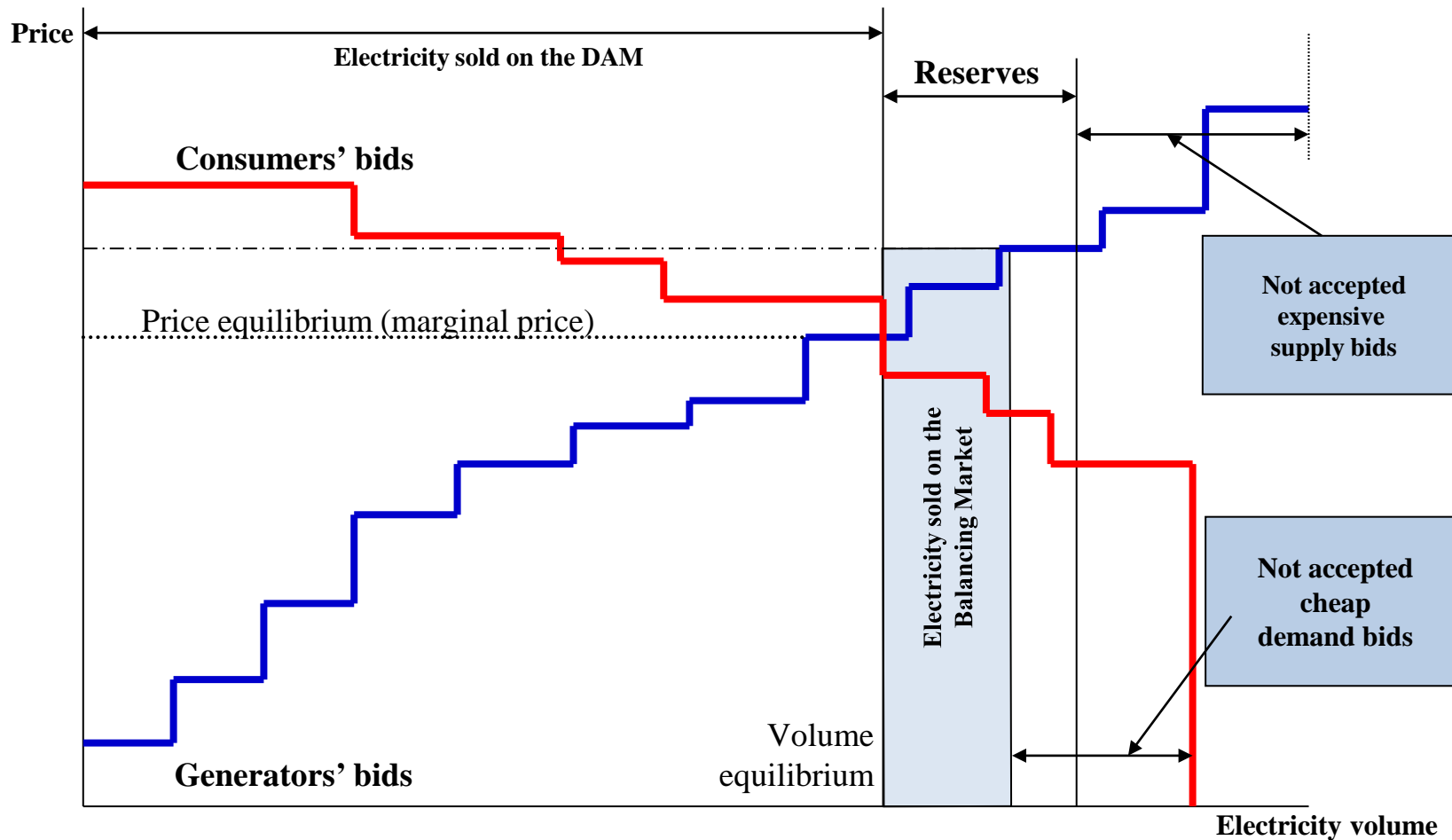
Market participants have a right to enter into free long-term bilateral contracts, both on the exchange platform and OTC. Such contracts are financial and are accounted for in the DAM trade.



Russia is using the “Nodal Pricing” Electricity Wholesale Market Model.

A **unique power system model** consisting of around **8000 nodes**, which considers the grid topology, transmission capacities, current bottlenecks and outages, is prepared every day for the Market Operator. The **price equilibrium is determined for each node** via this model by correlating competitive bids of buyers and sellers.

- The planned volumes of generation and consumption and corresponding prices in each node are determined on the DAM during day X-1 **for each hour of day X**.
- **Marginal Pricing** mechanism – price in the node is determined by the most expensive accepted generator's bid.



