

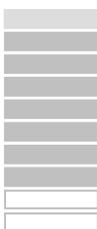


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ELECTRIC POWER INDUSTRY: GENERATING CAPACITIES OF RUSSIA

Analytical review (report)



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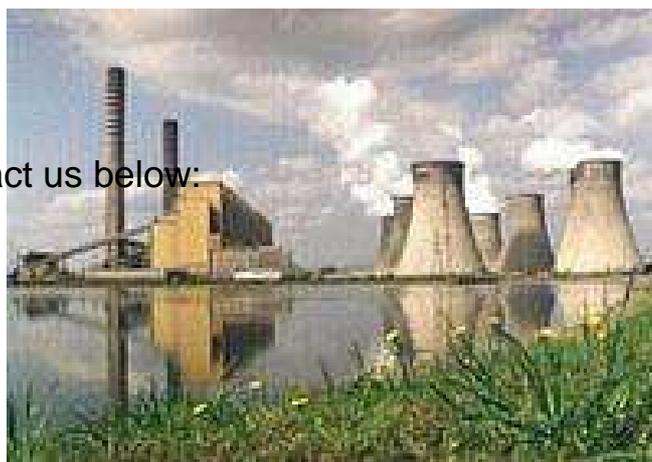
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Moscow, 2010

ANNOTATION

This review is a full-scale study of the state of generating capacities in the electric power industry after reorganization of RAO "UES of Russia". The first chapter of the study analyses the current situation of the Russian electric power industry in Russia, in particular, analyses the results of electric power industry restructuring, examines the key problems of the industry in detail. Special attention is paid to the state of the electricity and capacity market. Data on electricity export and import are given.

The review examines the principal trends of electricity production and consumption in Russia, presents data on volumes and structure.

A separate section deals with the impact of the crisis on electric power industry of CIS countries, including proposals how to solve the problems facing the electric power industry.

The study analyses characteristics of generating capacities, gives info on key performance indicators, such as installed capacities of power plants, installed capacity utilization factor, electric power generation, specific fuel consumption, etc.

The report includes data on commissioning/renovation of generating capacities, their state and development prospects. Info on investment programs of generating companies is given. Prospects in the area of governmental regulation and support of the industry are considered.

Special attention is paid to the state of generating capacities in nuclear and hydraulic power industries, including examination of their development investment program and its funding sources.

The review also contains info on energy efficiency of generating companies. Prospects of energy efficiency improvement in Russia are examined.

The review contains a forecast of development of generating capacities in the electric power industry of Russia.

The research data are based on 2008 and 2009 figures, in certain instances data for the first 4 months of 2010 are given.

The research was made in April-June of 2010.

The report is on 49 pages.

The report contains 24 tables and 26 graphs and diagrams.

The report is written in English.

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ANALYSIS OF THE CURRENT SITUATION IN THE ELECTRIC POWER INDUSTRY OF RUSSIA

Results of the Russian electric power industry restructuring

RAO UES of Russia ceased to exist on the 1st of July 2008.

In the process of restructuring RAO "UES of Russia" was divided into competitive and monopolistic sectors. It resulted in establishment of six wholesale generating companies (WGC) and a single Federal Hydrogenerating company (OJSC "RusHydro" (before the 26th of June - HydroWGC)), that owns principal hydrogenerating assets. 14 territorial generating companies (TGC) were established, the largest of them is TGC-3 ("Mosenergo"). The state retained control over HPPs, NPPs, electricity transmission lines (OJSC FGC UES united bulk power systems, 11 Inter-regional Distribution Grid Companies – distribution networks) and dispatching service (Regional Dispatching Office was transferred to OJSC "System Operator of UES" (UES SO-CDA)). OJSC "Inter RAO UES" was charged with management of foreign assets. All energy assets of the Far East were handed over to OJSC "RAO ES Vostok".

The restructuring resulted in fundamental changes in the Russian electric power industry. Sales of governmental stock and follow-on offering of shares of generating companies resulted in a general chart of new generation owners.

Table 1. WGC/TGC strategic investors

Company Name	Strategic Investor
WGC-1	OJSC "Inter RAO UES"
WGC-2	OJSC "Gazprom"
WGC-3	OJSC "Mining and metallurgical integrated works Norilsk Nickel"
WGC-4	German energy concern E.on
WGC-5	Italian energy concern Enel
WGC-6	OJSC "Gazprom"
TGC-1	OJSC "Gazprom"
	...
TGC-14	"Energopromsbyt" (Subsidiary of OJSC "Russian Railways" -51% and "ESN" group -49%).

