

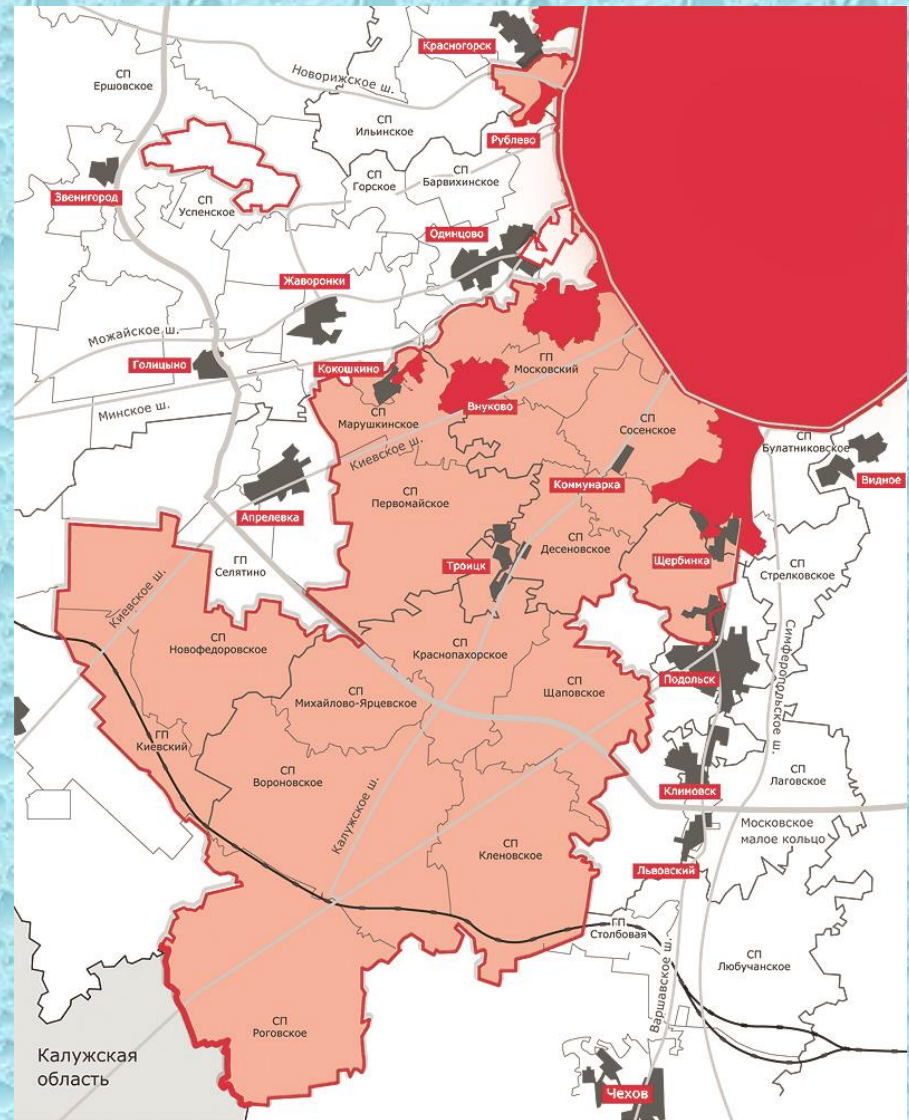


A concept of power supply for New Territories of Moscow.

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- The project of territory broadening for Moscow 2011' is one of the most prominent and challenging projects in the history of the capital development.
- The territory of city Moscow increased in 2,4 times due to territory of Moscow Region.





- A primary goal of town-planning policy of Government of Moscow is to enhance the quality of environment and that of life of the people.
- Government of Moscow is ready to create the most advantageous climate for investors and developing parties to reach the goal declared.





Now it is about 8 million square meters of real estate is put into operation annually and it is planned to reach 10 million square meters horizon in next 3 years.

Taking into account average price for 1 square meter of real estate as high as 5 000 USD, the total amount of capital investments will reach about 50 billion USD.