Determining prices for each node of the power system is a complicated optimization task.

Criteria for optimization – maximization of total welfare function with consideration to the current conditions (grid topology and current outages).

Wholesale Market – Electricity Segment

Main Advantages



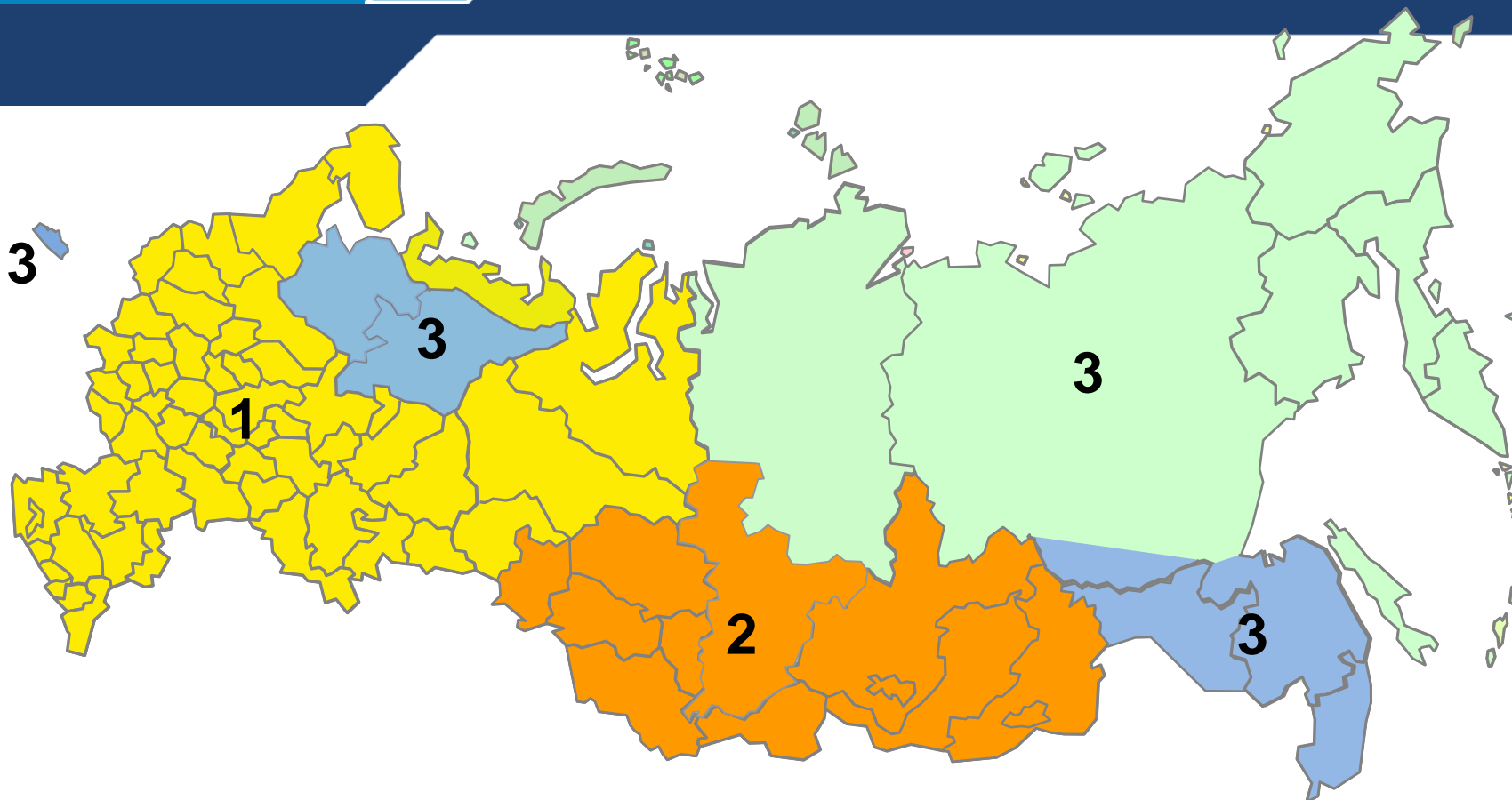
The incumbent Wholesale Electricity Market model creates **economic stimuli for:**

- Adequate planning of consumption volumes;
- Generators are economically motivated to adhere strictly to the issued generation plan or to the System Operator orders;
- Minimization of deviations from the planned regime by both generators and consumers.

Marginal Pricing mechanism creates a direct economic stimulus for generators to bid on the DAM according to their real variable costs of generating electricity.

