Chapter 16

ELECTRICITY IN RUSSIA

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- There has been a transformation of the system to separation and a wholesale market. The motivation was the urgency to mobilise investment in capacity.
- The steps include restructuring and private ownership (2003–08); price deregulation according to a schedule and full competition in generation (by 2011); and competition by ensuring third party access to network infrastructure. Price regulation remains to 2015 for retail consumers.
- The consequence was significant increases in capacity. The 2010 Russian budget commits to further electricity tariff increases to reduce the extent of the subsidies.

16.1 INTRODUCTION

The Russian Federation has embarked on, and achieved, significant progress on what seems to be the 'textbook version' of the comprehensive electricity sector privatisation, restructuring, competition and regulatory reform program (Joskow 2008), following the lead of the United Kingdom and applying the market design of the Pennsylvania–New Jersey–Maryland (PJM) model from the United States of America (USA).

As Pollitt (2007) remarks, 'what seems to be the case is that the pursuit of electricity reform through to its logical conclusion is only likely to happen in jurisdictions where there is strong ideological commitment to competition in energy markets. This will partly be driven by resource conditions … but significantly by whether there is a fundamental belief that electricity prices should be left to the market'.

In the case of the Russian Federation, the progress to date demonstrates that strong commitment to market reform and leadership has been the key condition for keeping the reform on track despite its unpopularity. It looks like the Russian reform has successfully passed the point of no return and the only way is forward, fine-tuning the wholesale market mechanism, aligning price signals and incentives, enforcing competition policy, increasing energy efficiency and fostering investment in modern technology, both public and private.

This case study outlines the scope and progress of the reform and some of its effects to date.

16.2 ELECTRICITY SYSTEM IN RUSSIA

The Russian Federation is one of the top electricity generating economies in the world:

- it is the fourth largest generator after the USA; China; and Japan, producing 5% of the world's electricity (IEA 2009);

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- in 2009 there were more than 700 generating plants in Russia with a total installed capacity of 211 846 MW;
- domestic electricity generation was 957.1 million MWh, domestic consumption 942.8 million MWh (SO 2010b);
- Russia is a net exporter of electricity (exports account for 2% of domestic supply, imports 0.3%) (FSS 2010);
- the composition of the installed generating capacity in Russia by type of fuel is 68% thermal, 11% nuclear and 21% hydro;
- the regional composition varies, with Siberia relying on hydropower stations (47% of capacity), the North-East on nuclear generation (27%) and the Urals almost exclusively on thermal generation (94% of installed capacity) (SO 2010b).

Russia's unified electric energy system was created during the Soviet times as the backbone for the economic growth in an industry-oriented planned economy. Following the Soviet Union's collapse, in 1992 the Russian Federation government transferred most of the electricity assets to the open joint stock company 'United Energy Systems of Russia' (RAO-UES).

At the onset of the reform, RAO-UES owned 72% of the economy's installed generating capacity and 95% of its transmission grid.[2] It had 72 regional vertically integrated subsidiaries called AO-Energos. The dispatch and system operation services also belonged to RAO-UES.

In 1998 Anatoly Chubais became the president of RAO-UES. His team was behind the concept of electricity reform and its implementation in Russia. Chubais' background as one of the architects of voucher privatisation and major market-oriented reforms of the early 1990s shaped his approach to the task of reforming the electricity sector. Chubais was responding to a number of challenges faced by RAO-UES.

Chubais faced a number of issues. Payment arrears were plaguing RAO-UES's bottom line during the transition years and there were no funds to maintain, even less to expand, the infrastructure.[3] A related motivation for the reform of the electricity sector came from the so-called 'Chubais cross', a diagram based on the existing and projected installed capacity, with the intersection in 2008 (Chubais 2007). Chubais observed that in 1990 electricity consumption was 1074 billion kWh. This fell to 809 billion kWh in 1998 and then steadily increased. By 2006 it had reached the 1992 level and Chubais estimated that at the rate of growth at that time the historic high of 1990 would be reached again in 2008. He went on to forecast consumption of 1198 billion KWh in 2010. He then estimated it would be necessary for Russia to build a substantial amount of capacity over the 2006–10 period to meet this growth in demand.[4]

The observations by Chubais were the basis of a case for reform in order to finance the construction of the new capacity. In retrospect, the timing of the capacity exhaustion could

[2] http://www.rao-ees.ru/ru/info/history/show.cgi?prof.htm.

[3] In 1998 salaries and wages of RAO-UES staff were on average 3 months in arrears, cash payments for electricity supply were less than 17% of the total owing, and more than 20 RAO-UES companies were on the verge of bankruptcy. Corporate debts of RAO-UES had reached about USD10 billion at the beginning of 1998. http://www.rao-ees.ru/en/invest/reporting/reports/report2007/4.htm

[4] Chubais' estimate was that Russia would require 40.9GW of capacity over the period 2006–10 and the context was that Russia had built only 23GW over the previous 15 years. Cook (2005) had produced a similar forecast of the growth of consumption, although meeting the 1990 level by 2010, rather than 2008. Cook argued that the majority of the investment would be required after 2010.

have been delayed by the current financial and economic crisis: as noted above, consumption in 2009 was actually only 943 billion kWh and capacity in 2009 was about the same level as it was in 1991. But at the time, the perception was that the value of the reform was acute.

Reform was conceived around the idea of maintaining government regulation over the natural monopoly components of the sector, while introducing competition and private investment in the generating segment. The large-scale reform of the electric power sector was launched in 2001.[5] The stated goals of the reform included:

- private ownership (2003–08);
- price liberalisation and full competition in generation (by 2011); and
- third party access to network infrastructure.

Pricing mechanisms for electricity tariffs were to be changed to stimulate investment, which had been inadequate for many years:

- The average annual input of new generating capacity over 1991–2000 was just 600–1500MW compared to 6000–7000MW over 1976–85 (Palamarchuk & Voropai 2006).
- In 2007 about two-thirds of all installed capacity had been commissioned at least 25 years earlier (Abdurafikov 2009 and Figure 16.1).
- With the accepted power infrastructure lifetime values, the depreciation of transmission lines had reached 50% in 2009, thermal generation 60–70% and hydroelectric power generation 80%.[6]
- The August 2009 accident at Sayano-Shushenskaya hydropower station highlighted the need for urgent investment in replacing aging and failing infrastructure.
- By the estimates of KPMG, the Russian electric energy sector would require investment of USD550 billion by 2020,[7] which exceeded the official figure of USD420 billion over 2008–20. The Russian Federation government's Energy Strategy 2030 estimates investment needs in the electricity sector between USD572–888 billion over 2009–30.[8]

Manufacturing and mining are among the largest users of the electric power (Figure 16.2), and a competitive modern electricity sector is essential for their performance. Energy saving measures are also becoming more important and are recognised in the recent legislation. Main elements of the policy to increase efficiency in the electricity energy sector using renewable sources were adopted by the Russian Federation government on 8 January 2009. The share of renewable energy (excluding hydropower generators with installed capacity greater than 25 MW) in total generation is scheduled to increase from 1.5% in 2010 to 4.5% in 2020.[9]

16.3 POLICY REFORM

Table 16.A1 summarises the current industry structure. Reform of the electric energy sector has been discussed since 1997, with the draft resolution 'The main directions of the State

[5] Reform began with the signing of Resolution #526 'On the Restructuring of the Electric Power Industry of the Russian Federation'.
[6] http://www.gazeta.ru/business/2010/01/25/3316190.shtml.
[7] http://www.gazeta.ru/business/2010/01/25/3316190.shtml.
[8] http://minenergo.gov.ru/activity/energostrategy/pr_4.php.
[9] http://minenergo.gov.ru/activity/plan/2010-2012_3/1.php.

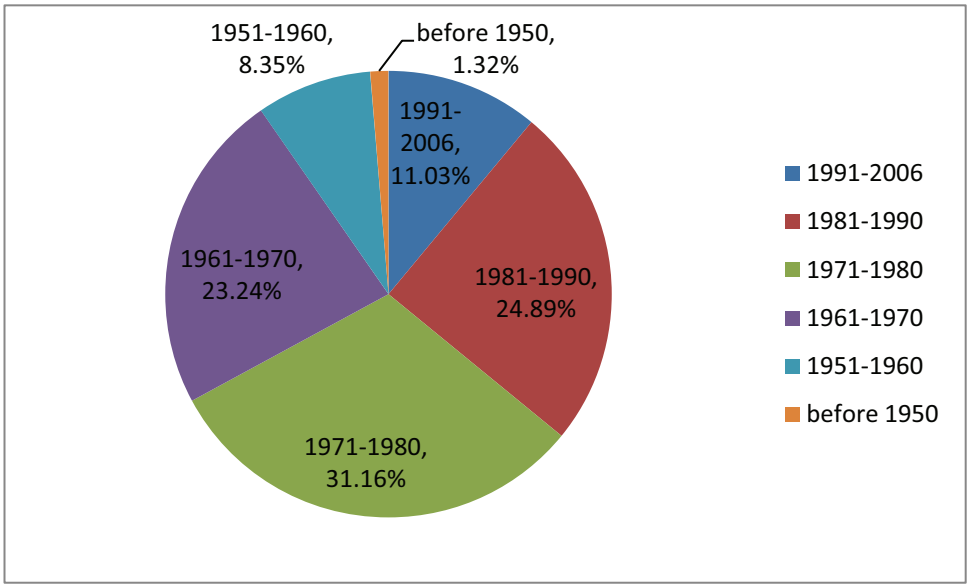

Figure 16.1: Distribution of installed capacity by commissioning year, 2007. (Source: Abdurafikov 2009)