Source: RosBusinessConsulting

A significant step towards competition creation in the electricity generation and sale sector was made. As a result, electricity prices of generating and retail companies should become competitive by 2011 and grid companies rates for electricity transmission and technological connections will be regulated by the government.

The restructuring resulted in attraction of ... bln RUB for investments into new generating and grid capacities.

However, it will be possible to summarize the main results of the electric power industry restructuring in three years at the soonest. At present new shareholders are learning the acquired assets, sorting out who and how will manage them and what should be done.

At present a lot of things in the Russian electric power industry restructuring has not been accomplished and requires additional work...

...

Principal trends of electricity production and consumption in Russia

Electric power industry as an integral part of the fuel and energy complex (FEC) is one of the backbone industries and its share in the national gross domestic product (GDP) makes up ...%. As other FEC sectors, at present the electric power industry is noted for its dominant position in the production sphere.

Despite production and tariff growth, energy companies suffer from a great scarcity of funds that they need to repair and renovate aging equipment and to commission new capacities.

Global liquidity crisis development, which provoked appreciation of credits for banks and companies, ultimately affected the development of the real sector of the Russian economy, including power consumption of the enterprises.

Volumes and structure of electricity consumption

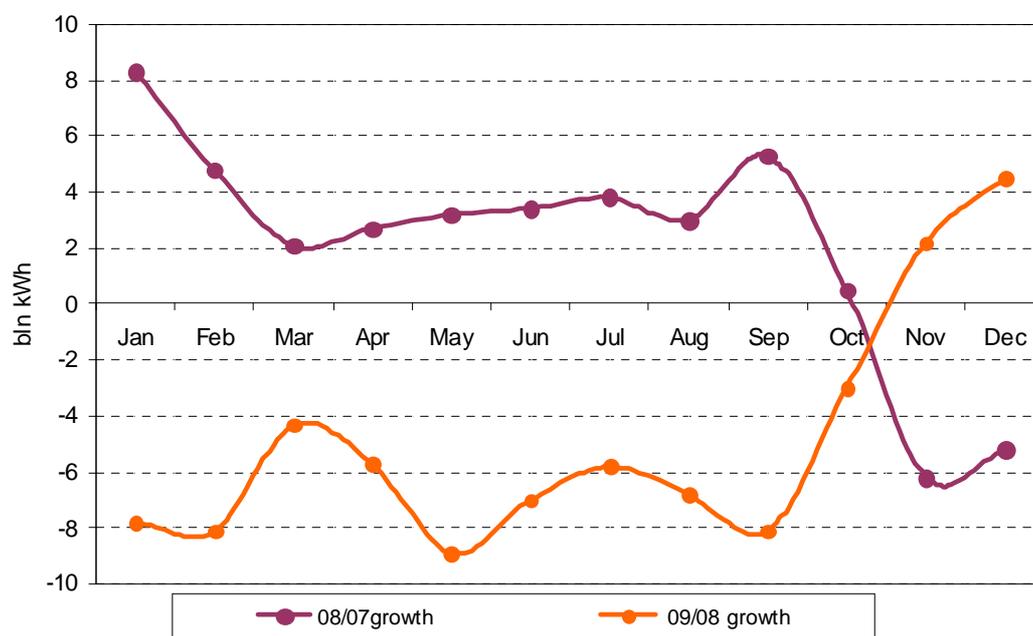
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In 2009 the entire electricity consumption in Russia made up ... bln kWh, what is ... % below the volume of consumed electricity in 2008. ... bln kWh (by ... % less), are consumed in UESs of Russia, ... bln kWh (... % more than in 2008) are consumed in isolated energy systems.

Despite total power consumption fall, in 2009 in several regional energy systems electricity consumption increased compared to 2008:...

...

