



ENERGY AND NATURAL RESOURCES

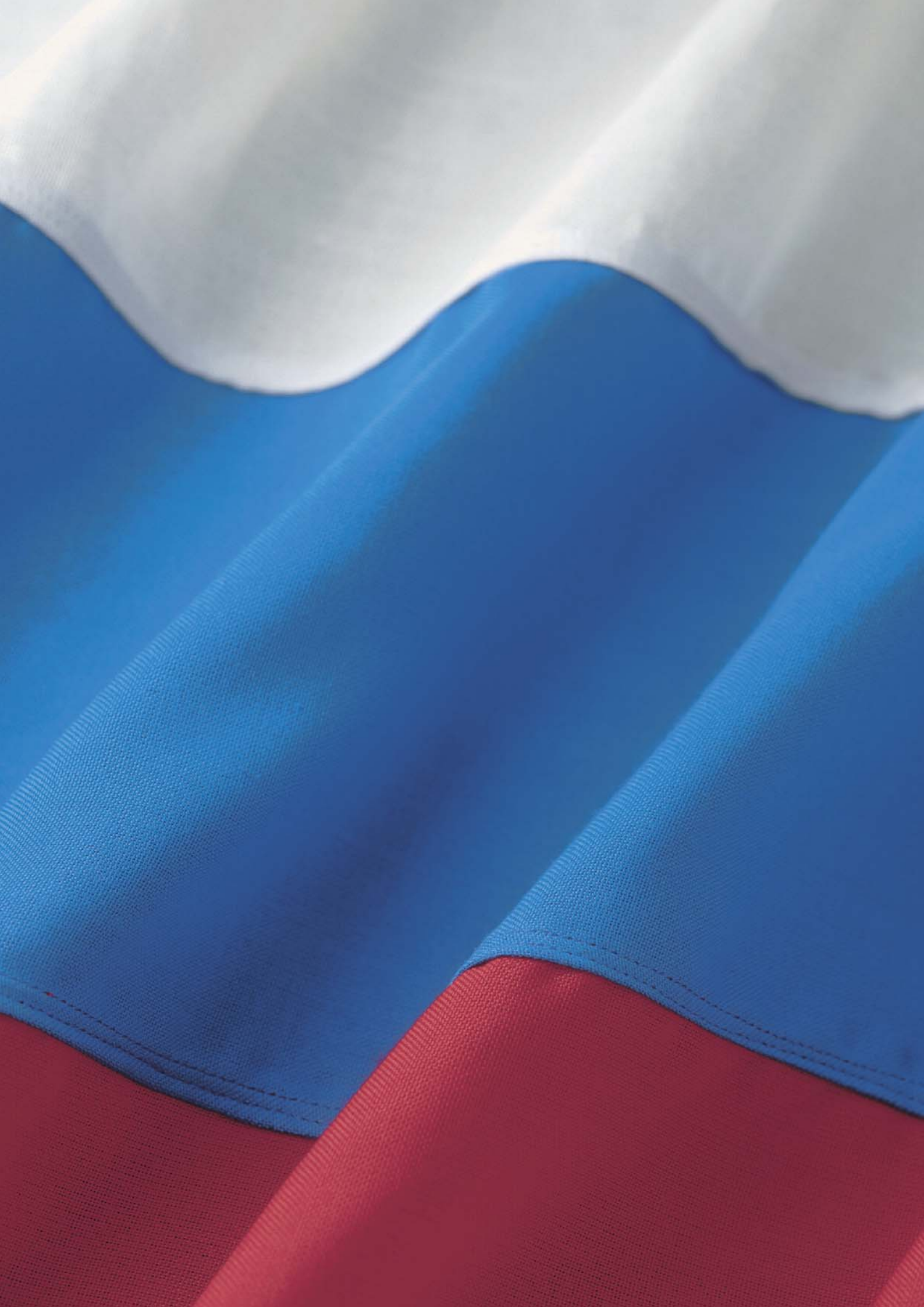
Think BRIC!

Key considerations for investors targeting the power sectors of the world's largest emerging economies

RUSSIA

ADVISORY





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Foreword



Péter Kiss
Partner, KPMG Global Head
of Power and Utilities

Energy is a global industry, vital to economic development and as such has strong political and social implications. The world's largest emerging economies, known in shorthand as the BRIC countries – Brazil, Russia, India and China – are in the top 10 global energy consumers and are home to 40 percent of the world's population.

The strong correlation between economic growth, welfare and energy use means that future demand levels, security of supply, energy mixes, production levels and general market dynamics will increasingly move to the fore as key issues.

Electricity is by nature a unique product. It is indispensable and it has no substitute. It is something we realize the importance of only when we experience a shortage. It is just enough to recall the biggest blackout in U.S. history in 2003 which struck parts of the Northeast, Midwest and even Canada, knocking out power to millions of Americans.

This publication is a part of a series of reports titled "*Think BRIC! Key considerations for investors targeting the power sectors of the world's largest emerging economies: Brazil, Russia, India and China*" – aiming to highlight major trends and challenges shaping the evolution of these countries' power sectors over the course of the next decade in light of the global economic crisis.

In this publication we have attempted to turn market data into meaningful information and include top-level executives' perspectives on the evolution of the Russian power sector from political, socio-economical, technical, environmental and legal aspects. They offer scenarios they consider adequate to meet the supply-demand balance challenge in the short-, middle-, and long term.

Major questions raised during this research included how necessary investments in generation, transmission and distribution will be financed in terms of state support, privatization and foreign direct investments, how regulation will support the emerging trends and how global financial turmoil will affect the pace of development.

I trust that the contents of this report will offer you deep insights into these unique, emerging energy industry markets.

A handwritten signature in black ink, appearing to read 'Peter Kiss', written in a cursive style.

Introduction & Methodology

This publication has been compiled by KPMG's Global Power & Utilities Knowledge & Resource Center, based in Budapest, Hungary as the Russian country report of the "**Think BRIC! Key considerations for investors targeting the power sectors of the world's largest emerging economies**" publication series.

KPMG conducted a comprehensive research both on- and off-site in Russia and our in-depth analysis characterizes the development of the electricity industry.

This report is partly based on a survey conducted by Ipsos, an independent international market research company, assigned by KPMG to interview key decision makers of the Russian power sector. Based on these interviews, professional databases, evaluations and KPMG forecasts, KPMG's Global Power & Utilities Knowledge and Resource Center compiled predictions for the development of the Russian power sector up to 2020.

During the survey period of March-May 2009, Ipsos' senior qualitative researchers conducted semi-structured personal interviews (based on a questionnaire prepared by KPMG) with top-level executives considered to be key stakeholders in the country's power sector. The target groups of the interviews comprised:

1. **Major market participants:** key players of the electricity industry bearing a dominant market position (both state-owned and privately held integrated electricity companies, TSOs, electricity traders)
2. **Regulatory authorities:** competent ministries, regulatory bodies
3. **Financial institutions:** domestic and international investment banks with dominant market share
4. **WEC** – World Energy Council
5. **Technological suppliers, equipment manufacturers**

The sample consisted of 15 prominent experts working throughout the power sector, and whom KPMG would like to thank again for the wealth of valuable information they shared for this report.

In Russia, the following listed companies and their representatives contributed to our survey:

Segment	Company
Major Market Participants	1. Gazprom (Mezhregiongaz - 100% subsidiary)
	2. RusHydro
	3. EuroSibenergo
	4. Holding MRSK
	5. Rosneft (RN-Energo - 100% subsidiary)
Regulatory Authorities	6. Ministry of Energy
Financial Institutions	7. Gazprombank
	8. Barclays bank
	9. Société Générale (Banque Societe Generale Vostok)
	10. Bank of Moscow
Technology Suppliers	11. ABB Group (ABB - Energosviaz)
	12. E4
	13. Schneider Electric SA
	14. Siemens
	15. Energostroy-investholding

Executive Summary

In 1920, just after the birth of the Soviet state, Vladimir Ilyich Lenin, made a grand, far-reaching declaration: *“Communism is Soviet power plus electrification of the whole country,”* he said, before setting about to fulfill his vision with a 15-year plan to bring power to the proletariat.

The Russian electricity system of today is largely a consequence of this and subsequent Soviet-era plans.

Scores of power plants feed almost 1 million gigawatt hours of electricity into a vast grid that comprises some 3.2 million kilometres of cables that stretches across 11 time zones. This all makes the Russian market one of the largest on the planet, representing 5 percent of global power consumption.

It is very impressive indeed, at least on paper. After decades of neglect, or poorly-managed investment in the post war period, the system struggled to keep up with demand during the boom years after the financial crisis of 1998, with Moscow experiencing power cuts earlier this decade.

More recently, the global financial crisis, along with the fall in the price of oil, has hit Russia hard, cutting purchasing power and sending industrial production plummeting downwards. As a result, electricity demand has dipped.

But this is seen only as a temporary respite, and by 2011 consumption is

expected to recover to the 2008 level of 850 TWh, rising to around 1,000 TWh by 2020. To meet this demand, the government has created a plan to boost total generating capacity from some 218 GW to 347 GW by 2020. This target, representing a massive 129 GW – or 60 percent - in new capacity, is seen as grandiose and hardly achievable; in this study, a more modest increase of 39 GW – or 17 percent – is seen as more attainable.

With observers at loggerheads as to which part of the ailing system is most in need of urgent attention, it is clear that in terms of opportunity to service the sector – whether it be heavy-current hardware, micro-electronic metering equipment or straightforward education of a new generation of operating staff – the field is vast and varied.

But money is in short supply, both in the public and private sectors; the state remains in control of all segments bar some thermal power plants. The Russian state supports, in fact requires, private investment into new generation equipment; but with an opaque regulatory system, even if financial institutions have the means to support private developments, it is questionable if the payback is worth the risk.

Unsurprisingly, given the urgent attention demanded by core issues, concerns about the environment and carbon footprints appear superficial at

best, despite Russia’s signature to the Kyoto Protocol.

It is against this fascinating, precarious background that KPMG undertook this study. What, then, are the needs, and what are the opportunities to service them?

First, the economy is expected to return to growth within two years and expand by 6.82 percent annually between 2013 and 2020. This, coupled with a decline in the population (from roughly 142 to 135 million), will result in a near doubling of Russia’s GDP per capita. That is, GDP per capita is expected to grow from just under USD 16,000 in 2008 (less than half the current average figure for Western Europe) to near USD 31,000 in 2020, i.e. some 90 percent of current western European norm.

This economic expansion will be the main driver of electricity demand, which stood at a fraction under 6,000 kWh per capita in 2008, barely half the figure for North America. Underpinned by economic growth electricity consumption should rise over 25 percent, to top 8,000 kWh per capita by 2020.

How will the electricity sector meet this increased demand? The current generation mix is very dependent on natural gas, which had a 46 percent share in 2006, supported almost equally by coal (18 percent), hydro (17 percent) and nuclear (16 percent).

Oil-fired plants held a negligible 2.5 percent, and renewable production was almost non-existent, with biomass claiming a mere 0.3 percent.

For the future, nuclear appears to have strong backers, based on reasons of cost, independence of supply and, no doubt, a strong domestic lobby. Russia's 31 nuclear units, with a capacity of 21,750 MW, remain in state hands, and current plans envisage an additional 30 units, meaning the nuclear share will rise to 20 percent of the total expected production of 1,330 TWh by 2020.

The role of coal is also expected to increase further, to some 20 percent of the market, while the relative proportions of gas and hydro generation will slip by 2020. Note that this does not necessarily mean a lack of new gas or even hydro plants; however, the government is keen to reduce the dependence on gas, and the area with most potential for hydro development, Siberia, is distant from the main centres of population.