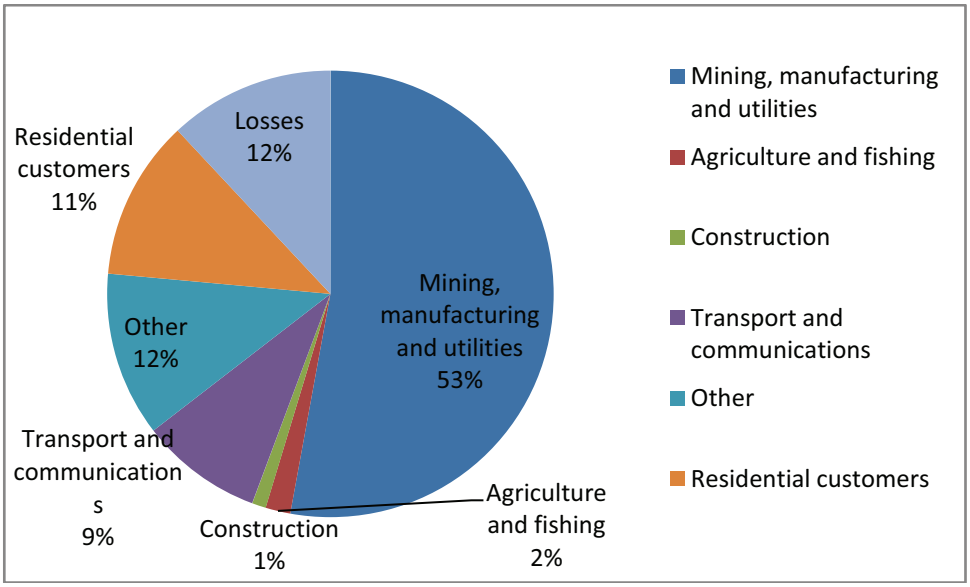

Figure 16.2: Electricity consumption by final use, 2007.

Table 16.1: Market concentration.

Name of firm	Service provided: Generation Transmission Retail	Year the firm first offered services	Market share	Owners of capital and their respective shares (domestic/foreign/ government)
FGC	Transmission	2002/1992	100%	25%-1 private/ 75%+1 gov
MRSK	Transmission (regional)	2003	90-100%	
System Operator	Network technical supervision	2002	100%	100% govt
RusHydro	Generation (hydro)	2004	13%	40 %/60% govt
Rosenergoatom	Generation (nuclear)	1992	12%	100% govt
Distribution/retail companies	More than 540	Various (reorganised during reform)	Some regions are highly concentrated	Various (public/private with different level of local governments share)
Generating companies: see below	More than 700	Various (reorganised during reform)	HHI=601 on the national level, but concentrated on regional level analysis	Mostly private, with foreign equity participation in three large WGCs (control about 11% of generating capacity).

Policy on Restructuring the Electric Power Industry in the Russian Federation' adopted by the government in 2000. The Arthur Andersen consulting company was chosen to assist in the development of the restructuring model. The large-scale reform of the electric power sector was launched in 2001 with the signing of Resolution #526 'On the Restructuring of the Electric Power Industry of the Russian Federation'. As of 1 July 2008 RAO-UES ceased to exist as a company, having completed both horizontal and vertical separation.

16.3.1 Ownership

The proposed industry structure and market design was based on international best practice in electricity sector restructuring. There was political will to implement liberalisation of the generation sector and to introduce third party access to the transmission and distribution infrastructure, which was to remain under majority government control. Incumbent hydroelectric power stations (previously part of RAO-UES) were transferred to the RusHydro company, with mandatory majority government ownership. Nuclear generation remained under full government ownership and supervision through the RusEnergoAtom Company.

In 2007, 48.5% of companies in the electricity, gas and water sector were private, contributing 54% to the total sector revenue and 34.5% employment. There were 1469 companies with (joint) foreign ownership – 3.8% of the total number of companies in the sector – producing 13.5% of the total sector revenue and employing 5.2% of the sector's workforce (Industry of Russia 2008). A Federal Law had imposed a 25% limit on foreign participation in the assets of the corporatised incumbent UES.[10] This restriction has been removed in the course of the reform.

The first foreign entry into electricity assets was by portfolio investors and private funds who bought shares in RAO-UES and then its spin-offs. In 2007–08 strategic investors entered. Currently, E.ON (Germany), Enel (Italy) and Fortum (Finland) are the three largest foreign investors in Russian generation assets. Newspapers report the following experiences of foreign investors in the Russian electricity sector. The Director-General of Italian Enel, the owner of WGC-5, comments that current electricity tariffs in Russia are four to five times lower than in the EU. Enel invests RUB20 billion per year in the generating capacity of its Russian company. The current level of tariffs is too low to support the investment activity. There are various social obligations attached to the balance sheets of the privatised entities which the private investor has to support. Low payment discipline creates another problem, with chronic payment arrears (Baumgartner 2009).

16.3.1.1 Generation

Restructuring of AO-Energos was launched at the end of 2001, starting with Belgorod-energo. In parallel with this, a wholesale market for electricity (and capacity) was set up to enable trading in electricity at unregulated prices. The active divestment of RAO-UES's generating assets has been underway. Foreign investors have gained control over 17 300MW capacity (30% of capacity privatised in 2007; 8% of total national stock (UniCredit 2008).[11]

[10] № 74-FZ of 7 May 1998 'On managing common stock of the Russian joint-stock energy and electricity company 'United Energy System of Russia' and stock of other joint-stock electric energy companies in Federal ownership'.

[11] In 2007 eight large generating companies (WGC-2,3,4,5 and TGC-1,3,5,8) were sold by RAO UES for USD20 billion (installed capacity 57 400 MW, about 27% of the national installed capacity). WGC-4 was bought by foreign investor Enel (Italy) and WGC-5 by E.ON (Germany).

16.3.1.2 Transmission

The Federal Grid Company (FGC, or FSK in the Russian acronym) was established in June 2002 as an open joint stock company fully owned by RAO-UES. The transmission assets of its regional subsidiary AO-Energos were brought under FGC control in March 2003. There is mandatory majority government ownership of the national transmission grid incumbents FGC (75% + 1 share) and System Operator (100%).

The network assets of FCG are spread over 73 regions of the Russian Federation, covering an area of 13.6 million km^2. They include 118 000km of trunk transmission lines and 757 transformer stations with a total capacity of over 286 000MVA (voltage 35–1150kV).[12]
FGC requires significant investment in modernisation and in the extension of the national high-voltage grid. According to FGC data, in 2010 the average depreciation of the network's physical assets is 41%, including 65% depreciation of transformer and other auxiliary equipment, 35% depreciation of transmission lines and 23% depreciation of buildings and facilities.[13]

Special rules apply to the new transmission assets built by other operators. Article 10.2 of the Federal Law 'On Electric Power Industry' stipulates that any entity can construct a transmission grid subject to building approvals (Article 42). Once connected to the national grid, transmission assets with a rated capacity greater than or equal to 330 kV, and other transmission assets with a rated capacity 220–330 kV providing a critical connection between significant generation and load centres, become part of the national grid. The owners cannot exit without the approval of FGC, which collects transmission charges on their behalf based on the established tariffs and reimburses the owners.[14]

16.3.1.3 Distribution

Before the reform 72 vertically integrated regional energy companies (AO-Energos) controlled most of the distribution lines in Russia. Subsidiary companies of RAO-UES hold 85% of distribution lines, with the rest belonging to four independent AO-Energos and municipal utility companies (Standard & Poor's 2008).

RAO-UES coordinated the reform of its regional subsidiaries with regional authorities:

- In August 2002 procedures for establishing the wholesale and territory generation companies (WGCs and TGCs), distribution grid companies and interregional grid companies were approved by the RAO-UES Board.
- As part of the restructuring process, 66 AO-Energos belonging to RAO-UES were unbundled and their distribution assets transferred to separate companies. Seven interregional grid companies were established in December 2003.
- In April 2004 the configuration of interregional distribution grid companies (IDGC, or MRSK in the Russian acronym) was approved[15] and 12 interregional distribution

[12] http://www.fsk-ees.ru/investors_about.html.
[13] http://www.fsk-ees.ru/evolution_strategy.html.
[14] Article 7.2 of Federal Law 'On Electric Power Industry' and Russian Federation Government Decree № 41 of 26 January 2006 'On Criteria for the Assignment of Electric Grid Facilities to the Unified National (All-Russian) Power Grid'.
[15] The first four IDGCs were established in October 2004: MRSK-1 UES of Centre and Northern Caucasus, MRSK-2 UES of North-West, MRSK-3 UES of Urals and MRSK-4 UES of Siberia.

companies (IDGCs) spin-offs had been formed.[16] IDGCs are publicly listed and majority government-owned (53%), with more than 300 000 shareholders.