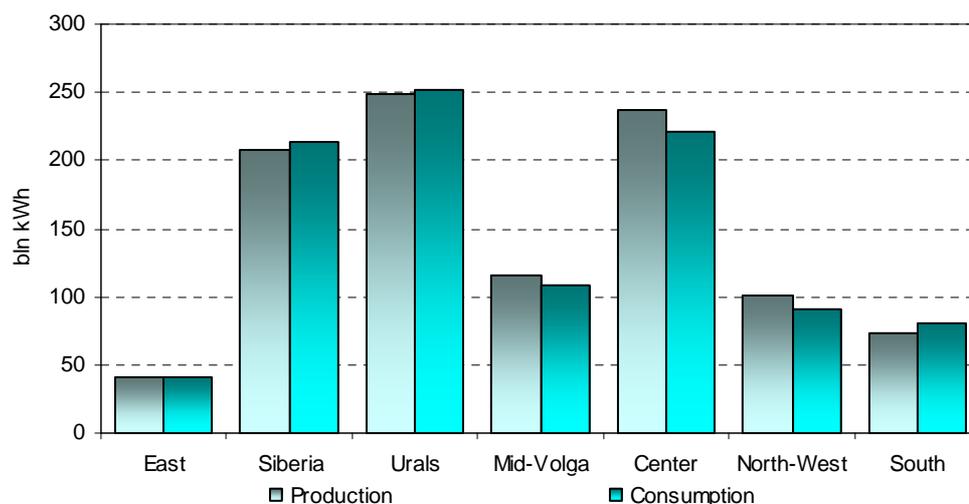
Fig. 1. Growth dynamics of actual electricity consumption in Russia in 2009, bln kWh



Source: Energy Forecasting Agency

Volumes and structure of electricity production

...

Fig. 2. Dynamics of electricity production and consumption by UESs of Russia, 2008, bln kWh

Source: OJSC Sysem Operator of UES, www.so-cdu.ru

In 2008 electric power plants of UES of Russia produced ... bln kWh (...% more than in 2007), insolated energy systems altogether produced ... bln kWh (...% more than in 2007).

Table 2. Electricity production structure by types of power plants in 2008, bln kWh

Power plants	Production, bln kWh	Change compared to 2007, %
TPPs		
HPPs		
NPPs		
Power plants of production facilities		

Source: RosBusinessConsulting

...

Table 3. Data on unified energy systems (UES) for 2009

UES	Generation, bln kWh	Relative to 2008, %	Consumption, bln kWh	Relative to 2008, %
East (including isolated systems)				
Siberia (including isolated systems)				
Urals				
Mid-Volga region				
Center				
North-West				
South				

Source: OJSC Sysem Operator of UES, www.so-cdu.ru

Electric power plants of UES of Russia produced ... bln kWh (... % less than in 2008), insolated energy systems altogether produced ... bln kWh (production growth made up ...%).

...

Export-import of electricity

Table 4. Export-import of electricity in 2008, bln kWh

	January - December	To January - December of 2007	
	2008	+/-	%
Export			
to countries outside the CIS			
to CIS countries			
Import			
to countries outside the CIS			
to CIS countries			

Source: Central Dispatch Office of TEC

...

Crisis impact on electric power industry of member states of the CIS

...

ANALYSIS OF GENERATING CAPACITIES CONDITION IN RUSSIA

In terms of electricity production and consumption the Russian electric power system ranks as the fourth in the world after USA, China and Japan. However in terms of aggregated capacities Russia lags far behind China and USA. While the US aggregated capacities exceed ... GW and other countries are approaching this figure, as of today the RF has only ... GW at its disposal.

Condition of generating capacities after the reform

Generation assets are consolidated into interregional companies of two types: wholesale market generating companies (wholesale generating companies – WGC) and territorial generating companies (TGC). WGCs unite power plants, producing almost uniquely electricity. TGCs include mostly thermoelectric stations (TES), producing both electric and thermal energy. Six of seven WGCs are established on the basis of thermal power plants and one (“RusHydro”) – on the basis of hydrogenerating assets. Thermal WGCs are set up on extraterritorial principle, while TGCs unite plants of neighboring regions.

Generating companies

Thermal WGCs

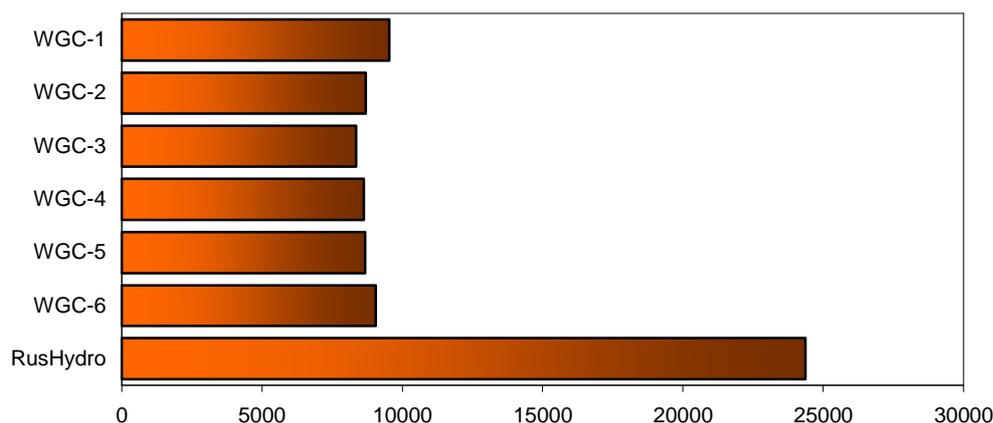
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Generating capacities