The government program sets a target of 4-5 percent for renewables by 2020, a goal analysts feel unlikely to be reached given the economic and regulatory climate. Hence this report sees renewables creeping up towards 2 percent of production – a modest increase if realized, but, given the size of the cake, this equates to 22 TWh of electricity – hardly insignificant in absolute terms.

Assuming that the new generation capacity comes on line, are the transmission and distribution systems up to the increased loadings? It appears unlikely, unless much work is done. Granted, network losses, currently at



around 10 percent of production, have been shaved lower in recent years, and the target for 2020 is 9.19 percent – against a global average of 8 percent.

However, technical investigations reveal that all three levels of electricity transmission companies, that is the state-owned transmission network, the Inter-regional Distribution Grid MRSK, and the municipally-owned city networks are all in a bad state of disrepair.

The needs are clearly wide-ranging, but respondents of KPMG's survey highlighted a need to install modern,

automated control and metering systems, new, efficient transformers, and the need for dual-tariff meters in the household sector as a prelude to demand-side control in order to smooth demand peaks. How much can be achieved in this predominantly publicly-owned segment, given the financial constraints, is another matter.

What does the total required investment for the electricity sector add up to? According to government plans, the sector needs some USD 655 billion between 2015-2020, with just over half that sum for generation, a

quarter for transmission investments and one-fifth for distribution.

By comparison, the International Energy Agency estimates are far more modest; it has assessed the needs at USD 440 billion up to 2030.

Based on these and respondents' opinions, this report estimates investment up to 2020 will be in the range of USD 500-550 billion.

Some respondents think the current financial crisis strengthens the case for investment into the electricity sector, based on the argument that assets are cheap.

"Today it is most attractive to invest here, because the return on capital is faster than in other developing countries," reasoned one foreign equipment supplier. But others point to a history of opaqueness and bias in favouring native concerns. *"There is a political preference and protection for the domestic investor. It is easier for local business elites to obtain the agreements necessary to do business,"* KPMG analysts concluded from respondent analysis.

There is also evidence of a certain national preference in terms of equipment revealed by KPMG's survey. Whether such opinions are based on empirical evidence, or misplaced patriotic emotions is impossible to judge, but it is felt that companies with production facilities in Russia, mainly in the form of joint ventures with local firms, hold an advantage over those merely importing the finished product, if only for reasons of lower cost.

What, though, of investing into the operating assets of the sector?

Although the formerly state-owned, vertically-integrated electricity company has been unbundled, the transmission and distribution networks, plus nuclear and hydro generation assets, remain in state or public ownership.

Furthermore, there seems to be no public awareness that allowing an inflow of private capital and know-how would do away with inefficiencies or improve services. Hence private companies, both foreign and domestic, have only been able to gain stakes in thermal power plants.

The government promises that legislation is in the pipeline to solve cross-subsidies and fixed end-user tariffs, and that with gradual liberalization, free electricity trading at unregulated prices will be available from 2011, thereby ensuring a competitive market to attract more private investors to finance new power plants. In fact, a 'day ahead' or spot market already exists, in theory.

However, at the time of writing, almost the entire generating capacity is sold according to regulated contracts. As one market participant stressed; "The rules of the capacity market should be urgently confirmed, because the whole process is blocked by this problem. Until this block is removed, nobody is going to build anything normally."

However, the government – seemingly unaware of both its own precarious finances and of the concerns of private capital - has confirmed that

there will be no reduction in the investment program of the state sector, and insists on the continuation of private investments at the same level as previously outlined.

This stance prompted the following response for this report from one financial institution;

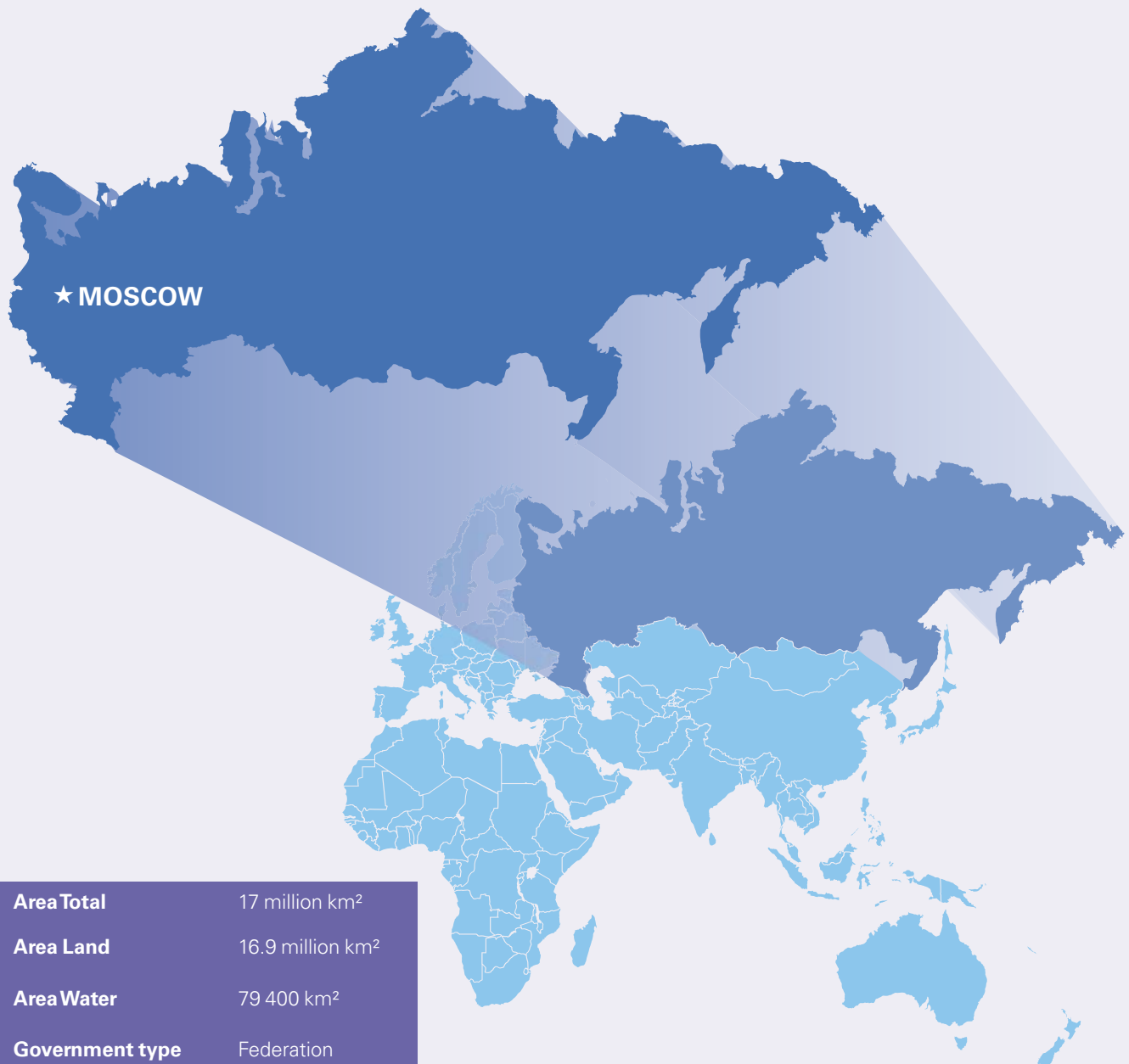
"If there is no money the government's declaration will not make any difference. I do not know how the government will solve this problem with new owners."

There is no doubting the government's resolve. As one technology supplier put it, so incisively; *"Our government will not allow any force majeure, because they are strategically-thinking people."*

Assuming that electricity demand does indeed begin to increase again from 2011, pressure – both from the public and business - will increase for reliable, affordable electricity. And in spite of the challenges – be they tariff arrangements, bureaucratic and permitting inefficiencies, the need to do favours or plain shortages of skilled staff – history has proved that business will get done.

As such, the Russian electricity sector is still a target for foreign investments, even in the current crisis period. As one survey participant puts it; *"As demand for electricity remains [even] in this period of crisis, investments will come. This business is very attractive."*

1. Russia – Country in Figures



Area Total	17 million km ²
Area Land	16.9 million km ²
Area Water	79 400 km ²
Government type	Federation
Capital	Moscow
Population (2008)	141.8 million (World rank: 10)
Population annual growth rate	-0.41 %

Source: CIA – The World Factbook, 2009

2. Population



Population growth is one of the main determining factors of energy demand. Although the share of the residential sector in electricity use is only 13 percent in Russia, population growth is decisive in respect to domestic demand for goods and products; additionally, population growth is important for industrial output and domestic gross production.

In the first section, Russia's major demographic trends and trajectories are presented to show the future opportunities in the country's economy and energy consumption.

The population of Russia was 141.8 million in 2008¹, making it the ninth largest country in the world according to population; nevertheless it is experiencing a steady decrease.



Russia is by far the last in terms of population out of the four BRIC countries. Lower birth rates and higher death rates have reduced Russia's population by 520,000 to 750,000 people per year between 2000 and 2008 which accounts for a 0.41 percent annual decrease.²

This trend is expected to continue, therefore, the present Russian population is predicted to decrease annually up to 2020. Figure 1 compares this trend to Western European population trends.

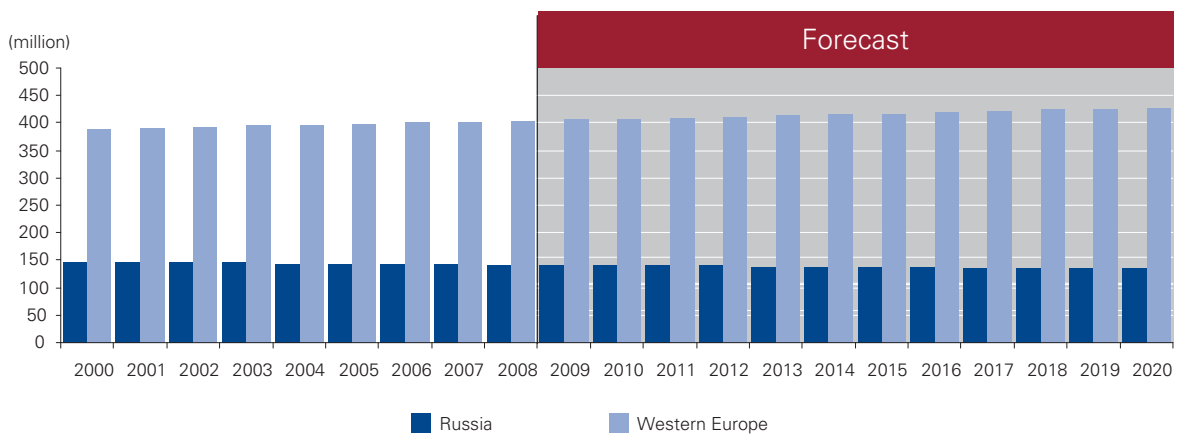
Out of the four BRIC countries only Russia shows a trajectory of decreasing population. In accordance with present trends the Russian population is forecasted to decrease to 135 million by 2020.

¹ Source: Economist Intelligence Unit

² Source: Economist Intelligence Unit



Figure 1: Population of Russia (2000-2020)



Source: KPMG and Economist Intelligence Unit

3. Economy

An important relationship exists between an economy and its electricity use. Interest in studying this relationship between electricity consumption and economic growth arises from the need to understand the complex links between the two. Electricity use depends on technical and economic factors, and in addition, it supports advances in technology and stimulates economic growth. Gross domestic product, as one of the most important economic indicators, correlates with electricity use and will presumably do so in the future as well. Ferguson et al. (2000) found a correlation between electricity use and welfare³ and numerous studies imply a relationship between the two. Our survey looks at the main factors affecting economic to consider the implications and bring to light future prospects for the electricity industry in Russia.