16.3.2 Regulation

The basic model of WGCs was approved in September 2003. Discussion of mergers between AO-Energos to form a single TGC started in December 2003. A lease-based model was used. The first WGC (#5) and the first two TGCs (#9 and #14) were established in September 2004. Hydroelectric power assets were consolidated in a separate WGC, RusHydro, in October 2004.

Mandatory unbundling provisions in force from 1 April 2006 mean that a company is forbidden to own or lease assets in the transmission/dispatch of electricity and in its generation and/or distribution. Since 1 January 2008 the same measures apply to a company's affiliates operating in the same price zone of the wholesale market (currently there are two price zones – Europe/Urals and Siberia).

Exemptions include Guaranteeing Suppliers (the Suppliers of Last Resort) – that is, designated distribution companies with universal service obligations to residential and other consumers; isolated systems where there is no competition, and where electricity is generated for the provider's own use. Most of the regions in the Russian Federation have companies which are exempt from the unbundling requirement.

The types of economic entities allowed bundled operations are:

- supplying network companies – activities in transmission and distribution;
- supplying companies with subscribers – transmission and distribution to connected customers as part of the operations but not the main economic activity;
- energy-industrial conglomerates – combined transmission and distribution; not the main activity but a secondary function (e.g., large production facilities in metallurgy, the paper industry, oil refineries, the petrochemical industry etc.);
- nuclear power facilities; and
- suppliers to military and other strategic entities.

Unbundling was performed in several ways, including the transfer of network assets to a different owner or the transfer of customer supply contracts to another distribution company or guaranteeing supplier.

16.3.2.1 Independent power producers

The entry of independent power producers was facilitated by the development of the wholesale electricity market and the setting of rules for third party access to transmission lines (see below). Independent generators with a total generating capacity of at least 25MW and 5MW minimum at each connection node can become participants in the wholesale market.

It was envisaged that the development of new generation capacity would be largely funded by private investors but until recently regulated electricity tariffs in Russia had failed to reward investment in new capacity (Table 16.2).

[16] http://www.holding-mrsk.ru/about/facts/spravka/. The grid network of 10 voltage categories (0.4–220kV) under MRSK-Holding is 2 million km; 637 million MWh were transferred through the grid in 2008.

Some features of the electricity markets include a long lag between committing to new capacity and the ability to supply it, the high cost of new energy compared to 'old'/installed energy, the lack of certainty of future electricity prices and the presence of generating plants with different cost structures (competition with hydro and nuclear generating facilities) (Belyaev 2005).

In 2004 electricity tariffs were US1.5 cent/kWh in the European part of Russia. Belyaev (2005) explains such low tariffs as a failure to account for capital costs as a result of 'gratis' privatisation of electric power industry assets in the early 1990s which led to the creation of the RAO-UES monopoly and its regional electricity monopolies AO-Energos. Prices for natural gas, a major fuel for thermal power generators, were regulated and the level was low. There was virtually no investment activity in replacement and new assets, hence there was no investment component included in the electricity tariffs.

Based on the analysis of cost structure for new and installed generation capacity (Table 16.3), Belyaev concludes that the deregulated electricity market will be characterised by a permanent capacity shortage. A similar argument recognises that the investment in new

Table 16.2: Selected comparisons of international electricity prices, 2007 (US cent/kWh).

Economy	Industrial	Households
Austria	15.41	25.72
Czech Republic	15.12	19.15
Denmark	–	39.60
Finland	9.69	17.24
France	5.95	16.90
Hungary	16.97	22.34
Ireland	18.59	26.72
Italy	28.98	30.53
Korea	6.02	8.86
Mexico	12.60	9.61
Netherlands	–	24.26
New Zealand	7.14	16.44
Norway	6.36	16.39
Poland	11.93	19.30
Portugal	13.13	21.97
Slovak Republic	17.39	21.96
Spain	12.52	21.80
Switzerland	9.38	15.43
Chinese Taipei	6.72	8.56
Turkey	13.88	16.48
UK	14.59	23.13
USA	7.02	11.35
Russia*	4.50	4.50

Source: IEA 2009, *data for Russia MED 2007.

Table 16.3: Cost components of old and new generation plants, 2005 (US cent/kWh).

OLD						NEW				
Type	**Depreciation**	**O&M**	**Fuel**	**Cost of capital**	**Total**	**Depreciation**	**O&M**	**Fuel**	**ROI**	**Total**
CFP	0.54	0.69	1.19	-	2.42	0.54	0.53	1.19	3.68	5.94
GFP	0.40	0.44	1.84	-	2.68	0.40	0.34	1.34	2.05	4.13
NPP	0.44	0.53	0.40	-	1.37	0.44	0.41	0.40	3.76	5.01

Source: Belyaev (2005). CFP = coal-fired plant, GFP = gas-fired plant, NPP = nuclear power plant; ROI = return on investment, O&M = operation and maintenance

generation capacity should be rewarded either through higher tariffs or through capacity payments. Recent changes to the Regulated Asset Base (RAB) should help to attract new entry by independent power providers (see Box 16.1 below).

16.3.2.2 Third party access

The 2003 legislation stipulated the rules for gaining non-discriminatory access to transmission and distribution networks. Transmission tariffs and technological connection fees are regulated by the Federal Tariff Service (FTS). In 2008 there were 120 companies with direct connection to FGC, including distribution network companies (56% of connections), independent network companies (9%), retail distributors (17%) and large consumers of energy (18%).

The formula for transmission tariffs changed in 2006 from the actual amount transmitted (in MWh) to a declared capacity (in MW per month). Base transmission tariffs increased from USD1478/MW per month in 2006 to USD2236/MW per month in 2008, with additional payments for transmission losses differentiated by region.[17]

Distribution tariffs are also set by the FTS (FTS Order № 20-e/2 6 August 2004, as amended on 31 December 2009, 'On approval of instructional guidelines for the calculation of regulated tariffs and prices for electric (thermal) power in the retail (consumer) market').

16.3.2.3 Wholesale electricity (capacity) market

The Administrator of Trading System (ATS) was founded by 28 bodies representing market participants (generators and consumers) and regulators.[18] ATSis a not-for-profit organisation whose responsibilities include managing trading and settlement in the wholesale electricity market (maintaining a registry of participants, registering contracts, data collection, development of rules and methodologies, dispute resolution etc.). A Market Council oversees operations of the wholesale electricity (capacity) market.[19]

The 'System Operator - Central Dispatch Administration of the Unified Energy System' (SO-CDA) was established in July 2002 to provide paid dispatch services. On 1 April 2003 the dispatch functions of AO-Energos were transferred to regional dispatch administrators – subsidiaries of SO-CDA – increasing the number of SO dispatch branches from 20 in 2003 to

[17] Transmission tariff is differentiated by voltage of the lines required to supply the energy. Four categories are specified: high voltage (110kV and above); medium first (35kV), medium second (20kV down to 1kV) and low (0.4kV and below). The higher the voltage, the less transformation losses are associated with electricity delivery to the customer, hence the lower the tariff. Distribution surcharge is included in the final tariff and is also regulated by the FTS.

[18] The wholesale market for electric energy and capacity was first tested in Russia in the late 1990s. The earlier model, FOREM, was based on Federal Law № 41-FZ of 14 April 1995 'On State Regulation of Tariffs for Electric and Thermal Power in the Russian Federation', and the Decree # 793 'On Federal (national) wholesale electricity power (capacity) market' (12 July 1996). The rules and structure of the new wholesale market, NOREM, are based on Federal Law № 35-FZ, 'On the Electric Power Industry (26 March 2003); #36-FZ, 'On Specific Features of Functioning of Electric Power Industry During the Transitional Period and on Introduction of Amendments into Certain Legislative Acts of the Russian Federation and on Recognizing Certain Legislative Acts of the Russian Federation to Have Lost Their Force in Connection with Adoption' (26 March 2003) and Russian Federation Government Resolution № 576 'On Federal Bodies of Executive Power Authorized to Provide State Control over Activities Performed by the Administrator of Trading System of the Wholesale Power (Capacity) Market' (16 September 2003).

[19] http://www.np-ats.ru/.

60 by 2004. SO is a technical body responsible for the technical security/uninterrupted supply of the national electrical grid.[20]

- Simulation trading at the new wholesale market started in September 2002.
- Originally there were 87 wholesale market participants. During 2002 wholesale market rules were developed, including payments for the ATS and SO services.
- The wholesale market model during the transitional phase was approved in March 2003.
- In October 2003 wholesale market regulations were adopted. Template contracts for joining the wholesale market were approved and the dispute settling mechanism established.
- The first trading in the competitive power sector ('5–15% total') was on 1 November 2003, with 6 registered buyers and 7 sellers and 13 000MWh traded at average weighted price RUB260/MWh.
- By the end of the first year of operation, the Russian wholesale electricity market became the 5th in Europe and the 9th in the world in terms of the volume traded.
- Out of 128 participants of the wholesale market in the first year, 54 were independent from the incumbent.[21]

The current design of the wholesale market has been influenced by the Pennsylvania–New Jersey–Maryland (PJM) interconnection model, including its nodal pricing approach and Financial Transmission Rights (FTR) mechanism to hedge price differences between the nodes. The role of the latter is fulfilled by Free Bilateral Contracts (Oksanen et al. 2009).