Installed capacity structure

The Russian electric power system is one of the largest in the world. The Russian electricity sector includes over ... thermal and hydro power plants and ... nuclear power plants with aggregate installed capacity of ... GW, what makes up about ...% of the world generating capacities. In 2008 Russian power plants produced ... bln kWh of electricity and supplied ... mln GCal of heat.

Fig. 3. Installed electric capacity of WGCs, MW



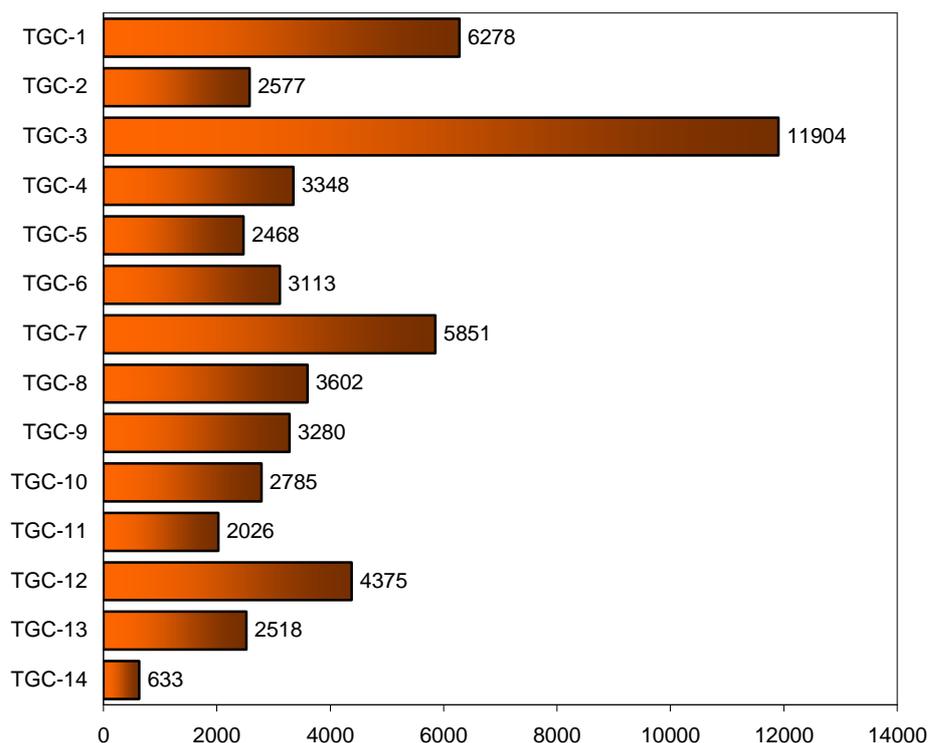
Source: sites of the companies

According to data of annual reports the total installed capacity of power plants of all WGCs in 2008 achieved ...GW, what makes up ...% of installed capacity of Russian power plants.

RusHydro accounts for ... GW of installed capacity (about...%).

...

Fig. 4. Installed electric capacity of TGCs, MW



Source: sites of the companies

...

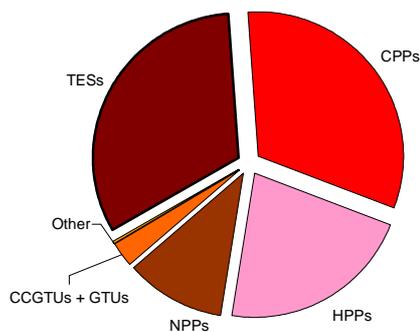
Table 5. Installed capacity of power plants as of 01.01.09

	Installed capacity, GW	Share in installed capacity, %
Russia, total		
TPPs		
HPPs		
NPPs		

Source: OJSC "System Operator of UES", www.so-cdu.ru

...

Fig. 5. Installed capacity of power plants as of 01.01.09, %



Source: OJSC "System Operator of UES", www.so-cdu.ru

...

Construction of new generating capacities

By 2010 the volume of constructed new capacities will be 2-2,3 times less than the General Location Scheme for Energy Facilities provided for.