Development of the Russian economy

After the financial crisis hit Russia in 1998, it was able to bounce back with amazing speed. The main reason for the recovery was that world oil prices, which deepened the troubles in the crisis, showed a rapid increase at the very end of the century.

Russia was able to attain an imposing level of economic growth with an average growth rate of 7 percent over the last decade, and ended 2008 with a 7.9 percent growth rate⁴.

The living standards of the Russian population have improved as a result of 10 percent on average personal income growth and a drop in unemployment rates. However, growth slowed in 2008 when export values fell back and domestic manufacturing and non-tradable services rated as key industries.



Figure 2: Main economic indicators

GDP (PPP)	USD 2 260.3 billion (2008)
GDP real growth rate	6.0% (2008 est.)
GDP/capita (PPP)	USD 15 937 (2008 est.)
GDP composition by sector	agriculture: 4.1% industry: 41.1% services: 54.8% (2007 est.)
Labor force	75.7 million (2008 est.)
Labor force by occupation	agriculture: 10.2% industry: 27.4% services: 62.4% (2007 est.)
Unemployment rate	6.2% (2008 est.)
Level of electricity provision to households:	Total 99% (2008)
Industrial production growth rate	1.9% (2008 est.)

Source: KPMG and Economist Intelligence Unit

3 Source: Ferguson, R., Wilkinson, W., Hill, R., 2000. Electricity use and economic development. Energy Policy. 28, 923-934.

4 Source: Economist Intelligence Unit



Regarding the international financial position of Russia, positive trends have been apparent since 2000. The running balance of payments exhibited surpluses, while the country's foreign exchange reserve increased to almost USD 600 billion by the end of July 2008, compared to the USD 12 billion it possessed in 1999.⁵

An increased foreign exchange reserve level has enabled the establishment of two sovereign wealth funds. A reserve fund was established to support budgetary expenditure in case of decreasing oil prices while the national welfare fund was set up to enhance infrastructure development in Russia.

The foreign debt of the Russian state has been decreased but the level of commercial short-term debt to foreigners has increased significantly resulting that the total foreign debt was almost one-third of GDP.

Nominal GDP

The following analysis and forecast of Russia's gross domestic product were prepared by KPMG based on the Economist Intelligence Unit's database.

The nominal GDP of Russia was USD 2,260.3 billion at PPP in 2008. In the period 2000-2008 the annual growth rate was 9.23 percent, which is significantly higher than the global average (6.38 percent).⁶

A significant proportion of the Russian GDP, more than 40 percent, is produced by the industrial sector, including the following:

- mining and extractive industries
- a wide range of machine manufacturing industries
- agricultural machinery

- defense industries
- road and rail transportation equipment, etc.

The significant growth trend of Russia's nominal GDP has been limited as a result of the financial crisis. Nominal GDP is predicted to fall by approximately 4.4 percent from 2008 to 2009. After one year of decline, the nominal GDP is expected to grow by 2.2 percent from 2010 and the Russian economy should start to recover from the crisis. Between 2009 and 2013 the compound annual growth rate (CAGR) of the nominal GDP is expected to surpass 5 percent. After a recovery period, the growth rate of the nominal GDP is estimated at 6.82 percent between 2013 and 2020. As a result, the nominal GDP of Russia is likely to reach USD 4,173 billion, which will represent 2.82 percent of the total nominal GDP of the world at PPP in 2020.

⁵ Source: CIA – The World Factbook, 2009

⁶ Source: Economist Intelligence Unit

Figure 3: Forbes Global 2000 ranking of Russian companies (2009)

World Rank	Company	Industry	Revenue (billion USD)	Profits (billion USD)	Assets (billion USD)	Market Value (billion USD)
13	Gazprom	Oil & Gas Operations	97.29	26.78	276.81	74.55
64	Rosneft	Oil & Gas Operations	46.99	11.12	77.40	34.07
76	Lukoil	Oil & Gas Operations	66.86	9.51	59.14	26.62
168	Surgutneftegas	Oil & Gas Operations	24.25	3.61	40.29	19.65
172	Sberbank	Banking	21.63	4.33	200.86	8.56
211	TNK-BP Holding	Oil & Gas Operations	36.25	5.94	27.94	9.45
241	MMC Norilsk Nickel	Materials	17.73	5.52	35.65	8.86
250	Severstal	Materials	22.39	2.03	22.48	3.6
505	VTB Bank	Banking	7.15	1.53	92.51	3.50
548	Tatneft	Oil & Gas Operations	11.03	1.76	15.08	4.42

Source: Forbes

GDP per capita

The GDP per capita of Russia is currently USD 15,937 which is 56 percent higher than the world average and 54 percent less than the Western European level (USD 34,420 in 2008).⁷ Due to the declining Russian population, GDP per capita will almost double by 2020 from the current level which makes for a 5.67 percent CAGR between 2008 and 2020. As a result, the GDP per capita of Russia is expected to be USD 30,921 in 2020 which will be approximately 58 percent higher than the global average (USD 19,466).

Current economic situation

By mid 2008, following exposure to the global economic crisis, the previously outlined positive trends began to reverse.

In September 2008, the credit crunch hit the Russian Trading System (RTS) stock exchange which has lost about USD 600 billion, or around 43 percent compared to its peak in May 2008⁸. The Russian banking system has also been affected by the global financial crisis and faced serious liquidity problems. In order to address the liquidity problems of the banking sector and to support the stock market, the Russian government initiated a rescue plan comprising over USD 200 billion in early October 2008. A tax cut plan of USD 20 billion was also launched to provide a safety net of sorts for society and the country's industry.⁹

In addition, world oil prices have steadily declined after peaking in mid-summer 2008 mainly due to the financial and economic crisis. From its high USD 140 per barrel the price of oil dropped to

USD 30 per barrel, by Christmas 2008 and has been increasing slightly since January 2009.¹⁰ The price drop aggravated the imbalances in Russia's external accounts and the federal budget. In November 2008, the Central Bank of Russia devaluated the Russian ruble (RUB) which led to a drop in foreign exchange reserves, to USD 435 billion by the end of 2008 compared to a peak level of USD 600 billion.¹¹ Mini-devaluations of the currency froze domestic credit markets and resulted in an increase in unemployment, wage arrears and a severe drop in production.

The financial and economic crisis revealed that the Russian economy is still dominated by export earnings from sales of energy and other raw materials, therefore its restructuring and diversification is of the highest importance.

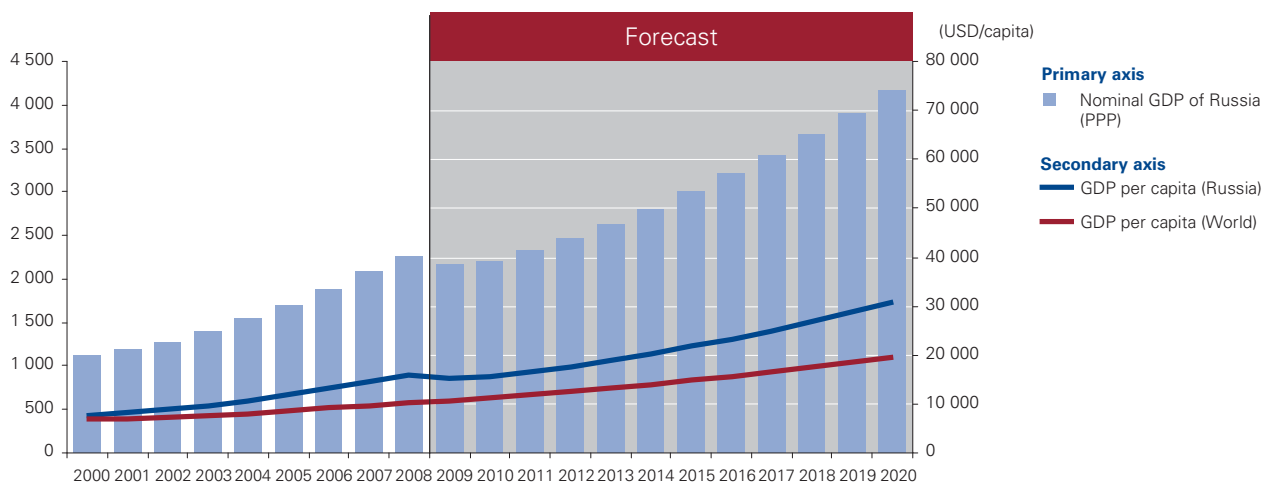
⁷ Source: Economist Intelligence Unit

⁸ Source: The Moscow Times: Russia's Stock Market Fall, August 4, 2009

⁹ Source: Economist Intelligence Unit

¹⁰ Source: Energy Information Administration

¹¹ Source: CIA – The World Factbook, 2009

Figure 4: Russia: Nominal GDP (PPP), GDP per capita

Source: KPMG and Economist Intelligence Unit

In order to achieve further economic growth and recover from the financial crisis, Russia's infrastructure needs to be modernized, and has large investment needs, but currently both domestic and foreign investors are concerned with the lack of proper regulatory regime, a high level of corruption and the lack of trust in institutions, among other risk factors. The first steps towards reform have been made by President Dmitry Medvedev, who was inaugurated on 7 May 2008. The President has outlined Russia's economic priorities, including the following:

- reduction of the state's role
- infrastructure improvement
- innovation
- judicial reforms and combating corruption

- reforms of the tax system
- development of the banking sector.

Furthermore, Moscow is continuously seeking accession to the World Trade Organization and has already made some progress, but its entry may be stalled due to both the global economic crisis and Russia's conflict with Georgia.

In order to implement large infrastructure development projects, large investments, in part from foreign capital, will be required in Russia.

How do you see the attractiveness of Russia for foreign capital investment during the course of the next five years?

Respondents' opinions regarding Russia's attractiveness for foreign capital investments were divided into

two groups among financial institutions that took part in our survey. One group of respondents believes that Russia was not attractive for foreign investments when the survey was conducted. (March-May 2009) First, they contend that the attractiveness of the country should be considered in relation to the attractiveness of other countries.

"Russia was attractive for foreign investments before the crisis. But now it is ranked 19th in the ratings chart. Brazil, India and China are more attractive now than Russia. This happened because Russia was more integrated in the global economy than the other developing countries and depended on the export of oil and gas. So the risks [for Russia] were greater."

-Major financial institution -



"In the current crisis period investors could not identify Russia as a "quiet harbor" and preferred to withdraw capital as much as possible."

-Major financial institution -

The second rather important factor is the country's internal political and macro economic situation. There is a political preference (and protection) for the domestic investor. It is easier for local business elites to obtain the permits necessary to do business; while foreign investors often do not

understand the way the Russian business community functions and, due to this, experience more difficulties. As a result, they find investing in the Russian market too risky.

The position of the other group of respondents, who consider Russia attractive for foreign investors, is based on currently cheap assets.

"The current crisis presents an opportunity to purchase cheap assets. In spite of all the negative factors of the Russian economic structure, and a

dependence on external factors, the economy of Russia is sufficiently developed enough and this is a serious consideration for investors to continue the forming of businesses. I think that this is a wonderful time for foreign investment, due to the cheap assets. The market in Russia has strong prospects, even in crisis conditions."

- Major financial institution -

Technology suppliers and equipment manufacturers are also finding Russia very attractive for foreign investments in the crisis period. The most attractive investments are those in the construction of new industrial facilities.

"It is very attractive, especially now, when there is a deferred demand on, for example, electrical equipment. Due to the crisis situation now it is possible to invest in the construction of new industry facilities smoothly."

- Major technology supplier -

"The attractiveness consists of higher rates of return and a higher level of profit possible when investing in the Russian economy. These days it is the most attractive destination, because the return on capital appears faster than in other developing countries."

- Major technology supplier -

Russia's political course is considered rather stable, favoring investments.