The Russian national electricity system is comprised of six united energy systems: Centre, Middle Volga, Urals, North-West, South and Siberia. The energy system of the East operates as a separate synchronous zone, with manual control over the 220kV connection with the Siberian system.

The national wholesale market is divided into two price zones for geographic reasons – European Russia/Urals and Siberia. The transmission links between the zones are weak. The third large region, Russia's Far East, is not part of the wholesale market due to its remoteness and lack of connections (Palamarchuk & Voropai 2009). There are also non-price zones/islands with limited connections to the wholesale market. Transmission capacity even within the same price zones is often congested, including the links between the Urals and the Middle Volga/Centre, and the North-West to and from the Centre (SO 2010a).

At the end of 2009, 82% of the technological reserve capacity was used in the Central subdivision of the market, signalling the need for additional capacity and facilitation of flows between the zones. Newly installed or modernised generating capacity comprised 1377MW, or 0.7% of the existing stock at the beginning of 2009.

The major suppliers to the wholesale market are six WGCs with cross-territorial operations, 14 TGCs and the government-owned nuclear energy consortium 'RusEnergoAtom', importers and independent generators (with total generating capacity of at least 25MW and 5MW minimum at each connection node). Buyers are distribution companies, including

[20] http://www.so-ups.ru/.

[21] The balancing market was launched in October 2005 (Government Decree № 620 of 17 October 2005 'On Amending the Russian Government Decree on the Deviations Sector of the Transitional Wholesale Power [Capacity] Market').

guaranteeing suppliers, exporters and large industrial consumers (with connected demand capacities of at least 20MVA and a minimum 2MVA at each connection node. For direct consumers and local distribution companies the latter limit was reduced to 1 MVA from 1 August 2007, and then to 750 kVA from 1 February 2008). In 2009 there were 7913 nodes and 12 151 branches in the wholesale electricity (capacity) market trading model (SO 2010a).

Until the introduction of the wholesale market, most of the electricity was supplied at regulated prices through long-term (usually 5-year) vested contracts. These regulated 'take-or-pay' contracts defined both the volume and prices of the electricity (capacity), and customers were required to make the full agreed payments regardless of actual consumption. The phasing out of regulated (vested) take-or-pay contracts has allowed for a gradual transition to market liberalisation.

As part of the liberalisation process, the share of electricity which can be traded on the wholesale market at unregulated prices is being increased gradually. The share of the regulated sector has been reduced as follows:

1 January 2007 to 30 June 2007	90–95%
1 July 2007 to 31 December 2007	85–90%
1 January 2008 to 30 June 2008	80–85%
1 July 2008 to 31 December 2008	70–75%
1 January 2009 to 30 June 2009	65–70%
1 July 2009 to 31 December 2009	45–50%
1 January 2010 to 30 June 2010	35–40%
1 July 2010 to 31 December 2010	15–20%.

Full liberalisation of the wholesale market is envisaged for 1 January 2011, with all electricity sold at free (competitive) prices. The regulated sector covers generators registered with FTS in 2007. All new generators and new capacity will be able to supply electricity at competitive prices.

The capacity market was launched on 1 August 2008, with buyers making payments to the generators for having a declared installed capacity ready to be employed at request.

The difference between the FTS regulated tariffs and the equilibrium wholesale market price is significant. In the European Russia/Urals price zone in 2008 the average market price was RUB708/MWh compared with the FTS price of RUB425/MWh (or US2.8 cent/kWh vs US1.7 cent/kWh). In the Siberian zone it was RUB500/MWh compared to RUB219/MWh (or US2.0 cent/kWh vs US0.9 cent/kWh), respectively (ATS 2010). The highest prices were observed in the South (due to high transmission losses), and the lowest in the Urals (low generation costs and large proportion of price-taking suppliers).

There are two major forms of electricity (capacity) trading in the 'unregulated' wholesale market – bilateral contracts and on a day-ahead market.[22] Bilateral contracts allow the parties to supply electricity directly to buyers (wholesale market participants) at contractual prices. The day-ahead market is composed of bids from suppliers and buyers for next day consumption. Buyers with excess capacity purchased through bilateral contract can sell their spare electricity on a day ahead-market. Similarly, a generator who needs additional capacity to fulfil contractual obligations can purchase additional amounts on a day-ahead market. The bids are processed by the ATS and the equilibrium price is determined using the nodal pricing model. As a result, an hourly supply schedule is designed with dispatch instructions

[22] http://www.rao-ees.ru/en/reforming/market/show.cgi?market.htm.

sent to the suppliers and buyers for the day ahead. The balancing market ensures that deviations from the scheduled supply/demand are met in real time (here, the participants are unsuccessful bidders from the day-ahead market who are offered to supply electricity, and buyers with controlled loads). Prices are calculated for more than 6000 nodes in European Russia/Urals and more than 600 nodes in Siberia, taking into account generation costs, transmission losses and congestion charges (Oksanen et al 2009)

16.3.2.4 Trade and interconnections

Electricity grids of several neighbouring economies work in parallel with the Russian grid: Belarus, Estonia, Latvia, Lithuania, Georgia, Azerbaijan, Kazakhstan, Ukraine, Moldova and Mongolia. Electricity grids of Uzbekistan, Kyrgyz Republic and (until the end 2009) Tajikistan are also connected via the Kazakhstan grid (SO 2010b). Direct transformation links exist with the grids of Finland (through Vyborg), Norway (several generators in the Kolsk system are supplying directly), and connection from the Far East to China (SO 2010b). The operating system frequency of the Russian national grid is 50Hz. Peak loads occur in the winter months, with historic demand maximums reached or exceeded during 17–21 December 2009 in all regional energy sub-systems of the national grid (SO 2010b).

Power failures can occur when the grid frequency falls outside the normal range, which is 50Hz+- 0.05Hz. This can happen during peak demand when there are insufficient spinning reserves to ensure normal frequency. The Moscow blackout of 25 May 2005 was caused by the failure of local distribution lines (110kV), raising concern about the classification of network lines as ‘transmission’ or ‘distribution’ in terms of government supervision (Renaissance Capital 2005). Figure 16.3 illustrates deviations from optimal frequency over 2004–09. Note that there is no clear trend in terms of changes in system reliability following the structural reform.

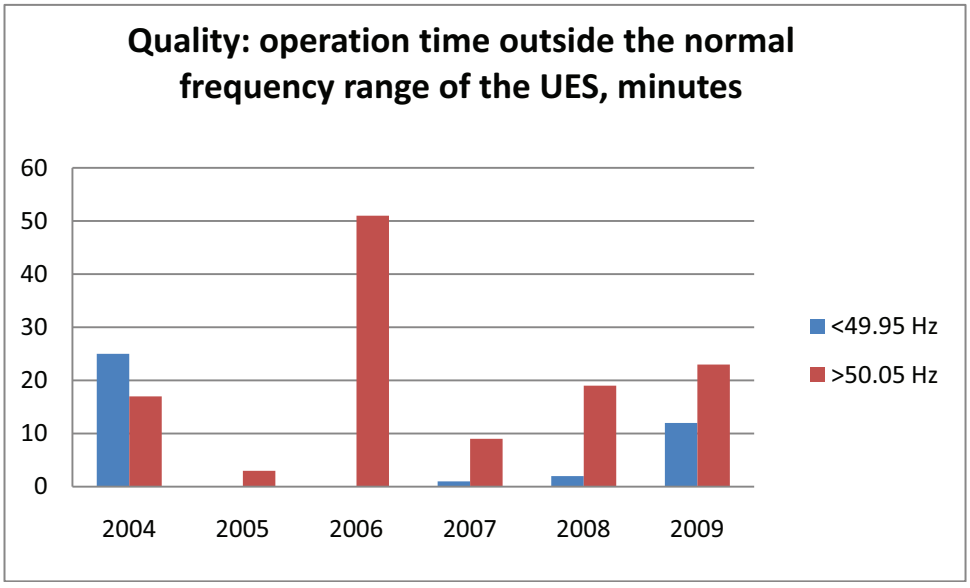

Figure 16.3: Technical reliability of RAO-UES operations, 2004–09. (Source: SO 2010a)

Russia imports electricity from Kazakhstan (Northern regions) and Kyrgyzstan (transit)/Central Asia, Ukraine and Lithuania; and exports to Finland/Nord Pool, Belarus, Kazakhstan (Western regions), and Georgia, Armenia, Mongolia and China (Inter RAO 2008).