...

Table 6. Commissions of capacities, GW

	Actual		Estimation		Total	GenScheme
	2006	2007	2008	2009— 2010	2006— 2010	2006— 2010
NPPs						
HPPs						
TPPs						
Total:						

Source: Energy Forecasting Agency

...

Table 7. Key commissions of 2009

RF Power Plant	Installed capacity, MW
Kashirskaya SDPP (OJSC «WGC-1»)	
TES International (1, 2 turn)	
...	

Source: Minenergo of Russia

Table 8. Key commissions of 2010

...

Generating equipment wear

Table 9. Equipment of Russian HPPs

Total	Time in commission from 30 to 50 years			Time in commission exceeding 50 years			
	Number of aggregates	Number of aggregates	Capacity (GW)	Share of total HPP capacity	Number of aggregates	Capacity (GW)	Share of total HPP capacity

Source: Minenergo of Russia

Table 10. Equipment of Russian NPPs

Total	Time in commission less than 20 years				Time in commission from 20 to 40 years		
	Number of aggregates	Number of aggregates	Capacity (GW)	Share of total NPP capacity	Number of aggregates	Capacity (GW)	Share of total NPP capacity

Source: Minenergo of Russia

Table 11. Equipment of Russian TPPs

Total			Time in commission from 30 to 50 years				Time in commission exceeding 50 years			
Boilers (pcs)	Turbines (pcs.)	Capacity (GW)	Boilers (pcs)	Turbines (pcs.)	Capacity (GW)	Share, %	Boilers (pcs)	Turbines (pcs.)	Capacity (GW)	Share, %

Source: Minenergo of Russia

...

Renovation of production capacities

...

Fuel utilization at thermal power plants

Fuelling of power plants

The share of gas thermal power plants in total volume makes up 69%, 29% operate on coal.

Table 12. Supply, consumption and reserves of principal types of fuel in 2008 and 2007 at TPPs

Fuel	Supply			Consumption			Reserves		
	2007	2008	+/- to 2007	2007	2008	+/- to 2007	2007	2008	+/- to 2007
Coal, thsd. tons									
Residual oil, thsd. tons									
Gas, mln cubic meters									

Source: Energy Forecasting Agency

Table 13. Consumed fuel structure, %

Fuel	2007	2008	+/- to 2007
Coal			
Residual oil			
Gas			
Other types of fuel			

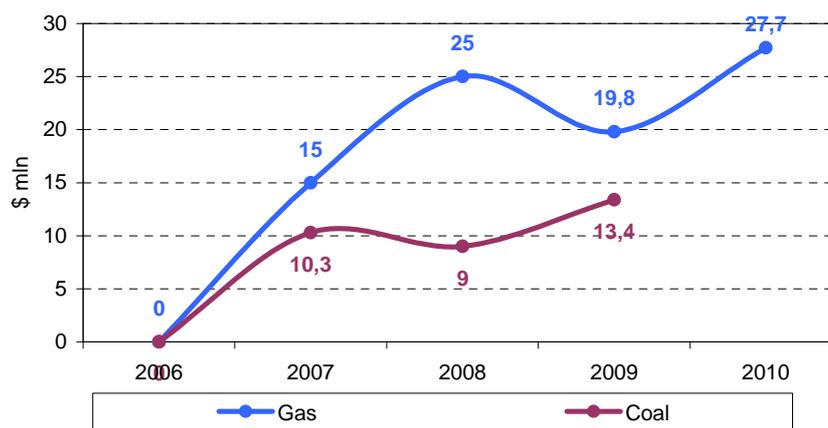
Source: Energy Forecasting Agency

... coal stations operate in the European part of Russia (altogether there are ...coal stations in Russia)....

...

Prices for fuel resources for electric power industry

...

Fig. 6. Actual annual growth of gas and coal cost

Source: Energy Forecasting Agency

...

Coal generation development prospects in Russia

...

Hydrogeneration

Condition of generating capacities at HPPs

In the process of RAO UES restructuring over ...% of Russian hydrogeneration assets were transferred to “**HydroWGC**”, later renamed into “**RusHydro**”. Now it is the biggest player of the wholesale electricity and capacity market. Of ... MW of total installed capacity of hydro aggregates of Russian HPPs “**RusHydro**” accounts for ...MW, i.e. a little over ...%. The company produces over ...% (... mln kWh) of total electricity produced by domestic **hydropower plants** (about ... bln kWh per year).

...