"...our Government will not allow any force majeure, because their thinking is strategic."

- Major technology supplier -

“The tandem of president and prime minister is a very strong political construction. It will encourage the flow of foreign capital into Russia... these two leading figures are working on development of the investment climate in Russia.”

- Major technology supplier -

As the Russian energy sector remains attractive for foreign investments, they will continue even in the crisis period.

“As the demand for electricity will remain in the period of crisis, investments will come to the energy sector as well. This business is very attractive.”

- Survey participant -

Energy economy

The fuel and energy complex, as it is referred to the sector in Russia does not merely fuel the domestic industry, but plays a vital role as the main generator of the economy, funding the country's status as global energy power. Some 20 percent of the GDP comes from fuel, while O&G trade

gives 60 percent of the total export, and Gazprom alone contributes around 20 percent of the state budget revenues. Russia having the world's far greatest proved reserves, is the single largest exporter of natural gas, delivering yearly 150 billion cubic meters of natural gas to Western Europe. Russia gives more than 12 percent of the global oil production, while it is the fifth producer of coal, supported by the second biggest coal resources of the world.

More than half of the total primary energy supply (TPES) is based on natural gas, hydrocarbons together make almost 75 percent of the TPES. Nuclear and hydro power account for around 8 percent of the primary supply, while coal still represents almost 20 percent of it.

The industrial and residential shares of the total final consumption are about 30 percent and 25 percent, respectively. Transportation makes up 20 percent, while agriculture is already negligible. In terms of energy products, electricity represents about 112 percent of the final consumption.

Figure 5: Main energy indicators of Russia, 2006 (million TOE)

Production	1219.98
Import-Export	-531.12
Dependency (Net Import/TPES)	-79%
Total Primary Energy Supply (TPES)	676.2
Total Final Consumption (TFC)	431,73
Conversion Rate (TFC/TPES)	64%
CO₂ emission (million tons)	1587.18

Source: KPMG and Economist Intelligence Unit; OECD/IEA Energy Balances of Non-OECD Countries, EIA, CENef, UNESCAPelligence Unit

Figure 6: Fossil resources of Russia (2008)

	Proved Reserves	Production	Consumption
Oil	79 billion barrels	9.9 million barrels per day	2.8 million barrels per day
Natural gas	43,300 billion cubic meters	601.7 billion cubic meters	420.2 billion cubic meters
Coal	157 billion tons	326.5 million tons	218 million tons

Source: BP Statistical Review of World Energy, 2009

4. Electricity Market



The accelerated growth of the Russian electricity sector dates back to the formation of the Soviet Union or Union of Soviet Socialist Republics (USSR). The establishment of the Soviet electricity sector was done in a piecemeal fashion. An extensive electrification program set the goal of providing electricity to everyone: the 15-year-long GOELRO Plan¹² ("State Commission for Electrification of Russia") was supervised by Vladimir Lenin himself who was extensively quoted with his phrase "Communism is Soviet power plus electrification of the whole country."¹³ The GOELRO Plan became the prototype for the well known 5-year plans of the centrally planned economies. It included construction of a series of regional power plants, including hydroelectric power plants and large industrial enterprises.

Throughout the 20th century the extensive electrification program, through which the interconnection and alliance of regional electricity companies was accomplished, has continued. Local, regional and interregional electricity networks were unified into the Soviet energy system and major interconnections were established with the socialist Central and Eastern European countries. The electricity sector in the planned economy was based on vertically integrated companies and centralized regulation of tariffs, which basically did not reflect costs.

Major reforms to the power sector were implemented in the 1990s; the largest electricity generation assets and interregional network facilities were brought under federal ownership and the federal wholesale electricity market (FOREM) was formed.

Additionally, the "Energy Strategy of Russia" was created with the goal of radical revision of structural and technological policies to achieve a European standard of quality within the electricity industry.

The Energy Strategy has set its main goals for the power industry up to 2010:

- privatization and focus on foreign investments
- reformed price and taxation policies
- renewal of policies and laws to allow for the restructuring of the sector.

Presently, Russian energy policy is still evolving. Generally the electricity sector in Russia has been liberalized. RAO UES of Russia, the electricity

¹² Source: Power Technology and Engineering, 1970 "50th anniversary of the Lenin Goéloro Plan and Hydropower Development"

¹³ Source: Lenin, 1920. "Collected Works", vol. 31, page 516

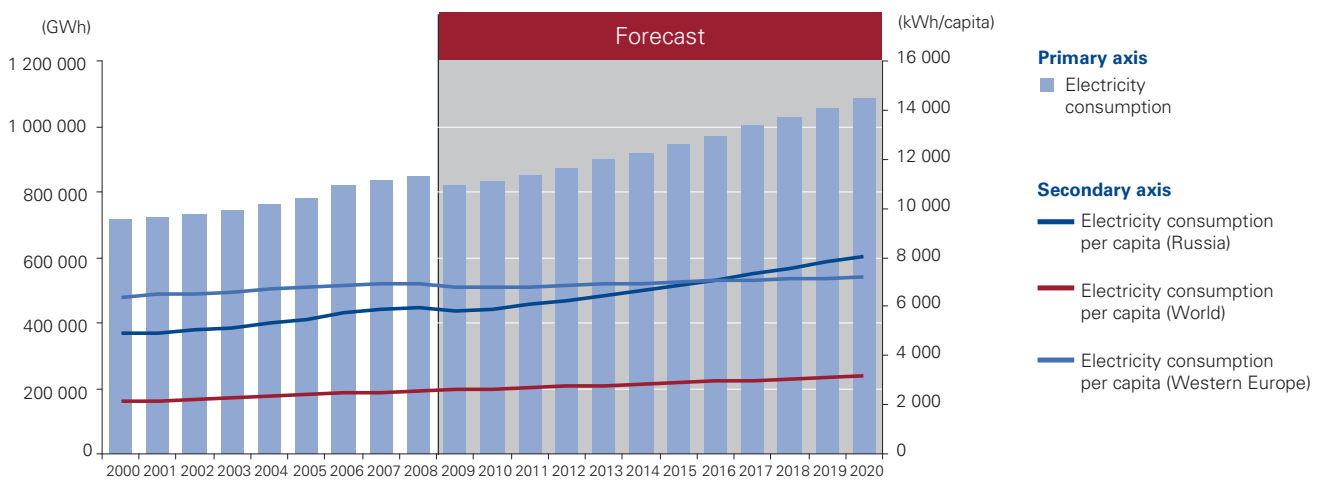


monopoly, has been dismantled in accordance with ownership unbundling. In line with the reform program, the Nonprofit Partnership Administrator of Trading System (NP ATS), which was established in 2001, is the only power exchange in Russia.

The process of gradual liberalization of wholesale and retail electric power markets, which began in 2006, shall be completed before 2011.¹⁴ One hundred percent of power and capacities will be traded at unregulated prices, apart from the residential sector.

Finally, major European utility companies have entered the Russian market, mainly through the privatization of generation assets. Foreign direct investments have been secured by new policies, allowing for necessary capital investments into the electricity industry.

Figure 7: Electricity consumption, electricity consumption per capita



Source: KPMG and Economist Intelligence Uni

14 Source: RAO UES, 2008 "Russian Power Market Reform"

4.1. Electricity demand

Russia possesses the largest electricity market in Europe, with consumption of 848,854 GWh in 2008, which represents 5.3 percent of the total electricity consumption of the world.

The following sections describing the present state and forecasted trends for Russia's energy market were prepared by KPMG's Advisory practice based on the Economist Intelligence Unit and International Energy Agency databases and taking into consideration market trends and effects of the economic downturn on them.

Electricity consumption

Currently, Russia possesses one of the largest electricity markets in the world representing 5 percent of global power consumption. Out of the four BRIC countries, it is the second in terms of electricity consumption after China.

In the 1990s, Russian electricity production dropped significantly due to a variety of factors including the decommissioning of several nuclear reactors and decreasing demand following the financial crisis in 1998. However, due to rapid economic recovery, electricity consumption was on an upswing between 2000 and 2008 and reached 848,854 GWh compared to 717,286 GWh in 2000.¹⁵ The electricity consumption of Russia grew by 2.13 percent annually between 2000 and 2008.¹⁶ In this decade, there has been a high increase in power consumption but due to the crisis, the situation has changed.

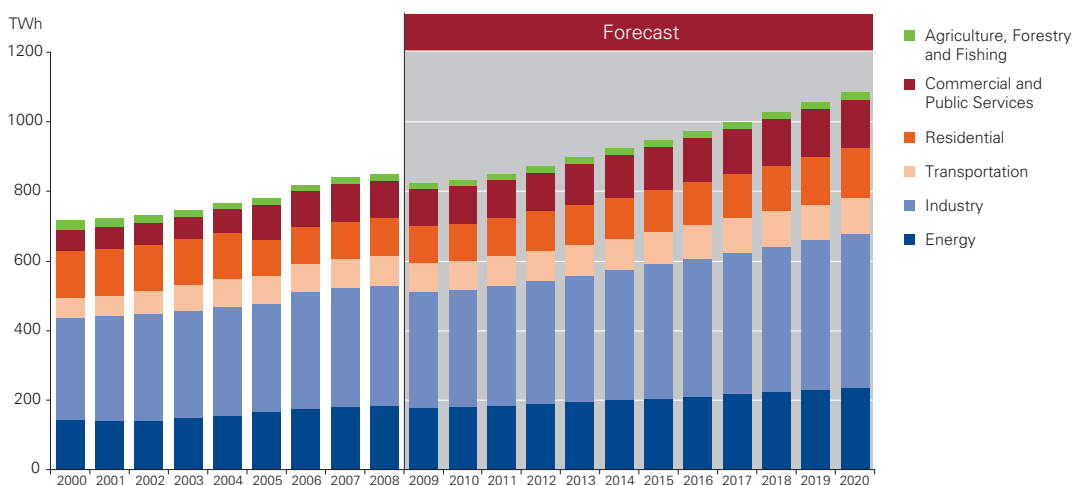
Due to the global financial and economic crisis a minor decline is expected in Russia's electricity consumption, but the growth trend is not expected to change significantly until 2020. Based on KPMG's analysis, the annual electricity consumption of the country should be approximately 1 million GWh in 2020. The annual

growth rate of the Russian electricity consumption is predicted to be 2.1 percent until 2020. As a result of this lower growth rate compared to that of Brazil, India and China, Russia is expected to be overtaken by India taking third place by the year 2020.

Electricity consumption per capita

Based on historical data, out of the four examined BRIC countries currently only Russian electricity consumption per capita is comparable with Western European levels. However, Russia's rate is still far behind the North American statistic representing only 52.7 percent of it. Russian power consumption was 5,985.3 kWh per capita in 2008, showing 2.55 percent annual growth between 2000 and 2008.¹⁷ In spite of the fact that the Russian population is decreasing,

Figure 8: Electricity consumption by sectors



Source: IEA, KPMG

15 Source: European Intelligence Unit

16 Source: European Intelligence Unit

17 Source: Electricity consumption per capita was calculated based on the EIU data by dividing the total electricity consumption of the country by the total population.

the trend for per capita electricity consumption is expected to decrease slightly in the forthcoming period, as the growth of the total electricity consumption of the country is not expected to increase to such an extent (mainly as a result of energy efficiency measures and energy savings).

Based on efforts taken by the European Union towards reducing the energy consumption of the European Community, Western European electricity consumption is expected to grow by only 0.61 percent between 2000 and 2020. As a result, Russian per capita electricity consumption is expected to be 8,047.2 kWh higher than in Western Europe in 2020.

Electricity consumption by sectors

The total electricity consumption of Russia is also determined by five sectors outside of residential consumption. Figure 8 shows the share of the six major sectors comprising total consumption, based on the International Energy Agency's database and KPMG's forecast.