The electricity system of Russia's Far East is independent from the European and Siberian markets and accounts for less than 10% of national total generation and consumption (Palamarchuk & Voropai 2006). Growing demand from neighbouring China creates an opportunity for developing this regional system. China has approved plans to construct 5000km of 500kV transmission lines along the Russia–China border. Since 2005 about 492 000 MWh of electricity has been exported annually to China, with the planned increase to 3.8 million MWh/year by 2015 (Drugov 2008). Various interconnection projects have been proposed and discussed (e.g., Belyaev et al. 2005; Yoon et al. 2006; Lee et al. 2007).

16.3.2.5 Industrial users choice

Large industrial users (with connected demand capacity of at least 20MVA, and a minimum of 2MVA in each connection node) can purchase electricity (capacity) directly from the wholesale market. For direct consumers and local distribution companies the required capacity limit was reduced to 1MVA from 1 August 2007, and then to 750kVA from 1 February 2008. This move facilitated further entry into the wholesale market by potential buyers.

16.3.2.6 Residential choice

There is limited competition in retail distribution to date. Section 16.3.10 contains examples of Federal Antimonopoly Service (FAS) investigations into the state of competition in the distribution sector. It is worth noting that the introduction of retail competition has been slow in many economies undertaking reform (Joskow 2008), and Russia does not appear to be an exception.

16.3.2.7 Consumer tariffs

The guaranteeing supplier receiving electricity through vested (regulated) contracts is obliged to sell the full amount at regulated retail tariffs. Residential customers are supplied exclusively at regulated tariffs. Any amount of electricity purchased at free wholesale market prices can be supplied at prices above the regulated tariffs. Independent distribution companies – participants in the wholesale market – can supply to any customer at unregulated prices. While the free bilateral contracts allow wholesale market participants to hedge their risks for future increases in the wholesale price, similar contracts do not exist for retail market participants.

Previously the rules for setting wholesale electricity tariffs were based on cost-plus reimbursement (Russian Federation Government Resolution № 109 of 26 February 2004 'On Formation of Prices for Electric and Thermal Power in the Russian Federation'). The allowable rate of return on invested capital was set to be between the government bond rate and the refinancing rate of the Central Bank of RF (13–14% in 2004 and 8.5–9% in 2009[23]). A similar approach was followed in the methodology for setting transmission charges.[24]

The allowable rate of return in the cost-plus formula often underestimated risk premiums associated with the economic activity of the regulated utilities, did not stimulate necessary investments and did not promote efficiency.[25] An Investment Guarantee Mechanism was

[23] http://www.cbr.ru/eng/print.asp?file=/eng/statistics/credit_statistics/refinancing_rates_e.htm.

[24] Federal Tariff Service Resolution № 56-e/1 of 21 March 2006 'On approval of methodology for calculation of tariffs for transmission services in the unified national (all-Russian) electricity grid'.

[25] Tariff levels for 2004–06 were set in the Russian Federation Government Decree № 1754-r of December 1, 2003 'On Approval of the Program for Changing State Regulated Prices (Tariffs) in Electric Power Industry'.

briefly introduced to compensate for investment in new capacity by levying a surcharge on the SO's tariff.

In the distribution/retail sector, residential tariffs were price-cap adjusted for CPI. One of the criticisms was that the expected inflation was lower than realised over 2002–05, and the prospective adjustor failed to compensate for an actual increase in costs. The real revenues of the sector were stagnant in 2002–05: the average profitability dropped from 15.7% in 2002 to below 10% by 2005, with half of all enterprises making losses (Milov 2005).

The deficiency of cost-plus pricing was recognised, and a new RAB formula for distribution tariffs was introduced in July 2008. The new formula was implemented in five regional pilot projects, with the consequent roll-out to other regions in 2009–10. Challenges include the determination of the asset base for RAB regulatory purposes: all new investments are included in the RAB calculations for the next accounting period. Hence there is a delay between the outlay of funds and the opportunity to recoup them through higher tariffs.

16.3.2.8 Regulators

The Federal Energy Commission (FEC) was established in 1995.[26] In 2001 the FEC assumed other anti-monopoly control functions in infrastructure sectors (transport etc.) and government regulation of tariffs. Regional Energy Commissions were formed to support the FEC activities with the role of regulating local tariffs for electricity and heat. In 2004 the FTS was formed to take over the FEC's functions. Responsibilities of the FTS include developing pricing and tariff methodologies and setting maximum and minimum price caps and tariffs (Box 16.1). Regional tariffs are set jointly with the Regional Energy Commissions (RECs).

Other regulators include:

- Federal Antimonopoly Service: competition supervision, including approval of mergers and acquisitions, regulation of market conduct and consumer protection. Oversees non-discriminatory third-party access to the transmission grid. Regulates the activities of the Administrator of Trading System.
- Administrator of Trading System – NOREM (wholesale electricity/capacity market operator) is a not-for-profit organisation with government involvement. Responsibilities of ATS include managing trading and settlement in the wholesale electricity market (maintaining a registry of participants, registering contracts, data collection, development of rules and methodologies, dispute resolution etc.).
- Rostekhnadzor (Russian Technical Supervision Agency) regulates technical protocols and norms in the construction and operation of the components of the electricity sector.
- System Operator – the technical body responsible for the technical security/uninterrupted supply of the national electricity grid.

Market competition and abuse of monopoly power in the electric energy sector is under the direct supervision of the FAS, a government agency in the Russian Federation. For the purposes of market definition, there is a single market for electric energy and capacity in

[26] Presidential Decree № 1194 'On Federal Energy Commission of Russian Federation' to regulate natural monopoly in the energy sector (based on the Federal Law № 41-FZ of 14 April 1995 'On State Regulation of Tariffs for Electric and Thermal Power in the Russian Federation', and Federal Law № 147-FZ of 17 August 1995 'On Natural Monopolies'). The FTS was formed based on the Russian Federation Government Decree № 204 'On Federal Tariff Service' (9 April 2004).

Box 16.1: RAB formula for distribution of tariffs.

The cost-plus formula was superseded with the Regulated Asset Base (RAB) methodology (Russian Federation Government Resolution N 459 of 18 June 2008 'On changes to the RF Government Resolution N 109 of 26 February 2004 *On Formation of Prices for Electric and Thermal Power in the Russian Federation*', with technical details provided in Annex to the Federal Tariff Service Resolution N 231-e of 26 June 2008 'Methodology for regulation of tariffs using the return on invested capital approach'). The new methodology formulated the rules for calculating regulatory capital value, reporting requirements for new investments and a formula for an allowable rate of return. Tariffs set for longer term (3–5 year) contracts are adjusted on an annual basis. Operating costs are adjusted for CPI, anticipated changes in business assets and an efficiency parameter (currently 1%, but possibly up to 2.5% reduction in operating costs pa). Any efficiency gains due to the reduction of transmission/distribution losses and to the reduction of operating costs remain with the company and are not taken into account in the annual review of tariffs (do not affect the allowable total revenue figure). The allowable return on capital (both equity and debt) is set once for the whole regulation period using the WACC formula. Return on debt is set to the average of return on corporate bonds issued by the regulated industries. Return on equity is set equal to the return on government bonds (4–6 year duration) plus risk premium for the regulated companies. Investment plans of the regulated company are coordinated with the FTS and, with the regulator's approval, earn the rate of return including the regional adjustor (higher allowable return in the areas of shortage). The investment activities are a separate item for accounting purposes and separated by geographic region (a Federal subject of the Russian Federation). Calculation of the initial regulatory capital value is performed by an independent expert. Transmission assets which are being fully funded by connecting charges are not included in the calculation of invested capital. The regulator receives an annual update on implementation of the agreed investment program and adjusts the values of the RAB and the return on RAB, and tariffs accordingly. In the distribution sector, RAB regulation has been in place for eight MRSK regional branches and the Tomsk distribution company since 1 January 2010, with an additional 22 branches switching to RAB by 1 July 2010. All the remaining regions will be on the RAB tariff formula by 1 January 2011. The regulators (FTS and Regional Energy Commissions) approve RAB parameters for each of the MRSKs. There is a perceived problem of regulatory valuations of the capital base being lower than accepted market valuation (ATON 2010).

Russia. Distribution companies supply electricity to the retail markets through retailers and guaranteeing suppliers. In 2008 both regulated and free (wholesale market determined) tariffs were in place. Supply to residential customers and other customers classified as such, including municipal utility companies, was conducted using regulated tariffs. The regions/territories outside the boundaries of the wholesale market were supplied using regulated tariffs (FAS 2009a).

The FAS registry in 2008 included 540 distribution companies, including 260 guaranteeing suppliers in 82 regions of the Russian Federation. Most of the regions have several distribution companies, usually coinciding with municipal divisions. At this level of geographic disaggregation, many sub-regional distribution markets appear highly concentrated.