**It is assumed to place of the following objects inside the
Moscow New Territories:**

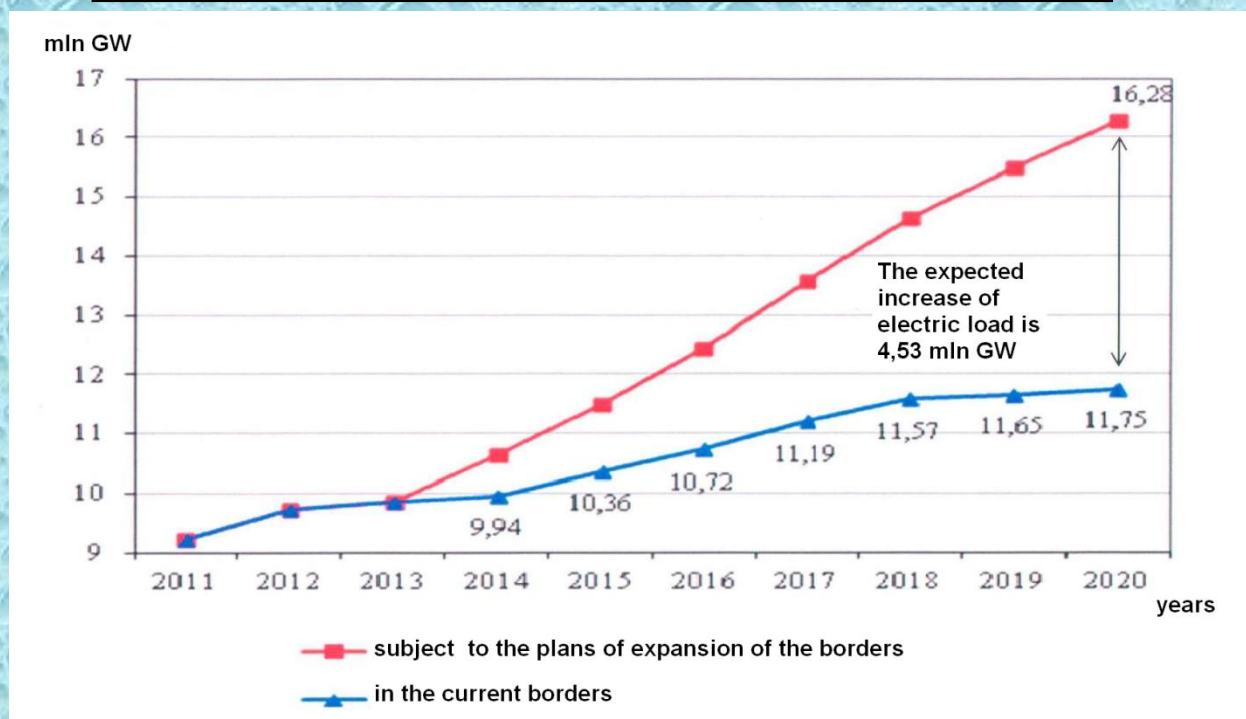
- the bodies of Federal state power;
- the bodies of Moscow city Government;
- objects of International Financial Center;
- scientific, educational and innovative clusters





An expected growth of electric consumption in Moscow with respect to territory borders broadening can reach a figure of 4,5 GW, at the same time a power deficiency of 2,3 GW will be delivered from neighboring power systems.