Energy sector

The energy sector accounted for 21.65 percent of the total electricity consumption of Russia in 2006, which had increased from its 19.96 percent level in 2000. The total consumption of the sector was 177,440 GWh in 2006.



Industrial sector

The most significant consumer of electricity in Russia is the industrial sector, which accounted for 40.65 percent of total consumption, reaching 333,190 GWh in 2006.

The industry sector followed by the energy sector should remain the two main consumers of electricity in 2020. Survey respondents anticipate some decrease in total electricity consumption in the short term due to the global financial and economic crisis. However, as the industrial sector is expected to recover shortly after the crisis, total electricity consumption is expected to start to develop further.

How do you see the development of power intensive industrial activities and its expected effect on electricity consumption over the next five years?

The power intensive industries were actively growing before the financial crisis. The government has invested

heavily in the development of these types of industries.

Due to the crisis, production in power intensive enterprises has decreased, and that has led to a decrease in energy consumption. Some experts estimate the decrease in energy consumption to be about 5-8 percent; others think that it has decreased by 10-15 percent.

The most difficult situation is in the metallurgical sector, especially regarding aluminum, the most power-intensive segment, due to a severe drop in metal prices. Other industries severely hit by the crisis are the petrochemical and heavy machine building sectors.

"For the moment production has fully stopped or decreased to the levels seen in 2005-2006 in many places. The most awful things have already happened. But nobody will launch new production now. Only some infrastructural things will be done."

- Major financial institution -

In the next 1-2 years, there will be a vast decrease in consumption. According to the best case scenario, it will take at least 2-3 years before consumption reaches mid-2008 levels. After 5-10 years, there should be a return to a high rate of growth of 5-10 percent due to the growth of production in power intensive industries.

“Certainly the industry will recover, but as essential projects have been frozen real growth will only occur after 4-5 years.”

- Major financial institution -

The crisis will urge power-intensive manufacturers to decrease the intensity of their power usage in production. This will likely be accomplished via the modernization of old, out-of-date equipment.

“History shows us that those companies that update their equipment turn out to be more resilient when faced with energy price hikes and financial crisis. Those that have not modernized are vulnerable.”

- Survey participant -

Transportation sector

The transportation sector showed the most significant growth, from 57,470 GWh in 2000 to 80,930 GWh in 2006, which was 9.87 percent of the country’s total consumption.¹⁸

Residential, Commercial and Public Services sectors

The total consumption of the residential, commercial and public services sectors increased from 193,410 GWh in 2000 to 211,960 GWh in 2006, but the share of the sector in total consumption has slightly decreased from 26.96 percent to 25.86 percent in the period in question (2000-2006).¹⁹

How do you see the dynamics of electricity consumption during the course of the next five years?

In the preceding period there was a very high rate of increase in Russia’s electricity consumption, but due to the crisis, the situation has changed.

“If you asked me about the electricity consumption a year ago, I would have drawn you a familiar, impressive chart showing the high rates of growth in electricity consumption. But now it is very difficult to make forecasts because the crisis is still in an active phase”.

- Major financial institution -

In reference to the forecasts, respondents believe that the overall electricity consumption of households should remain stable during the crisis. Household consumption in metropolitan areas such as Moscow and Saint Petersburg may even increase by a slow rate of 1-2 percent per year, while average household consumption in the country will remain at 2008 levels.

“Household electricity consumption is not elastic; it also has its limits. In general, today we do not have to pay EUR 2-3 per kilowatt-hour and this means that no one is seriously interested in implementing energy saving technologies or conserving electricity. That is why household electricity consumption is at least stable, and in the case of growth in prosperity consumption will start to grow as well. However, people are not becoming wealthier today, but even as the crisis strengthens, they are still buying refrigerators, TV sets, washing-machines, etc.”

- Major financial institution -

Nevertheless, looking at the consumption curve of the household sector over a five-year perspective, some factors may slow down the growth of consumption or stabilize it at a fixed level:



18 Source: IEA

19 Source: European Intelligence Unit

- As Russia weathers the financial crisis and household incomes fall, people will try to save on electricity.
- Moreover, electricity prices are expected to grow in the near future, which is also causing a shift towards more conscious consumption.
- The installation of a new type of metering equipment and the introduction of various types of tariffs (separate day and night tariffs) and energy saving lamps, will encourage conservation.

However, at the current moment, energy saving technologies can not curb (nor compensate for) the volumes of consumption.

“Energy consumption in the household sector will not change or grow significantly in the next 5 years. In the past, due to price increases in electricity, we started to save energy significantly. We began to use the double tariff energy meters, we started using energy saving lamps and other technologies, and we are simply turning off the lights and saving money. That is why I think that neither a decrease nor significant growth will happen.”

- Major technology supplier -

The use of a new type of electric meter does not lead to a decrease in the consumption of electricity, but simply smoothes out the peaks of energy loading. Currently, the growth of electricity consumption is constrained by low revenues from the sale and construction of residential real estate. Growth will definitely be apparent once the crisis is over.



How would you evaluate the progress of the rural electrification program from political/institutional/financial perspectives?

In Russia no centralized program of rural electrification exists because nearly the entire country is connected to the power grid.

“There are no vast non-electrified areas in Russia. There are some minor ones on a local level, in places where no one lives, but it is not a problem in relation to the State Policy.”

- Major financial institution -

Issues of this kind are under the control of the municipal grids and local authorities. Further electrification of rural territories will be conducted only in the event that the government (represented by the local authorities) pushes companies to do it, as in the majority of cases it is absolutely unprofitable.

“...Rural areas are supplied by high-voltage 35-36 kilovolt lines,... it could

definitely be said that the infrastructure of these high-voltage lines has been out of date for some time. The lines are old, they do not meet modern requirements, and it is long overdue to change them... But the question is: who will finance it?”

- Major technology supplier -

Small and medium-sized enterprises sector

The small and medium-sized enterprises (SMEs) and service providers also bear a significant share of Russian electricity consumption.

What are the expectations for development of the SME (small and medium-sized enterprise) and the commercial sectors and its expected effect on electricity consumption in the next five years?

The amount of small and medium-sized enterprises is not high enough in Russia. Their share of total electric consumption is small.

“Modern agricultural technologies will come to Russia in the next five years and these technologies relate to energy consumption.”

- Major Financial Institution -

“Medium-sized and small enterprises do not make up the same share of GDP in Russia as they do in the rest of the world. such businesses are not power intensive in Russia.”

- Major financial institution -

SME growth existed prior to the crisis, but now the situation is unclear. Some of the respondents believe that small and medium-sized enterprises will recover only after the end of the crisis, but it is not likely to be easy for them.

“I am afraid that there will not be such a rapid upsurge of consumption as we had in previous years. It will be very hard for small and medium-sized businesses to recover. Their progress is likely to be minor in the next 5 years.”

- Survey participant -

“I think that infrastructure for the development of small and medium

sized businesses will appear only after the economy starts to revive, after the crisis. Today, it is almost absent and it is impossible to create it until the large-scale industries regain their momentum.”

- Major market participant -

However, the majority of respondents believe that SMEs will quickly recover after the crisis and electricity consumption in the next 5 years is likely to increase, but it is hard to estimate the possible rate of growth at this time.

“In fact now there is a pause in terms of SMEs. It remains to be seen what happens in 2010. Nothing will happen in 2009, everybody will wait for 2010.”

- Major technology supplier-

One of the arguments for the growth of the SME sector and its electricity consumption is the governmental support provided to

this sector. According to a Russian government program, small and medium-sized businesses should reach new levels.

“Regarding the President Program, great attention is paid to the small and middle-size business.”

- Major technology supplier -

Agriculture

The share of the agriculture, forestry and fishing sector fell in the period covered by our survey, from 3.97 percent in 2000 to 1.96 percent in 2006²⁰.

How do you see the development of agricultural electricity consumption in Russia over the next five years?

Agriculture has never been a serious electricity consumer in Russia.

The share of this sector in total electricity consumption is somewhat low.

“I believe that agriculture does not have a very big share in the total consumption of electricity, so it will grow slightly but in total volume of consumption it will not be significant...”

- Survey participant -

Figure 9: Electricity average prices in Russia

	2005		2006		2007	
	RUB*/kWh	USD/kWh	RUB/kWh	USD/kWh	RUB/kWh	USD/kWh
Residential (incl. VAT)	0.976	0.0345	1.172	0.0431	1.398	0.0546
Industrial (> 750 kW)	0.901	0.0318	0.956	0.0351	1.069	0.0417
Total average	0.928	0.0328	1.023	0.0376	1.171	0.0458

Source: *Note: RUB – Russian Ruble, the currency of Russia
Source: RAO UES, Deutsche Bank Research, KPMG calculations

20 Source: European Intelligence Unit

The development of the agricultural sector, including the implementation of modern and power intensive technologies, depends on government subsidies. Agriculture was one of the prioritized sectors for the government over the previous 3-5 years and will probably continue to be so in the next five years.

“Our agriculture is not competitive. It could not exist without government subsidies. The situation would be very serious if the government did not stimulate and subsidize it. Many agricultural producers are far from the consumer centers and the electrification expenses will never be repaid. There is no business at all without governmental support as none of the joint-stock companies will consider the sector as a serious business project.”

- Survey participant -

Power pricing

In the course of the reforms since 2003, within the framework document revised in 2007, “The Energy Strategy Russia to 2020” the Russian electricity sector, alongside the natural gas sector gradually conforms more and more the market principles. The liberalized wholesale market, produces market-based prices between generators and buyers. For the regulated retail market segment, prices are set by the regional tariff committees in both of the two main price areas, the European and Siberian territories. The regional tariff boards calculate prices within the thresholds set by the Federal Tariff



Service. As a result the regional differences are quite significant, in some cases an eight to nine-fold difference can be observed between the regions.

The difficulties of the market transition are highlighted by the fact that until 2004 industrial consumers paid higher prices than the households, and three years ago the sector still recorded about USD 2.8 billion cross-subsidization, the residential consumers receiving subsidies amounting USD 800 million from the approved tariffs.

One of the main drivers of the price evolution is the natural gas price, which will cease to make a loss for the supplier Gazprom on the domestic market this year. The regulated gas and electricity prices likely to become cost reflective, considering the required investment needs as well, during the next decade, though the recent crisis could pose delay.

4.2. Electricity supply

Russia’s electricity production was examined based on data from the International Energy Agency and the Economist Intelligence Unit. Between 2000 and 2008, Russian electricity production grew by 2.19 percent annually, which was almost equivalent to the growth rate of consumption (2.13 percent).

Prior to the crisis, power outages (e.g. Moscow power blackouts in 2005) often took place as a result of a deficit in generating capacities and the poor condition of the grids.

Installed capacity

In 2006, Russia’s total installed capacity of electricity generation was approximately 218 GW, which is second only to that of China among the BRIC countries. The growth rate of installed capacities between 2000 and 2006 was 1.18 percent.²¹

²¹ Source: International Energy Agency statistics

Figure 10: Installed capacity (GW)

2000	203.5
2001	204.7
2002	205.6
2003	214.4
2004	215.5
2005	217.2
2006	218.4
2015	255
2020	257
CAGR (2000–2006)	1.18%
CAGR (2000–2020)	1.17%

Source: KPMG, IEA, EIU

The country’s strategic economic policy framework, and sectoral strategies including the RAO UES Investment Program, were referred to as the “new” GOELRO plan. Huge investments in generation basically aim at the replacement of capacities that are to be phased out. The government program, “The General Scheme of Power Industry Facilities Installation in 2015-2020” mandates a significant increase in generation capacities in the future (347 GW by 2020), but in the current financial and economic situation, fulfillment of that objective could be considered too optimistic. Since Russia is expected to be able to cover its domestic consumption, its installed capacity is anticipated to increase to 257 GW by 2020, representing a 17 percent total increase from 2006 levels, providing significant investment opportunities for domestic and foreign investors.