Distribution companies belong to one of the following categories:

- Distributors – spin-offs from RAO-UES AO-Energos ('AO-energosbyt'). There are 70 such distributors on the FAS registry, all of them participants in the wholesale market. Some of these distributors were active in more than one region: 'Far East energy company' operates in several regions of the Russian Far East; Mosenergosbyt in both Moscow city and Moscow oblast (region); Petersburg energosbyt company in St Petersburg city and Leningradskaya oblast;
- Independent distribution companies – participants in the wholesale electricity (capacity) market and serving primarily large industrial customers. Some of these were also present in more than one geographic subdivision of the retail market: Rusenergosbyt (Moscow) is active in trading and supply of electric energy in 45 regions, serving the needs of the Russian Railways; Mezhregionenergosbyt (Moscow)

is active in 39 regions; Siburenergomanagement (Voronezh) is active in 13 regions; RN-Energo (Moscow) is in 6 regions; Energoservice Trading House (Moscow) is in 7 regions; Transneftservice (Moscow) is in 34 regions; and Mechel-Energo is in 4 regions;

- Other retailers, including municipal companies and non-members of the wholesale market. These distributors purchase energy from guaranteeing suppliers, other distributors or directly from generators, some of whom are second-tier guaranteeing suppliers.

According to FAS (2009b), the share of type (1) distributors in most of their geographic markets exceeds 75%; in some regions they are the monopolistic suppliers. All of these distributors have the guaranteeing supplier status. In the regions with multiple distributors, often only AO-Energos can purchase electricity on the wholesale market and re-sell it to other guaranteeing suppliers. At the same time, there is increased competition between retail distributors.

Since 1 April 2006 a company has been forbidden to own or lease assets in the transmission/dispatch of electricity or in its generation or distribution. Since 1 January 2008 these measures have applied also to a company's affiliates operating in the same price zone of the wholesale market (currently European Russia/Urals and Siberia).

Challenges facing FAS in enforcing this law include enforcement mechanisms which are not clearly specified and the difficulty of keeping track of the owners of affiliated entities. Breaches of the law on the separation of natural monopoly and competitive activities in the electric energy sector are brought by FAS to courts on a case-by-case basis. Uniform practices in solving such cases are not yet established.

Some third-tier distribution companies attempting to purchase electricity for further distribution from large distributors/guaranteeing suppliers complain about anti-competitive requests, such as pre-payment for the electricity or other arbitrary conditions.

Overall, FAS estimates that the level of competition in distribution and retail remains low and that most markets appear highly concentrated. In 2008 there were almost 3000 complaints to FAS regarding anti-competitive behaviour in the electricity sector. About one-third of these cases were investigated, with 60% of them resulting in orders by FAS to stop the offending action. Most of the complaints pertained to the refusal of guaranteeing suppliers to grant connections to the independent distributors, unreasonable conditions of supply, disconnection of services etc. Box 16.2 outlines some of the barriers to entry in distribution.

16.3.2.9 Universal service obligations and cross-subsidisation

Guaranteeing Suppliers (Suppliers of Last Resort) are designated distribution companies with universal service obligations to residential and other consumers. The guaranteeing supplier receiving electricity through vested (regulated) contracts is obliged to sell the full amount at regulated retail tariffs. Residential customers are supplied exclusively at regulated tariffs. The situation is to be preserved until 2015. Residential customers account for 11% of total electricity consumption (data for 2007).

Box 16.2: Barriers to market entry by new distributing companies.

1) Administrative barriers, such as:
- postponement of tendering for the status of guaranteeing supplier within the established geographic market to 2010;
- failure by the Ministry of Energy to approve rules and develop sample documents for the earlier tender to provide guaranteeing supplier services, in breach of the May 2008 deadline;
- control over retail tariffs for guaranteeing suppliers;
- lack of consistency in the application of tariff policy (e.g., approval of one-part tariffs for transmission charges by local tariff regulators while the two-part tariffs were still contractually in place)

2) Economic barriers, such as:
- requirements to reimburse the guaranteeing supplier when switching to an alternative supplier if breaking the contract within its duration (normally one year);
- high cost of installing metering equipment to connect to the wholesale market;
- customer receipts arrears;
- unauthorised or unaccounted for electricity consumption;
- cross-subsidies;
- arrears of payments for supply to communal utilities;
- investment needs to maintain infrastructure;
- inefficiencies in transmission and distribution networks, including technical dilapidation, disputed ownership of distribution lines, large distances from the point of connection to wholesale purchasers to final consumers; and
- abuse of market power by guaranteeing suppliers, barriers to entry by independent distributors by refusing them on the grounds that they are not final consumers.

3) Technological barriers:
- lack of automatic metering and accounting systems to participate in the wholesale electricity market.

Source: FAS 2009a.

The need to bring electricity tariffs in line with economic costs has long been publicly recognised in Russia.[27] Residential electricity tariffs were often used as a policy instrument in election campaigns at sub-federal level, with tariffs kept artificially low in pre-election years (Yudashkina & Pobochy 2007).

By 2004 the residential tariffs reached the level of industrial tariffs and in 2005 exceeded them at 1 RUB/kWh (or US3.4 cent/kWh) (Kurronen 2006).

The government provided USD90 million in direct subsidies for electricity tariffs in the Far East in 2004, in addition to USD280 million fuel subsidies in the Far North.[28] Cross-subsidisation takes different forms in Russia between industrial and residential users, heat and electricity tariffs, geographic regions, implicit subsidies from regulated natural gas prices and electricity tariff discounts for special categories of customers (e.g., veterans, pensioners, low income). The full extent of cross-subsidies is difficult to estimate. The range is USD4.5–12 billion per year (Milov 2005, Renaissance Capital 2006). RAO-UES estimated electricity cross-subsidies in 2007 to amount to RUB115 billion (USD4.5 billion), a 34% annual increase over USD3.3 billion subsidies in 2006.[29]

Major steps in the elimination of cross-subsidy between residential and industrial customers occurred over 2003–04, with the gap between residential and industrial tariffs closing by 2004. Retail tariffs still remained below the full economic costs but were expected to rise to reflect the full costs of distribution and retailing. The efficiency of electricity use remained low, and the need for energy-saving measures became apparent.

[27] The Government Decree № 1231 'On gradual elimination of cross-subsidies in electric power industry and on bringing residential electricity tariffs in line with actual costs of generation, transmission and distribution' of 26 September 1997 has set the elimination in action.
[28] http://budgetrf.info/?tag=dotacia.
[29] http://www.rao-ees.ru/en/invest/reporting/reports/report2007/8_3.htm.

The 2010 Budget of the Russian Federation's assumptions of average electricity tariffs include:[30]

- an increase in average electricity tariffs for all users from US4.5 cent/kWh in 2007 to US7 cent/kWh in 2011 and US10.5 cent/kWh in 2020;
- residential tariffs to increase more steeply from US4.5 cent/kWh in 2007 to US7.1 cent/kWh in 2011 and US15.3 cent/kWh in 2020 (Table 16.4);
- residential tariffs to be subject to government regulation at least until 2015;
- 60% of all electricity will be purchased at the unregulated wholesale market from 1 January 2010 but residential customers will continue to be supplied at regulated tariffs (tariffs in the regulated segment of the electricity market are set annually);
- full elimination of cross-subsidies in residential electricity tariffs in 2015;
- domestic prices for natural gas to be brought in line with the world price by 2020; and
- residential electricity tariffs increasing 1.35–2-fold over 2011–15.

Following the budget announcement there were public protests across Russia against the forthcoming increases in electricity, transport and residential utility tariffs.

16.3.3 Review of the implementation of reform

The changes in policy since 2003 are summarised in Table 16.5. Implementation of a reform of such depth and magnitude in a relatively short time (one decade) has presented multiple challenges. The population in general resisted the reform, unimpressed by the idea of higher retail electricity tariffs. Keeping the residential segment shielded from free market prices was a trade-off to liberalising other segments of the electricity sector.

During 2002–05 there were delays in passing the necessary legislation and starting the reform. The Duma (2007) and Presidential (2008) elections added to the uncertainty as to the future progress of the reform. The Renaissance Capital (2005) report highlighted the industry's disappointment with the discrepancy between the announced reform milestones and their implementation.

Note that there are essentially two wholesale electricity markets in Russia – capacity and electricity. Wholesale electricity prices at a day-ahead market are based on marginal (variable) costs, covering mostly the fuel component. Fixed costs of generation are covered through capacity payments, with an annual competitive selection of future capacity suppliers (to supply starting year of selection +4). The amount of capacity payment is differentiated by new/old energy, between type of fuel (nuclear, hydro, gas and coal) and is calculated for each generator based on the rate of return formula. Clarifications of the capacity payment rules and mechanisms and liberalisation of tariffs would help to resolve the uncertainty that has stifled investment in the generation sector.[31]

Tightly regulated by regional energy commissions, consumer tariffs often did not leave any room for regulated distributors' required capital expenditure. The shortfall between the usage fees and costs was often covered through connection fees introduced in 2006. For 2008–12 the connection fees for new customers and for existing users requiring additional capacity are expected to cover the capital costs and investment. Reliance on connection fees has the

[30] http://budgetrf.info/?tag=dotacia

[31] Russian Federation Government Decree № 238 of 13 April 2010 'On pricing parameters of capacity traded in wholesale electricity/capacity market during transition period' and Russian Federation Government Decree № 89 of 24 February 2010 'On issues of competitive tendering of long-term capacity in the wholesale electricity/capacity market'.