Sending a bid with a higher price is economically unreasonable for the generator (given it is not enjoying a dominant position in the region).

Marginal Pricing is a way of financing the development and modernization of the most efficient generation.



Territory of the Wholesale Power Market:

1 – First Price Area (European part of Russia and the Urals);

2 – Second Price Area (Siberia);

3 – Areas of Tariff Regulation (Kaliningrad, Arkhangelsk, Far East and others).



Two types of Tariff Regulation Areas:

1. "NON-PRICE" areas of the Wholesale Electricity Market

Kaliningrad, Arkhangelsk, Komi, Far East: South of Yakutia, Primorye, Khabarovsk, Amur, Jewish Autonomous Region.

Non-price areas are determined by the Government Decree 770 (29.09.2010). They are characterized by **insufficient competition (high market concentration)**, thus, prices (tariffs) in these areas are set by tariff regulators.

These areas operate synchronously with the main Power System, but market mechanisms do not apply there. Supply companies and large consumers have to purchase electricity and capacity at a regulated price.

2. "ISOLATED" regional power systems

Far East: Most of Yakutia, Kamchatka, Sakhalin, Magadan, Chukotka.

The list of isolated regional power systems is approved by the Government Decree 854 (27.12.2004). For technological reasons these regional power systems **operate asynchronously** with the main Power System. Prices (tariffs) in these areas are set by tariff regulators.

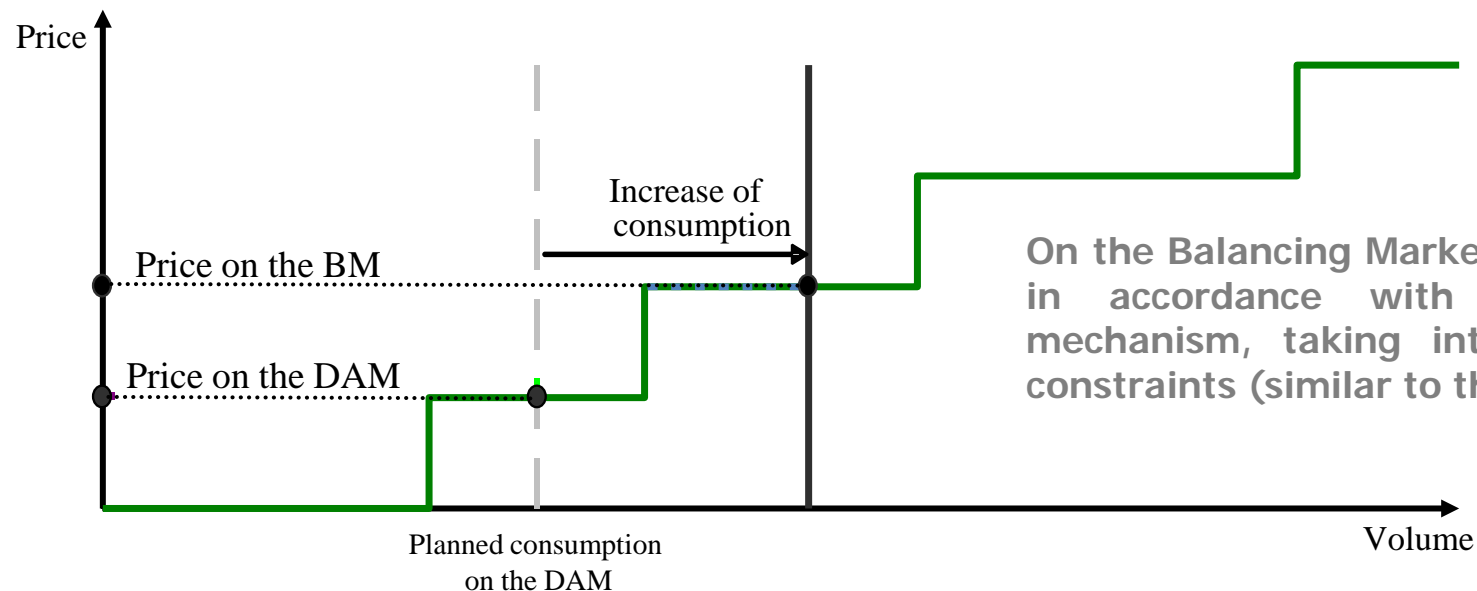
Power companies in these regions are not unbundled. One company incorporates all activities and supplies final customers. Consumers pay for electricity (at a regulated price).