Breakdown of electricity production

Russian electricity generation is based on fossil fuels including natural gas, coal and oil. In 2006, thermal power accounted for approximately 67 percent (662 TWh in 2006) of electricity generation.²² Among fossil fuel resources, natural gas was the most dominant (46 percent of total generation), while coal was also significant (making up 18 percent of total generation). As Figure 11 shows, Russia’s thermal power generation is followed by hydropower (17.4 percent) and nuclear (15.7 percent). In the last two decades, the Russian electricity industry has undergone major reforms: the joint stock company United Energy Systems of Russia (RAO UES) was reorganized, and in July of 2008 RAO UES was dissolved.

Based on estimates, the share of thermal power is not likely to change significantly; only natural gas is predicted to lose its share in the power generation, while the importance of coal is poised to slightly increase.

How do you foresee the future balance of power plant fuel consumption? What changes do you expect in the generation mix?

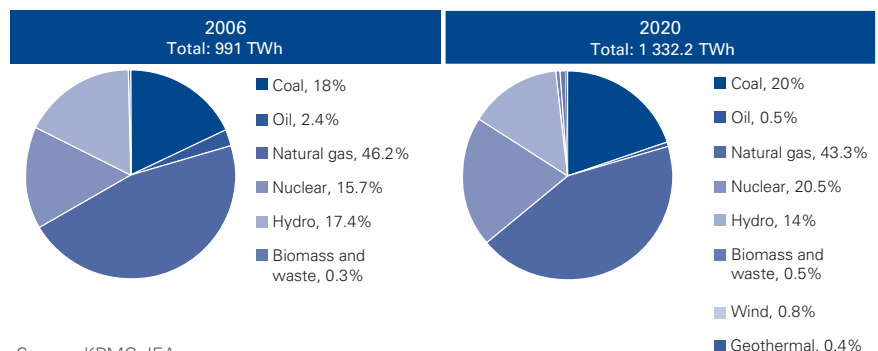
The Russian power generation mix consists of:

- Thermal power generation, including stations working on natural gas and coal
- Hydro power generation
- Nuclear power generation
- Renewable power generation.

The structure of this mix is not expected to change significantly in the next 10-20 years.

Currently **thermal power** generation bears the largest portion of the mix and it is expected to remain this way in coming decades due to significant domestic resources. The share of thermal power generation in the total energy balance of Russia will be about 65-70 percent over a 10 year perspective. Natural gas represents about 40 percent within the current generation mix, but the government will take measures to reduce the share of gas-fired power generation, and to use gas in other ways. Natural gas is more environmentally friendly than coal, though coal is less expensive than gas.

Figure 11: Breakdown of electricity production



Source: KPMG, IEA

22 Source: European Intelligence Unit

Russia has significant **hydro power** resources, bearing a current share of about 20-22 percent - but in accordance with "The General Scheme of Power Industry Facilities Installation in 2015-2020", the share of hydro generation is to be reduced to 14 percent by 2020.

Nuclear power generation will be significantly developed in the forthcoming decades and its share may increase up to 20 percent from the current level of 10-15 percent.

"Today it is the option that we should pursue."

- Survey participant -

Renewable power generation is not significant, representing only 0.5-1 percent within the current generation mix. But a government program in place aims to increase the proportion of renewable power up to 4-5 percent by 2020. However this target is not likely to be achieved as a result of the financial crisis.

The breakdown among the various technologies is highly dependent on the levels of investment required by each. Well-tested technologies in the thermal power sector require fewer investments, but have high fuel costs. Still, the return on investment is relatively quick compared to nuclear or large hydro projects. The balance will change only if new "clean coal" technologies are developed. In such case the share of coal generation will increase; otherwise it will remain the same.

Nuclear power generation

The share of nuclear power within the country's overall electricity production is about 16 percent, which is relatively low in comparison to some other European countries and might be increased given its potentials such as advanced technologies, developed infrastructure, skilled labor force and technicians.

Steady increases in the price of fossil fuels and fossil-fuel-based power generation, however, will not support the sustainable development of the Russian economy in the long term.

The government nuclear power development program includes construction of 30 additional units up to year 2015, as declared in "The General Scheme of Power Industry Facilities Installation in 2015-2020". In the context of this program, the share of nuclear power is expected to grow to 25 percent by 2030.

What are the expectations on the development of nuclear power generation during the course of the next decades?

The nuclear power generation sector of Russia has not been privatized, it is still controlled by the government. Russia's nuclear power plants comprise 21,743 MW of generation capacity with 31 operating reactors.²³ Several reactors supply district heating.

All respondents agreed that nuclear generation should be further developed in Russia since it has various advantages including the following:

- nuclear energy is cheaper than other traditional generating resources
- the supplies for nuclear energy resources will last longer than supplies of gas and oil for thermal power generation
- independence from mineral resources
- nuclear energy is a more environmentally friendly type of generation in case of adherence to specifications of exploitation
- lack of development of this energy source could lead to the country's overall developmental lag.

"I consider that the share of nuclear power generation in the future mix of total generation should be not less than 20 percent."

- Major market participant -

Renewable power generation

Russia has minor renewable power generation capacities besides its hydro power plants that generated 17.4 percent of the total electricity consumption in 2006 (173 TWh)²⁴. The ratio of hydro generation is expected to decrease to 14 percent by 2020.

To what extent do you see further development of the renewable power generation segment (taking into account the related incentive schemes) in the next five years?

²³ Source: www.world-nuclear.org

²⁴ Source: IEA, World Energy Outlook 2008



The efforts of the Ministry of Energy are focused on the development of renewable power generation. There has been slight progress in this sphere, and there are governmental decrees on this topic. The current share of this type of generation is very small: it is less than 1 percent and still perceived as exotic.

"The share of this segment is very small. It is 1 percent or less. That is why it does not influence anything and is interesting only in terms of prospects."

- Survey participant -

This generation segment could be developed only with the help of the government as this type of energy is considered very expensive, unprofitable and uncompetitive with other types of generation.

"Renewable power generation is absolutely a non commercial entity. Its life cycle efficiency coefficient is

negative. For example, the construction costs of a renewable wind power station are higher than the revenue it could produce for its entire working life."

- Survey participant -

The Russian government is working on the development of renewable generation.

- According to the governmental program the share of renewable power generation in the total mix should reach about 4 to 5 percent by 2015-2020.

"We know about the European plan "20-20-20", aimed to increase the share of renewable power generation to 20 percent by the year of 2020. We do not have such ambitious plans yet, but we are moving in this direction."

- Survey participant -

- Amendments to the legislation have been ratified by the government to stimulate the development of renewable power generation.
- Governmental regulation is being prepared which will define financial incentives for companies that develop such projects.

Survey respondents' opinions on the expediency of renewable power generation development in Russia vary. In general there are several positive and negative factors.

The positive factors include:

- In the case of rising fossil fuel prices, renewable power generation may be more competitive.
- There are some specific regions in the country (e.g. Kamchatka), where this type of power generation could be very effectively used.
- This type of energy could effectively supply local needs.
- This sector is science-intensive and its development will lead to the development of other fields.

The negative factors include:

- The construction of renewable power generation stations is very expensive.
- Renewable power generation is not competitive with other types of generation nowadays (renewable power resources are very expensive, about EUR 600 per kilowatt-hour).
- Renewable power generation could be used solely as a local resource of energy, for small towns and villages, or in specific regions: mainly in the

seaside areas and in the Far East (Kamchatka).

- Renewable power generation is not likely to be used as a main energy resource; the maximum possible share could reach 10-15 percent. It would need to be balanced out by other types of energy generation as it depends on weather, seasonal changes, and other factors.

Nevertheless some generating enterprises such as RusHydro and Eurosibenergo are expanding their work in this field and implementing some projects.

Some specifics are slowing down the development of renewable power generation in Russia:

- Currently there are sufficient mineral resources in Russia (for fuelling power stations).
- A transition to solar and wind power generation will not be effective in Russia due to the country's unique climate.
- The construction of new renewable power capacity would be very expensive as the technology is typically imported.

What are the expectations for the development of large-hydro capacity for forthcoming decades?

Large hydro power generation (as well as nuclear) is controlled by the government. The company RusHydro manages the sector.

"I think that development will be very active, especially in Siberia and Far East."

- Survey participant -

According to "The General Scheme of Power Industry Facilities Installation in 2015-2020" construction of about 27 new power stations with a capacity of more than 300 megawatts is planned by 2020. Modernization of numerous power stations is also on the agenda.

All the same the share of hydro generation will decrease, according to the General Scheme, from 17.5 percent in 2006 to 14 percent by 2020. The largest and most important project is Boguchanskaya HPP.

There are some constraining factors for the realization of the government program regarding the development of large hydro capacity, the most important being the financial crisis.

"The project that has progressed the furthest is Boguchanskaya HPP, but due to the crisis all projects have needed to be postponed."

- Major market participant -

As for the further development of large-hydro power generation and the construction of new power stations, the majority of respondents believe there is a lack of resources for them in Russia.

"Everything that could be dammed [in Russia] has already been dammed."

- Survey participant -

The construction of large-hydro stations is possible only in Siberia, where hydro potential exists and there are large areas that can be flooded which is necessary during the construction. In contrast, it is not possible to build large hydro stations in the country's central region where the majority of energy consumers are situated.

"The European part of the country has already exhausted its hydro resources. Potential resources remain only in Siberia and in the Far East... But there is a bigger problem: the necessity to develop the East for large scale electricity consumption. A power station is just an energy resource for other production."

- Major financial institution -

So it is more likely that the development of large hydro power generation will happen through the modernization of existing stations and units, and not via the construction of new facilities.

"The construction of hydro power stations will continue, but will be limited to small and medium-sized facilities. The reconstruction of existing stations will be the first priority."

- Major financial institution -

According to respondents, the advantage of hydro power generation is the low cost of the energy. Regardless, the significant disadvantages of these type of generation assets include associated environmental problems and very high construction costs.

"The construction of new [hydro] power stations is very capital intensive, with specific and very expensive environmental measures to address. In my opinion, in terms of nuclear power development and the development of investment programs in traditional generation, such power intensive projects are not probable in the next five years."

- Survey participant -

Still, there are good prospects for development of SHPs on the country's smaller rivers.

“Due to the needs of the upcoming Olympics there are many small hydro power station projects in the energy sector which are being considered, on various mountain rivers in the Sochi region.”

- Survey participant -

“The concept of small Hydro-power stations is very relevant. They do not harm the environment, and there is no need to build large facilities.”

- Survey participant -

Summary of the generation mix forecast

To conclude the Russian generation mix forecast, it can be stated that the future balance of power generation will be stable in general. Its structure will not change significantly in next 10-20 years. Thermal generation will remain the most significant source at 64 percent, followed by nuclear generation (20.5 percent) and hydro

power generation (14 percent). The share of renewable power generation is expected to remain negligible.

While this forecast presents the overall distribution of the generation mix in Russia, the situation can vary depending on the region. The proportion of different generation types is also related to the level of technological development and to the level of required investments. Well-proven technologies in the thermal power sector require less investment.