Table 16.4: Electricity tariffs for 2006, and projected for 2007–20.

Electricity tariffs ***(US c/kWh)***	**Scenario**	**2006**	**2007 estimate**	**Forecast**												
				2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
All users	**1**	*3.9*	*4.5*	*5.4*	*6.1*	*6.6*	*6.8*	*6.5*	*6.0*	*6.3*	*6.4*	*6.6*	*6.7*	*6.9*	*7.0*	*7.2*
	2	*3.9*	*4.5*	*5.4*	*6.1*	*6.8*	*7.0*	*7.1*	*7.2*	*7.5*	*8.0*	*8.4*	*9.1*	*9.6*	*10.1*	*10.5*
	3	*3.9*	*4.5*	*5.4*	*6.1*	*6.8*	*7.0*	*7.2*	*7.3*	*7.6*	*7.9*	*8.2*	*8.5*	*8.9*	*9.2*	*9.5*
Residential	**1**	*4.0*	*4.5*	*5.0*	*5.6*	*6.4*	*6.8*	*6.9*	*6.7*	*7.4*	*8.0*	*8.6*	*9.2*	*9.7*	*10.2*	*10.7*
	2	*4.0*	*4.5*	*5.0*	*5.7*	*6.5*	*7.0*	*7.5*	*8.1*	*8.9*	*9.8*	*10.8*	*12.1*	*13.3*	*14.3*	*15.3*
	3	*4.0*	*4.5*	*5.0*	*5.6*	*6.5*	*7.1*	*7.7*	*8.2*	*8.9*	*9.7*	*10.6*	*11.4*	*12.4*	*13.2*	*13.9*

Source: http://budgetrf.info/?tag=dotacia

Table 16.5: Recent changes in policy.

Area of policy change	Year of change	Description of change
Structure	2003–08	Restructuring of incumbent operator RA-UES based on: •vertical unbundling of contestable activities from network services and system operation; first accounting and then structural separation; and •horizontal unbundling of contestable components of the value chain, to facilitate competition in generation, retail and repair/maintenance services.
Ownership, structure	2003–08	All assets owned or controlled by RAO-UES, all existing assets of regional energos and any other public utility enterprises owning or operating electricity infrastructure were subject to restructuring. Restructuring of RAO-UES resulted in the creation of 6 wholesale generating companies, 14 territory generation companies and an international trading/generating company (Inter RAO). All hydro-electric power assets were transferred to RusHydro. Nuclear generation assets are under Rosenergoatom. All high-voltage transmission grid assets were transferred to the Federal Grid Company, and regional distribution networks to an Inter-regional Transmission Company. Technical supervision of the electricity network is performed by the System Operator. Privatisation of generating assets.
Market access, competition	2003	Third party access to the grid for independent generators and reorganised wholesale and regional generating companies. Horizontal unbundling of retailing functions, including the creation of guaranteeing suppliers to serve regulated consumers and to operate as a retailer of last resort.
Regulation, market access	2003	Wholesale electricity and capacity market has allowed competitive supply in the market not covered by vesting (regulated) contracts. Creation of an Administrator of Trading System. Next-day market, balancing market, financial transfer rights market and market for derivatives.
Regulation	2003	Elimination of licensing requirement for economic activity 'generation, transmission and distribution of electric energy'. Technical standards and norms (Rosteckhnadzor).
Market access	2003–08	Entry of foreign utilities/strategic investors in electricity infrastructure. Currently, E.ON (Germany), Enel (Italy) and Fortum (Finland).
Regulation	2008–	Move from cost-plus to RAB tariff formula for regulated activities.

drawback of increased volatility of MRSK's revenues. In an economic downturn, the demand for new connections and additional capacity falls, so funding for investment projects dries up (Standard & Poor's 2008).

The incentive for distribution companies to recoup shortfalls of tariff revenues over the cost of investment and maintenance through connection charges created a significant barrier to small and medium enterprises (SMEs) seeking a new connection. In response, the Russian Federation Government mandated a simplified procedure for technical connections.[32]

It is important to recognise that the original investment program, formulated in the economic boom years, has been halted by the financial and economic crisis of 2008–09. As noted

[32] By Resolution № 334 of 21 April 2009, since 5 May 2009 the connection fee for the maximum capacity of 15kW should not exceed RUB550 (USD18). Customers requiring connection of 15–100kW are given the option to pay the connection charge in instalments within 3 years from the connection date. Information disclosure requirements were imposed on distribution companies to facilitate transparency of their connection fee decisions (FAS 2009b). The decision has led to a 30% increase in connection applications from SMEs over 2008–09 (for <15kW connections), and a 50–60% increase in the requested total capacity (MED 2010a).

above, electricity consumption failed to grow at the rate that Chubais has expected and in hindsight the growth in capacity was not required as urgently as he had predicted.

The data from the Ministry of Economic Development and Trade demonstrates that, despite the recession, the electricity, water and gas sector fell by only 5.2% in physical output, and actually increased 2.4-fold in revenue over 2008–09 to RUB200 billion (USD8 billion) (MED 2010b). Improved financial performance of the sector was definitely attributed to the increase in tariffs as part of the reform implementation. Processing and manufacturing industries in energy-using sectors were hit particularly hard by both falling demand for their goods and rising electricity costs. This is a (rather painful) example of when price signals generate incentives to increase efficiency – both technical efficiency, through energy-saving measures, and allocative efficiency, by considering the longer term viability of the energy-using sector – given the true economic cost of electricity and other energy sources. These efficiency gains, and the reductions they make possible in the energy intensity of the economy, have been an important benefit of the reforms to date and of the further stages of its implementation which are planned.

Investment targets for 2008 and thereafter were not fully met, however.[33] Russian Prime Minister Vladimir Putin recently criticised private owners of generating assets for lagging behind with their investment programs. The industry response was that recent changes in economic conditions forced the postponement.

16.4 CONCLUSION

The electricity sector in Russia has experienced significant reform since 2003, in terms of ownership, pricing and access to new competitors. The commitment to price reform has led to the scope for efficiency gains in energy use. The transition of pricing to world market levels has been an important contributor to support for the implementation of reform, but the commitment remains to reach the global benchmarks.

One of the prime motivations for the reform was to create incentives for new investment. Foreign investors have been attracted to the sector. However, the slower than expected growth in electricity consumption, including the impact of the global financial crisis, has allowed a delay in those investments. The maintenance of an investment program remains an issue, and some uncertainties related to the design of the reforms are yet to be resolved.

The progress of reform and its significance in Russia can be put into context by consideration of the lessons from the experience in California in 2001. Several issues underpinned the electricity crisis there at that time: the lack of investment in new generating capacity during the reform period when market rules were being developed; the strategic behaviour of the generators to withhold capacity and bid up wholesale prices, and the inability of retailers to pass the increased wholesale costs to consumers due to retail price caps.

The following observations not only highlight the new stages of the reform but also illustrate the ways in which the reform program in Russia has learnt from the experience in California:

[33] In 2008 the national energy system received an addition of 11 000km of transmission/distribution lines (76% of the planned facilities), transformation stations with total capacity 22 570MVA (90% of planned capacity) and 2004MW of generating capacity (68% of the planned) http://minenergo.gov.ru/activity/plan/2010-2012_3/1.php.

- *Investment in new capacity*
  It appears that investment in new capacity has been postponed until the rules of the wholesale market become clear and tested. Owners of the privatised RAO-UES generating assets have had their investment programs approved but much of the investment concentrates in replacing dilapidated assets and upgrading existing assets. There have been virtually no green-field investments until recently. The latest clarifications of the capacity payment mechanisms have created the conditions that would allow them to recoup fixed investments in the new projects.

- *Strategic behaviour of generators and market power*
  The new rules for capacity payments impose heavy penalties on generators withholding declared capacity or using a different mix of capacity from that approved by the System Operator. Generators operating in the markets with limited interconnection are subject to price-cap regulation by FTS and FAS. Base-load nuclear and hydro-generating assets remain fully/majority publicly owned, with the majority of private suppliers operating thermal plants with comparable cost structure. All of the above make the occurrence of California-type changes to the market design less likely.

- *Retail price caps and inability to pass costs to final users*
  With the scheduled liberalisation of the wholesale market to 2011, most customers will be supplied at unregulated wholesale market tariffs. Residential customers will be supplied at regulated tariffs until 2014, with the level of residential tariffs gradually brought in line with the full economic cost. Industrial and other users will be supplied at market prices. Voluntary bilateral contracts between suppliers and buyers of electricity/capacity allow retail distribution companies to hedge their price risks and purchase contractual amounts at mutually agreed prices. Any price increase at wholesale markets can be passed on to industrial and other non-residential customers, who are not subject to price caps.

16.5 REFERENCES

Abdurafikov, R 2009. Russian electricity market: Current state and perspectives. VTT Working Papers 121, http://www.vtt.fi/inf/pdf/workingpapers/2009/W121.pdf accessed on 10 February 2010.