Hydraulic power industry development prospect

...

Nuclear generation

Condition of generating capacities at NPPs

Currently ... nuclear power plants with the installed capacity of ... MW operate in Russia. Nuclear generation share makes up ...% of total electricity generation. Nuclear power plants are operated by OJSC “Energatom Concern” – a member of OJSC “Atomenergoprom”....

...

Nuclear industry development prospects

Investment program of GC «Rosatom»

...

Construction and renovation of generating capacities at NPPs

...

Investment activity

Investment programs of subjects of the RF electric power industry for 2009-2011 stipulate commissioning of ... MW of generating capacities, ... km of power transmission lines and ... MVA of transformer capacities.

...

Investment program

Investment program of OJSC «Gazprom»

...

Government regulation

...

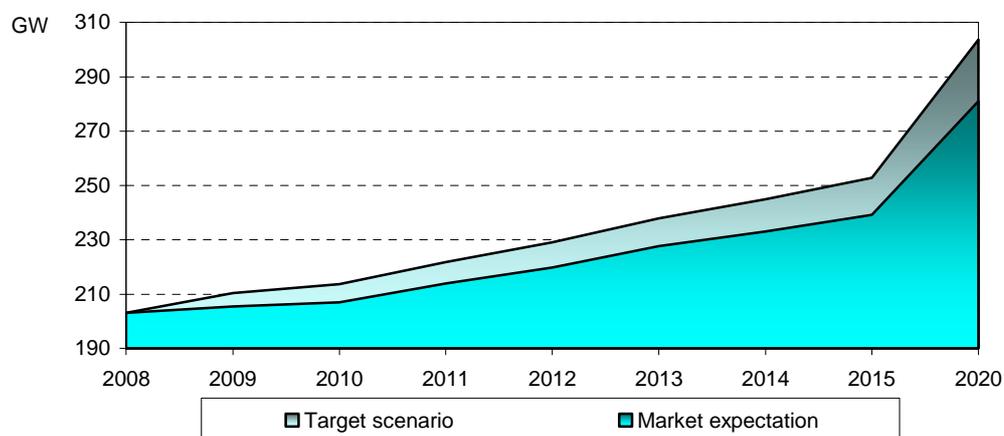
Energy efficiency of generating companies

...

FORECAST OF DEVELOPMENT OF GENERATING CAPACITIES IN THE RUSSIAN ELECTRIC POWER INDUSTRY

...

Fig. 7. Forecast of demand for installed power plant capacity, GW



Source: Energy Forecasting Agency

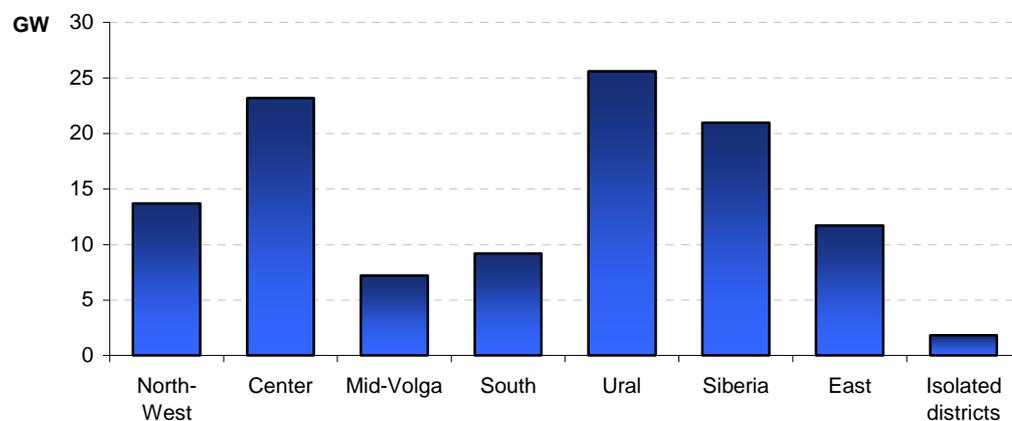
Table 14. Dynamics of capacities of operational power plants till 2020

Performance indicators of capacities of operational power plants, GW	2009-2010	2011-2015	2016-2020	2009-2020
Capacity de-installation, including				
final de-installation				
de-installation for replacement				
Capacity gain due to remarking and reconstruction				
Total reduction of installed capacity of operational power plants				

Source: Energy Forecasting Agency

...

Fig. 8. Amount of commissioned generating equipment by UESs, GW



Source: Energy Forecasting Agency

...