Electricity supply

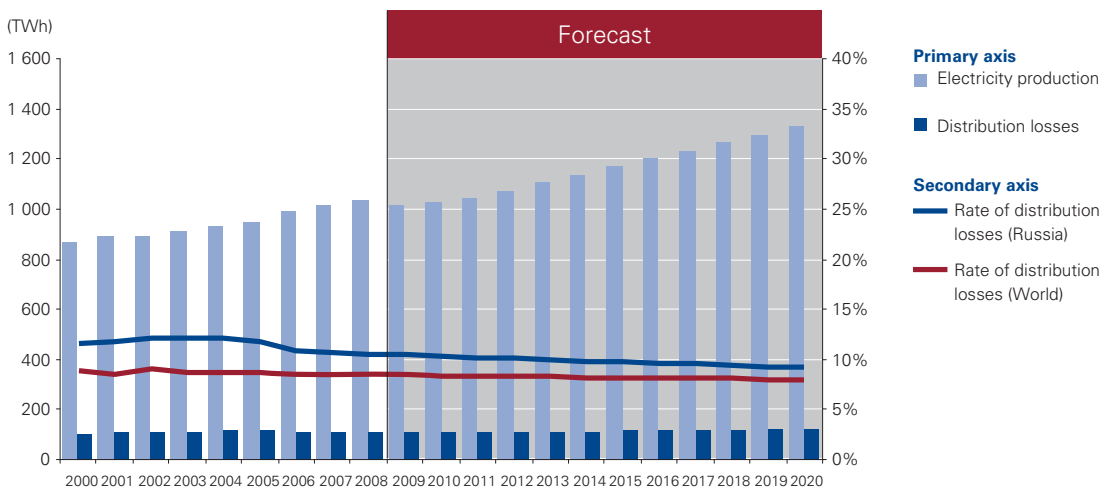
Figure 12 shows the electricity production of Russia versus the distribution losses of the network. As can be seen on the chart, Russia’s electricity production was nearly 1 million GWh in 2006, which represented a 13.7 percent increase compared to its level in 2000. Due to the global financial and economic crisis a slight decline is anticipated in Russian electricity production, since

activities in the industrial sector have declined. However, electricity production is expected to increase after the crisis with an annual rate of 2.6 percent, reaching 1.3 million GWh by 2020. In the meantime, the government strategy “General Scheme of Power Industry Objects Placement in 2015-2020” represents a 4.5 percent annual growth rate that could be considered overly optimistic.

Network losses

As a result of continuous improvements, the rate of **distribution losses** of the Russian distribution system decreased by 1.15 percent annually until 2006; this level is slightly above the global average. Based on estimates, this decreasing trend will continue until 2020 and the rate of distribution losses will draw closer to the world average. By the year 2020, the distribution loss rate is expected to be approximately 9.19 percent of the country’s total electricity production

Figure 12: Electricity production and distribution losses



Source: KPMG, IEA

while the world average is predicted to be around 8 percent.

What kind of network developments (including metering) need to be under-taken over the next five years to reduce power outages and electricity losses during transmission and distribution?

The electricity network of Russia is divided into three segments. The first segment includes a bulk electrical power grid (Unified National Electric Grid), which is managed by the enterprise FSK EES (Federal Grid Company). The government has a specific development program for this segment.

The second segment includes the distribution grids. The state holding company MRSK (Interregional Distribution Grid Company), which is in charge of the distribution grids, has its own investment program.

The third segment comprises municipal grids. These are managed and financed by local authorities according to their needs and priorities.

The development of grids is urgently necessary, especially in the distribution sector. The condition of distribution grids is very poor: the equipment is out of date as no modernization has occurred for many years. Currently there are special investment programs that are related to urban development plans for the modernization of electric lines. These programs define the future development trends of local electric grid companies.

“The development of transmission grids can solve many problems in Russia... And also the development



of regional distribution grids is needed...It is a social problem and should be one of the local authorities' priorities.”

- Major financial institution -

Survey respondents emphasized the following action tasks:

Power outages

Power outages often take place as a result of the deficit in generating capacities (before the crisis), and not because of the poor condition of the grids. This could be resolved by the:

- Development of infrastructure, to eliminate the isolated territories
- Modernization of the equipment

- Some categories of consumers such as hospitals should have standby power supplies to be used in case of an emergency.

Technical losses and power theft

Technical losses are due to outdated equipment, old electric lines, electric transformers and defective metering equipment. Power theft, however, reflects social problems (energy deficiency) and the lack of adequate control and metering systems.

Respondents recommend that the following steps to be taken:

- Implementation of modern automated control and measuring systems throughout the system,

including substations and segments of line. This equipment will help to consistently check the condition of the lines, and to curb losses during transmission and distribution

- Use of best practices in the production of transformers
- Increase intelligence level of the grids
- Implementation of double tariff energy-meters in the household sector (which has already begun in Moscow) to smooth out energy consumption peaks and conserve energy.

Heavy investment is needed for the modernization of electrical equipment as well as for the widespread installation of energy meters. However, arranging financing for these investments on a commercial basis appears to be impossible.

"It is so much money, no one has even calculated it...Simply put, the project will not pay off."

- Survey participant -

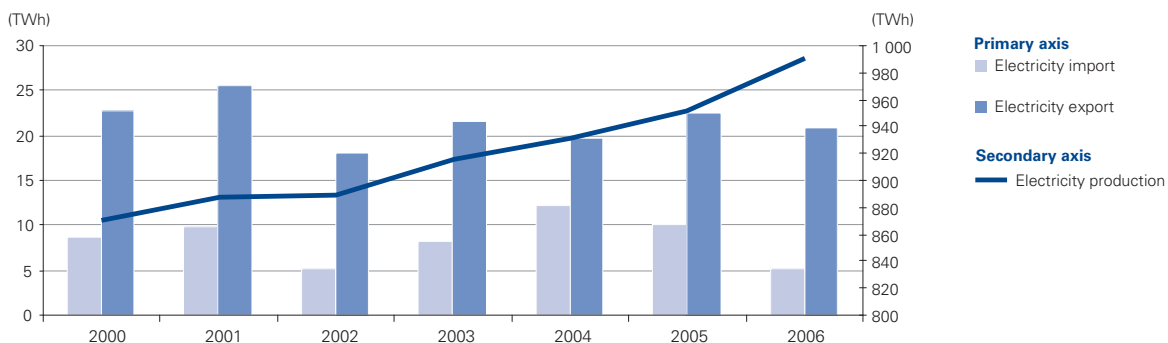


Electricity import, export

Figure 13. shows the trends of Russia's electricity import and export versus its total electricity production. In 2006, Russia exported a total of 20,826 GWh of electricity to China, Finland, Norway, Georgia and Moldova. This is considered to be a significant amount in absolute terms while in relation to the country's total electricity production, it only represents 2.1 percent of the total production.

At the same time, Russia imported a total of 5,090 GWh of electricity from Latvia, Lithuania, Belarus, Ukraine, Azerbaijan, Kazakhstan and Mongolia, which accounts for 0.5 percent of the country's total production in 2006²⁵. It is anticipated that Russia will be able to maintain and even significantly increase its positive export balance of electricity. In order to increase the level of Russian electricity export, cross-border capacities have to be improved – exhibiting a significant investment need.

Figure 13: Electricity import, export and total electricity production



Source: KPMG, IEA

25 Source: KPMG analysis and IEA statistics

“While conducting the reform the privatization was implemented to the full planned extent.”

– Major financial institution -

4.3. Current ownership structure of the power industry of Russia

The Russian power sector is currently undergoing an extensive restructuring process. In the course of the restructuring, the state owned, vertically integrated Unified Energy System of Russia (RAO UES of Russia) was reorganized and partially privatized.

Reorganization of electricity generation sector

Prior to privatization and liberalization, the Russian power system was dominated by RAO UES of Russia (Единые Энергетические Системы России) a state owned electric energy holding company that controlled the majority of generation units and transformation lines. Besides the ownership of 70 energy companies and 40 power plants, RAO UES of Russia was also responsible for transmission, operation of the system and power research. RAO UES had difficulties with fulfilling the increasing electricity demand as a result of lack of investments, which led to significant failures such as the Moscow power blackouts in 2005.

The reorganization of the Russian energy market began in 2006 and was completed by the July 2008 when RAO UES of Russia was dissolved and its remnants taken up by the Federal Grid Company (FGC).

As a result of the restructuring, independent entities were created through vertical and horizontal separation of the generation sector. Seven wholesale generation companies (six thermal WGC and one hydroelectric WGC), and 14 territorial generation companies (TGC) were created and privatized excluding the hydroelectric WGC that remained state-owned. Nuclear power production will still remain under the ownership of RosEnergAtom, the state owned company of the Russian Ministry of Atomic Energy.

In the course of liberalization, foreign companies became majority owners of Russia’s privatized generating capacities; therefore the development of an adequate regulatory framework for the electricity industry is required in order to provide secure long-term prospects for investors. Besides the foreign investors, some private Russian companies were also involved in the power sector privatization such as Gazprom, IES (Integrated Energy Systems), Lukoil and SUEK (Siberian Coal and Energy Company).

Organization of the transmission, distribution and trade sectors

The Russian electricity sector consists of seven separate regional power systems, namely the North-West, Center, Middle Volga, North Caucasus, Urals, Siberia, and Far

East. Out of the seven regions only the Far Eastern is not connected to the integrated power system. The Russian electricity network comprises almost 3.2 million km of power lines, 118,000 km of which are high-voltage cables over 220 kV.²⁶ The former RAO UES of Russia that owned the transmission system was unbundled into the Federal Grid Company (FGC UES) and into 11 Interregional Distribution Grid Companies (IDGCs) in July 2008²⁷. Despite the restructuring, the transmission sector will remain mainly state-owned, such as the electricity supply companies where the Russian State will also retain a majority share, a minimum 51 percent stake.

As follows, KPMG question major market players about the privatization and restructuring process of the Russian electricity sector.

What sort of time frame do you expect for the acceleration of the privatization process in the electricity sector?

The privatization process in the electricity sector is already finished in Russia. It took place mostly in the thermal power sector. Its conclusion was apparent via the reorganization of RAO UES of Russia. This company ceased to exist as a “state-owned monopoly” and has been transformed into several state-owned and private companies.

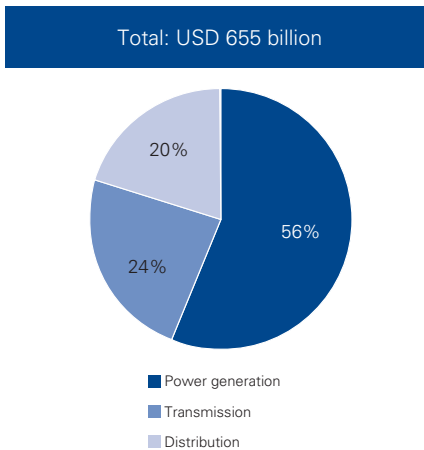
“While conducting reform privatization was fully implemented to the planned extent.”

- Survey participant -

²⁶ Source: Federal Grid Company of Unified Energy System’s website www.fsk-ees.ru/eng

²⁷ Source: RAO UES of Russia’s website www.rao-ees.ru

Figure 14: Investment needs of the electricity sector up to 2020



Source: Russian Government's investment program: "The General Scheme of Power Industry Facilities Installation in 2015-2020"

Large segments of the market such as nuclear power generation, hydro power generation (except for SHPs) and grids are still controlled by the Government and there are no plans to privatize these segments.

The only possibility for change is some kind of redistribution of the thermal power assets amongst their current owners.

"Grid companies are monopolistic businesses, so they should always be controlled by the Government according to the law."

- Major market participant -

"Nuclear must fall under state security.... The only area where the question of government control could be questioned is hydro power generation. In the case of hydro power stations, modernization and reconstruction are needed; a concept exists that hydro power generation should be privatized and that a private owner would tend to be more effective."

- Major market participant -

Further plans for the development of the electricity sector

The Russian electricity generation mix is expected to remain stable in the next 10 years, but significant investments are expected in the nuclear and hydro power generation sectors.