ATON 2010. Electricity distribution: RAB must go on. ATON LLC. 4 February 2010.

ATS 2010. Wholesale Price Report 2008. Administrator of Trading System, http://www.atsenergo.ru/idc/groups/rt_cost_review/documents/ats_download/ats078093.pdf accessed on 20 February 2010.

Baumgartner, O 2009. Further rise in tariffs inevitable – Support for investment activity still lacking. *Nezavisimaya Gazeta,* 11 August 2009. http://wwww.ng.ru/energy/2009-08-11/12_tarify.html accessed on 13 February 2010 (in Russian).

Belyaev, L 2005. The need for a regulation of the generation capacity development in a competitive electricity market. Power Tech, 2005 IEEE Russia, 27–30 June.

Belyaev, LS, OV Marchenko & SV Podkovalnikov 2002. *Expected consequences of transition to market in Russian electric power industry* Power System Technology, 2002. Proceedings. PowerCon 2002. International Conference on Power System Technology Proceedings Vol. 1 Digital Object Identifier: 10.1109/ICPST.2002.1053497, pp. 24–28.

Belyaev, LS, NI Voropai, LY Chudinova, SV Podkovalnikov & VA Savelyev 2005. *Prospects of electricity infrastructure in East Asia* Power Engineering Society General Meeting. IEEE Digital Object Identifier: 10.1109/PES.2005.1489190, Vol. 2, pp. 1536–39.

Drugov, S 2008. *Guarding security of the Far East energy system* 'Energorynok' (Energy Market), No. 7, http://www.e-m.ru/er/2008-07/23510/?phrase_id=23106 (in Russian).

Energy Strategy 2030. http://minenergo.gov.ru/activity/energostrategy/ (in Russian).

FAS 2009a. 'Analysis of the electricity (capacity) retail distribution market in 2008. 28 December 2009'. Federal Antimonopoly Service, Russian Federation. http://www.fas.gov.ru/analisys/tek/a_28410.shtml. accessed on 16 February 2010.

FAS 2009b. 'Attention small businesses: Technological connections to electric networks'. Electric Energy Supervision Department. 9 July 2009 http://www.fas.gov.ru/monopoly/power/a_25269.shtml?print.

FSS 2010a. 'Electric energy balance of Russia, 2008'. Federal Statistical Services of Russian Federation. http://www.gks.ru/free_doc/new_site/business/prom/el_balans.htm, accessed on 20 February 2010 (in Russian).

FSS 2010b. 'Industry of Russia 2008'. Federal Statistical Services of Russian Federation. http://www.gks.ru/bgd/regl/b08_48/Main.htm (in Russian).

IEA 2005. *Russian Electricity Reform: Emerging Challenges and Opportunities.* International Energy Agency/OECD, Paris.

IEA 2009. 'Key world energy statistics'. International Energy Agency, Paris. 2009. http://www.iea.org/Textbase/nppdf/free/2009/key_stats_2009.pdf.

Inter RAO-UES 2008. Investors' presentation. April 2008.

Inter RAO-UES 2009 'Russian Energy Trip. Presentation May 13, 2009'. http://www.interrao.ru/_upload/editor_files/file0529.pdf, accessed on 8 February 2010.

Joskow, P 2008. 'Lessons learned from electricity market liberalisation', *The Energy Journal*, Special Issue 'The Future of Electricity: Papers in Honor of David Newbery'. http://econ-www.mit.edu/files/2093.

Kurronen, S 2006. 'Russian electricity sector – reform and prospects. Bank Bank of Finland, BOFIT Institute for Economies in Transition BOFIT Online 6/2006'. http://www.bof.fi/NR/rdonlyres/C60670F4-B7BB-4267-95BC-37788A1A76C9/0/bon0606.pdf, accessed on 15 January 2010.

Lee, S-S, Y-C Kim, J-K Han, J-K Park, S-H Lee, M Osawa, S-I Moon & Y-T Yoon 2007. *Northeast Asia Power Interconnection Routs and Representative Studies in South Korea* Power Tech, 2007 IEEE Lausanne Digital Object Identifier: 10.1109/PCT.2007.4538606, pp. 1893–98.

MED 2007. 'Concept of long-term growth to 2020 for Russian Federation'. Ministry of Economic Development of the Russian Federation, 31 October 2007. http://wcm.economy.gov.ru/minec/activity/sections/strategicPlanning/concept/doc1193835322297.

MED 2010a. 'Report on the outcomes of implementation of the new rules for technological connection to electric networks for small businesses'. Ministry of Economic Development of the Russian Federation. http://wcm.economy.gov.ru/minec/activity/sections/naturMonopoly/doc20100209_03.

MED 2010b. 'Summary indicators of social-economic development of Russian Federation in 2009'. Ministry of Economic Development and Trade, 3 February 2010, http://www.economy.gov.ru/minec/activity/sections/macro/monitoring/doc20100203_01, accessed on 31 March 2010.

Milov, V 2005. 'Regulatory framework in the Russian power sector: trends and challenges'. Institute of Energy Policy/Center for Strategic Research, Presentation, Moscow, 14 July 2005.

Minenergo 2010a. http://minenergo.gov.ru/activity/powerindustry/powerdirection/energorynok/ (in Russian).

Minenergo 2010b. 'Report on the results and projected future activities of the Ministry of Energy, Russian Federation, for 2010-2012'. http://minenergo.gov.ru/activity/plan/2010-2012_3/1.php, accessed on 31 March 2010.

Oksanen, M, R Karjalainen, S Viljainen & D Kuleshov 2009. 'Electricity markets in Russia, the US, and Europe'. EEM 2009. 6th International Conference on the European Energy Market, Leuven, Belgium 27–29 May 2009. Digital Object Identifier: 10.1109/EEM.2009.5207214 pp. 1–7.

Palamarchuk, SI & NI Voropai 2006. 'Russian's power industry restructuring: current state and problems'. Engineering Society General Meeting, 2006. IEEE. 6 pp.

Palamarchuk, SI & NI Voropai 2009. 'Status and development of the Russian electricity market'. Power & Energy Society General Meeting, 2009. PES '09. IEEE, pp. 1–5.

Palamarchuk, SI, MA Lamoureux & NI Voropai 2008. 'Status of Russian power sector liberalization'. Electric Utility Deregulation and Restructuring and Power Technologies, 2008. The Third International Conference on Electric Utility Deregulation and Restructuring and Power Technologies, Nanjing, China, pp. 82–8.

Pollitt, M 2007. 'Liberalisation and Regulation in Electricity Systems: How can we get the balance right?'. CWPE 0753 and EPRG 0724 Working Paper. October 2007, http://www.eprg.group.cam.ac.uk/wp-content/uploads/2008/11/eprg0724.pdf, accessed on 31 March 2010.

RAO-UES 2003. 'Concept strategy for RAO UES of Russia for 2003-2008 "5+5"'. United Energy Systems of Russia. http://www.rao-ues.u/ru/reforming/kon/show.cgi?kon_main.htm, accessed on 1 February 2010.

Renaissance Capital 2005. *Utilities: Form and Substance*. 30 August 2005.

SO 2010a. 'Forecast of reaching system limits and conditions to ensure operations within the limits'. System Operator. 31 January 2010 (in Russian). http://www.so-ups.ru/fileadmin/files/company/reports/disclosure/2010/tech-disc-jan2010.pdf, accessed on 8 February 2010

SO 2010b.' United Energy Systems (UES) of Russia 2009 operations report'. System Operator, 31 January, 2010 (in Russian). http://www.so-ups.ru/fileadmin/files/company/reports/disclosure/2010/ues_rep_2009.pdf, accessed on 16 February 2010.

Standard & Poor's 2008. 'Restructured Russian distribution companies are facing an increase in debt and new regulatory regime' (in Russian). 8 September 2008. http://www.standardandpoors.ru/article.php?pubid=4524&sec=pr, accessed on 12 February 2010.

Tatenergo 2009. 'Wholesale electricity market rules in the transition period: main features'. Powerpoint presentation. www.tatenergo.ru/download/presentation_02.ppt, accessed on 19 Februrary 2010.

Udaltsov 2005. 'Critical challenges and strategy for facing the power sector reform transition'. Presentation at World Bank workshop 'Russian Electricity Reform', Moscow, 14 July 2005.

UniCredit 2008. 'Global Equity Research: Sector Flash – Electric power', Russia/CIS. 24 January 2008.

Voropai, NI & YN Kucherov, 2000. 'Russia and the EU electricity directive'. *Power Engineering Review, IEEE*, vol. 20, no. 4 Digital Object Identifier: 10.1109/39.833011, pp. 19–21.

Yoon, J, D Park, & H Kim 2006. 'Feasible power exchange model between the ROK, the DPRK and Russia', Power Engineering Society General Meeting. IEEE Digital Object Identifier: 10.1109/PES.2006.1709195.

Yyudashkina, G & S Pobochy 2007. 'Regulation of the electricity sector in Russia: regional aspects', *Quantile*, 2007, issue 2, pp. 107–30, http://quantile.ru/02/02-YP.pdf (in Russian).