Wholesale Market – Electricity Segment Balancing (Intraday) Market

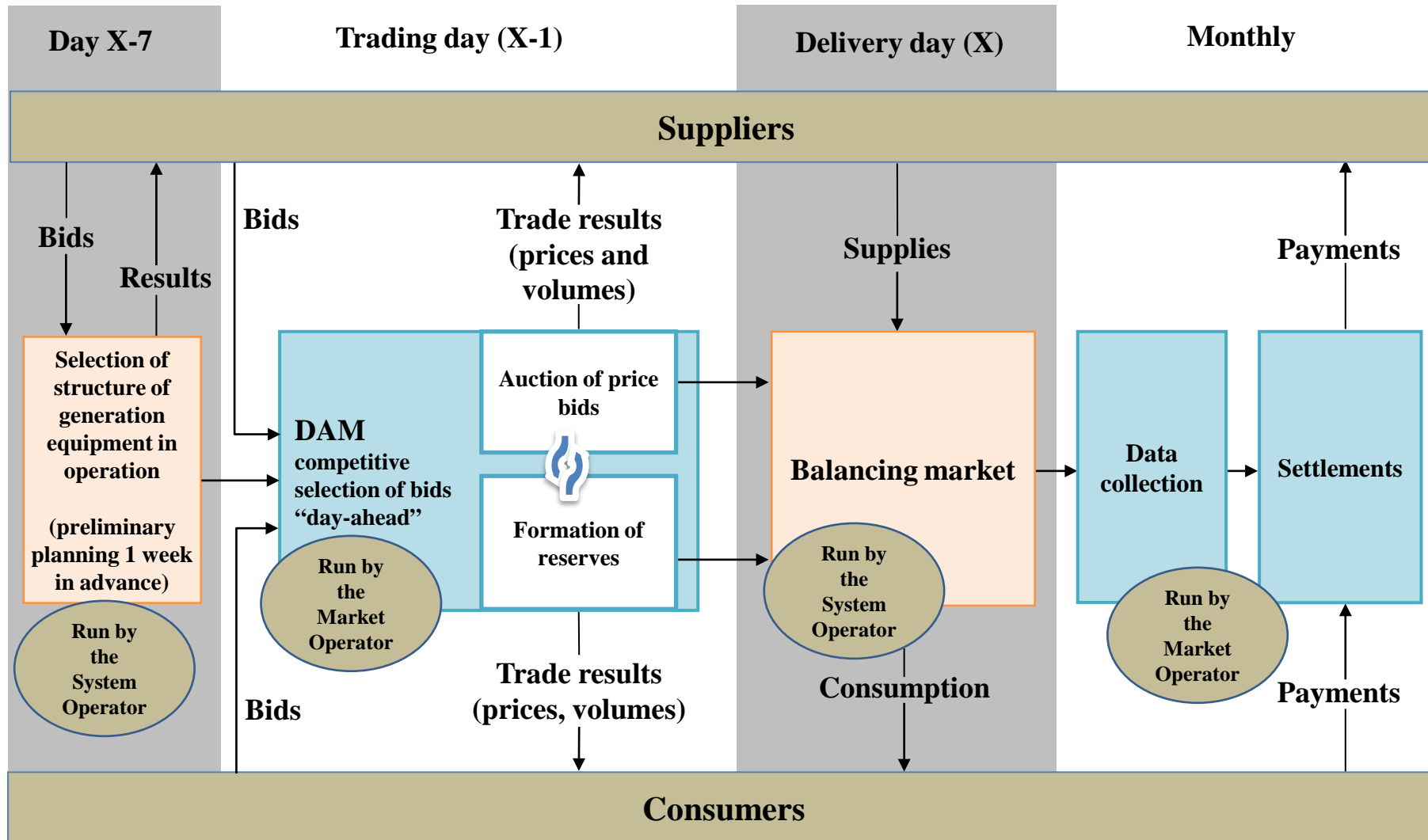


Balancing Market is an **intraday market** run by the System Operator. It allows making additional trades closer to the delivery hour. It is an **instrument of covering real-time deviations** of consumption/generation from the DAM plan.

 On the Balancing Market the System Operator matches intraday competitive bids of the participants every 2 hours.