Dynamics of electric loads of Moscow



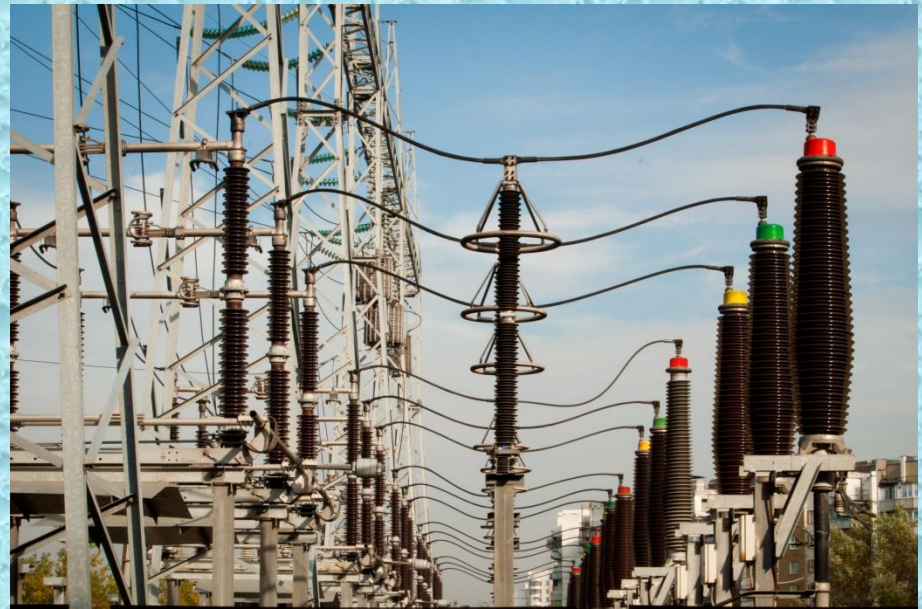


As a result of decision of Central Dispatching Unit while designing the network of electric supply for Moscow New Territories the following main terms should be carried out:





- backbone (of system-level importance) for power grid is 500 kV network;
- retaining of 500 kV principles of circle-type development and evolving;
- usage of mostly circular scheme development decisions must be ensured in 220 kV network;
- introductions of dispersed and renewable generation;
- distributional network is that of 220 kV and 20 kV.





It is assumed to construct the following objects on the territory of Moscow:

- 5 electrical substations rated 500 kV;
- 17 substations 220/20 kV;
- the cable lines of 500 kV with total length 361 km;
- the high voltage cable lines rated 220 kV with total length 381 km.



The overall capacity of new substations will amount 6 918 MVA, including 6 438 MVA of substations rated 220 kV and 480 MVA that of 110 kV.

Capital expenditures for objects of Moscow Power grids renovation and refurbishment are estimated to reach about 266,2 billion RUR (8 billion USD), including new-site' construction 161,2 billion RUR (4,9 billion USD) and refurbishment of 105 billion RUR (3,1 billion USD).





For electric power supply of Customers it is necessary to erect about 200 distributional substations rated 20 kV;

Each of backbone 500 kV substation is suggested to bear two power autotransformers with nominal voltages 500 kV and 220 kV rated 501 MVA;