Overview scheme of the Electricity Market Segment



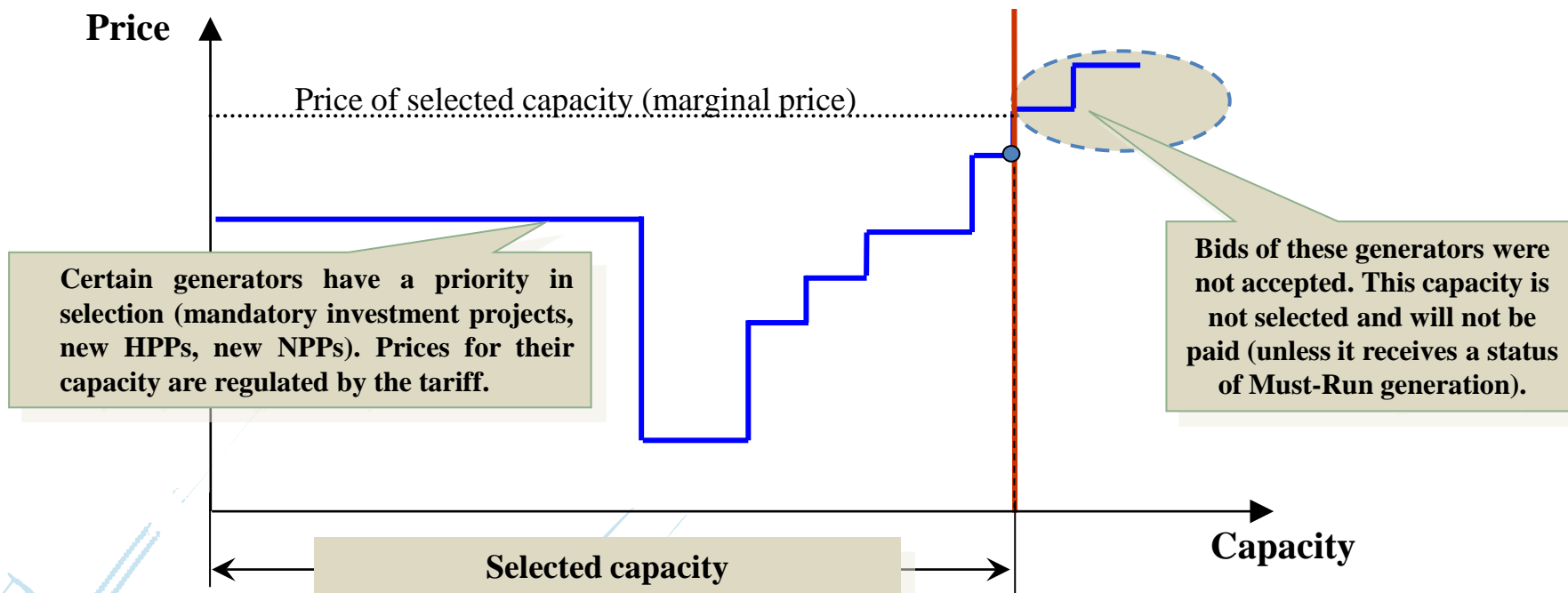


**Capacity – a unique product, which essentially is an obligation of the generator to be ready to produce a certain amount of electricity (corresponding to the amount of sold capacity) at any given moment.
By selling capacity a generator assumes this obligation and gets paid for it.**

- The **amount of necessary generation capacities is determined in advance** by the System Operator – determination of demand for capacity on the Capacity Market.
- **Commercial Selection of Capacity** – generation units are selected according to their competitive bids and considering market specifics, up to the necessary demand for capacity. Selected generators are guaranteed to be paid on the Capacity Market in exchange for their obligation to “provide capacity”.
- Generators’ readiness to produce electricity (according to the sold capacity and fixed technical parameters) **is checked hourly**. Severe penalties for failing to provide capacity.
- Capacity is paid by consumers of electricity, post-factum. The price for purchasing capacity is determined post-factum, **collected money should be sufficient to pay for all selected generators**.
- *Capacity market provides long-term stability and security in the power system – it prevents from the deficit of generation capacities.*
- *Capacity market increases investment attractiveness of the power sector – long-term guarantees for investors in generation.*
- *Capacity market almost fully eliminates electricity prices volatility.*

Wholesale Market – Capacity Segment

“Commercial Selection of Capacity”



- Commercial Selection of Capacity is performed for the year $X+1$ ($X+4$ in perspective).
- 28 separate areas, in which commercial selection of capacity is performed (due to transmission system bottlenecks).
- In certain areas Price Caps on capacity price are introduced.
- Must-Run generation capacity is always selected, its price is regulated by the tariff.



- System of economic incentives designed to attract power market players to participate in providing the required level of reliability and quality of the Russian power system functioning;
- As part of the service the owner must ensure that his equipment complies with additional parameters and requirements for the modes of operation.

Ancillary Services:

- Primary frequency control using power generation equipment (rendered from January 18, 2011).
- Automatic secondary frequency control and automatic power flow control using power generation equipment (rendered from February 7, 2011).
- Development of emergency control system (including installation and modernization of relevant devices) of UES of Russia (project is being developed).



Thank you!