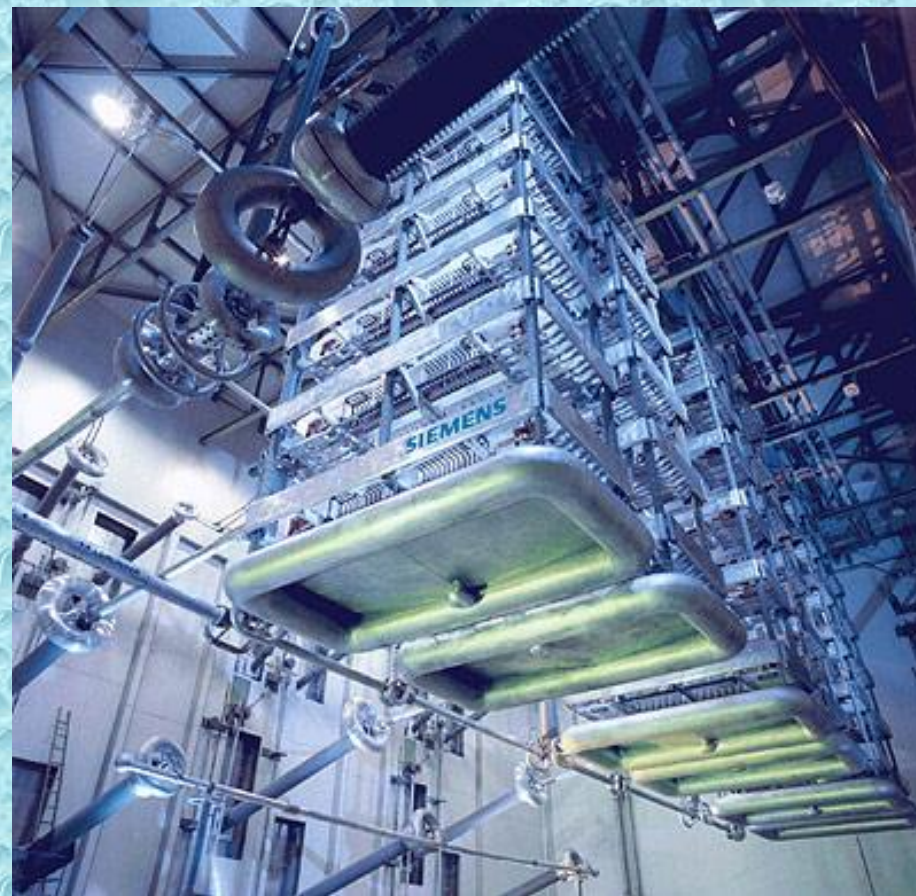


- Each of 220 kV substation is suggested to bear four power transformers with nominal voltage 220 kV and split winding two by 20 kV rated 100 MVA;
- A new network of electric power supply is created independently of existing grids 220 kV, 110 kV, 10 kV and 6 kV and is bound to operate autonomously with gradual electric consumption drift of existing Customers while feeding network aging towards the newly created substations.





- A challenging task for Moscow power network is growth of short-circuit currents in electric grids of 220 kV and 110 kV, to be limited as a solution.
- Scheduled measures for short-circuit current limitation are estimated in approximately 1,3÷1,5 billion USD and are expected to be fulfilled in 7÷8 year duration.





**Development of electric grid for Moscow grids power plants and
New Territories implies the under following:**

- **Putting into operation feeding cable lines with overall length 2 621 km;**
- **Erection of new 276 distributional substations rated 20 kV.**

**Total expenditures are
estimated to reach about
53 billion RUR
or 1,6 billion USD**



For solution of principally new challenges facing before currently being created in Russia Intellectual Electric Grids of new generation it is planned to implement utterly modern technologies and equipment, including the following systems and solutions:

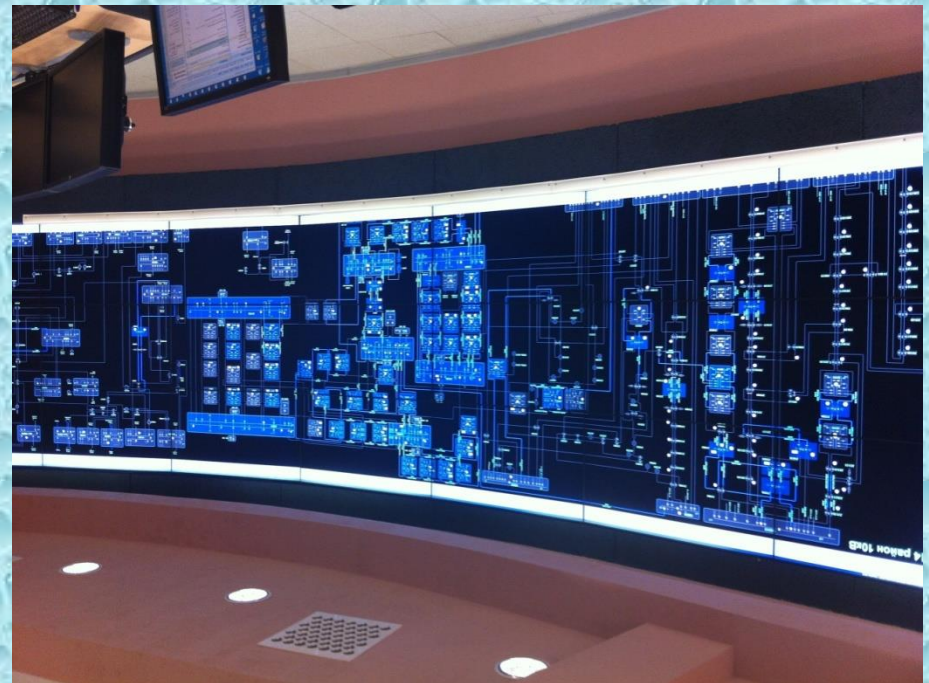
- **control and adjustment for active and reactive power with elements of FACTS;**
- **short circuit current limitation;**
- **electric energy storage;**
- **forecasting and intellectual analysis of emergency and faulty situations;**
- **emergency automation;**





For solution of principally new challenges facing before currently being created in Russia Intellectual Electric Grids of new generation it is planned to implement utterly modern technologies and equipment, including the following systems and solutions:

- **monitoring and control of technical state of wear-and-tear of technological equipment;**
- **high-speed and fully automated both-ends communication technologies, implemented in real-time mode;**
- **smart metering and load-shedding and intellectual consumption control programmes.**





We kindly thank You for Your
attention.