Regarding the electricity grid, Russia aims to integrate its electricity network with the Western European system. RAO UES of Russia has been participated in the Baltrel program which aims to create a common, open electricity sector in the Baltic Sea region. In the meantime Russia has also entered into negotiations with the ENTSO-E (former UCTE that comprises most of the European countries TSOs) in order to discuss the technological and operational aspects of the interconnection of the systems.

"I would say it is impossible to choose between the development of grids or generation. They are both equally important."

- Major market participant -

Investment priorities

The Russian government defined its investment program and presented it in "The General Scheme of Power Industry Facilities Installation in 2015-2020". This government strategy provides rough numbers on the overall need for investment in the development of power plants and the electricity network totaling USD 655 billion²⁸. Investment needs are divided between the generation segment and the network infrastructure of the electricity industry. Investments related to power generation account for 56 percent of the total investment need, while the transmission grid development stands at 24 percent and the distribution grid at 20 percent.

In the meantime the International Energy Agency has estimated the total investment needs of the Russian electricity sector to be USD 440 billion (at 2007 costs) up to 2030, which is significantly lower than the amount proposed by the Government²⁹. Estimates within the General Scheme are most probably too optimistic, given the financial and economic situation and may need revision. Therefore, the actual investments implemented by 2020 are expected to be in the range of USD 500-550 billion.

28 Source: Calculate based on 32.59 RUB/USD (Bank of Russia)

29 Source: International Energy Agency

What are the top investment priorities in the electricity sector over the next five years?

The situation in each segment has its own peculiarities. Systematic decisions are made according to the weight of the deficit in the energy system of each region. In some cases it is necessary to build new power stations, but in other cases it is better to improve the network. The plan of development in "The General Scheme of Power Industry Facilities Installation in 2015-2020" was made taking into account the specifics of each sector of the Unified Energy System.

Major investments are required both in distribution and generation.

"...Grids were not financed for years, they are in awful condition. That is why the grids come first and then generation."

"The distribution grids are the priority. The main investments should be in the grids of Moscow and Tyumen. Those regions suffer from the lack of infrastructure."

"The generation is also rather dated, so many improvements could be made there...The final factor for consideration is the lack of transmitting capacities."

- Major financial institution -

Regarding the distribution sector, it is crucial to invest in the renewal of infrastructure as this sector relies heavily on equipment and regular updating and maintenance has not been a priority.

"I suppose that investments are needed primarily in the electricity distribution sector ... Regarding the electricity distribution sector, MRSK (the International Distribution Grids Company) faces a sorry plight. The old equipment has not been repaired for years; it is on the way out."

- Survey participant -

However some respondents believe that investing in the MRSK³⁰ (distribution grids) is rather risky, due to the unstable situation of the company and its poor internal organization.

Will the state be able to finance investments in the electricity sector over the next five years?

The Government should and will finance the electricity sector, but only in the state segments of the market including the grids (FSK, Holding MRSK), nuclear generation and hydro power generation (RosAtom and RusHydro).

"... the government... must finance the grids infrastructure, hydro power generation and nuclear power generation. The remainder is private power generation and this is a question for those people or organizations who are the owners of this generation. The Government is performing its obligations fully."

- Major financial institution -

"The government has no way out, because transmission is completely a state segment. The state share in distribution is about 50-75 percent."

- Survey participant -

Thermal power generation is privatized, and investments in this sector will be made by private investors. The amount of private investments and the implementation of investment programs are controlled by the government. Government support in this sector can only occur through credits offered to private investors.



30 Source: MRSK Sibiri ("Interregional Distribution Grid Company of Siberia" Joint Stock Company, IDGC of Siberia, JSC) is the largest distribution grid company in the Siberian Federal District. The service territory coverage covers four time zones. The power network volume is 1123430 conventional units. Every day Siberian MRSK supplies almost 15 million people with energy. Total length of the MRSK Sibiri power lines is 265 845 kilometers. The facility's staff totals more than 20 000 people. Source: <http://www.mrsk-sib.ru/eng/>



4.4. Main determining factors in the development of the electricity industry

Regulatory climate

Worldwide experiences and best practices support the fact that decentralization and privatization lead to market liberalization and sustainable development. To facilitate these, a supportive legislative background is required, the lack of which is one of the basic constraints on the development of Russia's electricity system.

As the state is usually unable to maintain a country's electricity system in a satisfactory condition through its investments, especially on the scale that Russia should, the involvement of private capital is a necessary step to keep the technology stream flowing into the country. This also requires regulated support from the state.

In this process of development, competition on a free market should be the desired goal, which requires precise legislative planning and careful organization.

Russia has already shown willingness to bring in know-how via international market players, as the increase in private ownership in the generation sector shows.

The energy policy of Russia is still evolving and the restructuring of the energy sector has been conducted through ownership unbundling and the privatization of RAO UES of Russia. In the course of the reform program,

What are the expectations on the level of public and private sector investments going into the electricity sector in the course of the next five years?

The government will completely finance the state segments of the market. The state segments comprise transmission grids, distribution grids, hydro and nuclear generation.

The private sector – thermal power generation - will be financed only by private investors.

The Government has confirmed that there will be no reduction in the investment program for the state segment and insists on the continuation of private investment at the same level as was previously planned.

The development of local electrification will also depend on private investors.

"The government has confirmed that its investment programs have not

changed as of 9 April 2009. It is very important that the government does not cancel these programs."

- Major financial institution -

Despite the Government's declaration, doubts regarding financing capabilities do exist. Respondents are unsure how private investors (not to mention the Government) will be able to continue with the planned level of investments due to the crisis and the lack of financial resources.

"If there is no money, the Government's declaration will make no difference. I do not know how it will solve this problem with the new owners. Still, the Government is holding its line and the new owners will try to invest. I do not know whether this will be successful or not."

- Major financial institution -

Private investors will initially tie up money in generation followed by distribution grids.

the first and only power exchange of Russia (Nonprofit Partnership Administrator of the Trading System) was established in order to stimulate the electricity marketplace.

The gradual liberalization of the wholesale and retail electricity market is still in progress. In this process legislation is being formed to achieve 100 percent liberalized trading at unregulated prices (excluding the residential sector) by 2011.³¹

With the help of such restructuring and liberalization, Russia is expected to be able to handle rising energy prices successfully, sales of newly added and planned generation capacities, the complexity of electricity distribution, fulfilling the requirements for state subsidies and end-user tariff issues.

What are the top priorities of the Regulatory Agency over the next five years?

The top priorities of the Regulatory Agency should be the assurance of reliability and continuity of the electricity supply at an optimum price. On the one hand, the price should provide for the functioning of fixed assets, and on the other, it should be acceptable for consumers.

Therefore the first priority of the Ministry of Energy is the implementation of the wholesale electricity (capacity) market. This takes has not been finished by RAO UES due to the ceasing of its activity as a "state-owned monopoly".

"The rules of the capacity market should be confirmed without delay, because the whole process is blocked

by this obstacle. Until it is removed, no one will build anything in a conventional way."

- Major market participant -

For the moment the wholesale market consists of:

- *a regulated market sector*
- *a "day-ahead" market (or spot market)*
- *a balancing sector.*

Currently, nearly the full sum of capacity is sold via regulated contracts. However, there are some new additional capacities within the framework of the market liberalization model which are sold according to a free pricing principle. Eventually, the launching of a fully competitive capacity market is planned which will attract private investors. Private investors however will not invest in the energy sector without seeing the possibility of return on their investments.

"Due to the appearance of new owners (private companies), the government should provide them with effective operating conditions, a competitive capacity market, and the abolition of cross-subsidization."

- Major financial institution -

Along with the capacity market, the abolition of cross-subsidization and strengthening of antimonopoly regulation are also considered top priorities.

Moreover the government should strictly define its future development strategy and its priorities. This is a matter of urgency, because the

country's energy consumption has changed due to the crisis, and "The General Scheme of Power Industry Facilities Installation in 2015-2020" needs revision now.

Electricity prices

The current tariff structure does not represent the real market prices for electricity, therefore the main tendency is that the overall tariffs are being raised in the Russian electricity sector. Major market players were asked for their opinions on the expected future development of electricity prices.

What is the end-user electricity tariff structure expected to be over the course of the next five years? Will the regulator be able and committed to reducing subsidies and cross-subsidies in the existing end-user tariffs and gradually move towards a cost-reflective tariff regime in the next five years?

According to the plan of energy market restructuring, the full liberalization of the wholesale (capacity) market should happen by 2011.

"The tariffs are becoming gradually outdated. If liberalization progresses according to plan, we will have 100 percent liberalization of the energy market by the end of 2011."

- Survey participant -

The Ministry of Economic Development of Russia is working on the problem of non-representative pricing. A draft law on the no tax levy is being considered now which would allow for

³¹ Source: RAO UES, 2008 "Russian Power Market Reform"

eliminating cross-subsidization and implanting cost-reflective tariffs for end consumers.

One of the current problems that should be solved in the near future is the lack of coordination between the wholesale and retail electricity markets. At present these tariffs are growing.

“The tariffs went up threefold compared with last year because of the lack of clear and understandable working rules.”

- Survey participant -

“The tariffs will grow... This is caused by the necessity of investment for construction and modernization in the energy sector. This is why the tariffs will increase.”

- Survey participant -

But for the moment, due to the financial crisis certain consumers who are especially vulnerable (industrial consumers and low-income households) are not ready to pay the full tariff. Under these circumstances, the government will not be likely to agree to reduce subsidies and cross-subsidizing anytime soon.

Energy saving

Currently, power intensity is very high while energy efficiency is low in the Russian industrial sector. Consequently, there is a lot of room for energy saving improvements that would lead to conservation of gas, providing additional resources to the country.

What kinds of energy saving technologies are expected to be implemented over the next five years? What level of support will the state provide in this respect? How will it influence consumption?

Energy conservation is a critical issue that needs serious knowledge-based support and additional resources in terms of financing research and development activity.

The figures provided by the Ministry of Economic Development of Russia show a very high level of power intensity and very low energy efficiency in the industrial sector in total.

The implementation of energy saving technologies has already been started and should continue over the course of the next five years for the following reasons:

- The growth of electricity tariffs related to the liberalization of the market
- The financial crisis, as consumers want to reduce charges for electricity.

However, as discussed earlier, the financial crisis has interrupted the development of energy saving technologies, as major investments are needed for modernization. Yet survey respondents believe that the process will continue, though the speed and level of developments are still unclear.

“It will go on despite the crisis. In any case these technologies will become cheaper, and people will calculate the savings ... The costs are initial making them very profitable in the long term.”

- Survey participant -

The government has also proclaimed the importance of energy saving and the necessity of implementing energy saving technologies. Some laws have been taken into consideration by the Parliament and there is a presidential decree on measures for increasing energy efficiency and the greening of the Russian economy.

“Now, the State Duma of Russia is considering a law on energy conservation.”

- Survey participant -

“This year the president has signed a decree on energy efficiency at large companies. I cannot estimate the scope, but I know that there are programs being developed and they are not receiving adequate funding.”

- Survey participant -

However, the government does not have any mechanisms to support this process and it will not finance it. Still, support via soft loans could be very effective, especially for the large key enterprises.

The possible influence of implementing energy saving technologies on the consumption of energy is not considered to be significant.

For the moment energy saving technologies are being implemented in new construction as they are included in the stage of project design. Modernization of established facilities, in most cases, is not yet profitable. In the household sector the implementation of energy saving technologies has just started.



GHG emissions have increased by 11 percent since 1998; economic growth in the same period, meanwhile, was over 60 percent between 1998 and 2008. However, it is a widespread view in Russia that the economic growth necessarily means a parallel rise in GHG emissions.

In 2007, Russia emitted 2.19 billion metric tons of carbon dioxide equivalent, which is the highest since 1994 but still 33.94 percent below the 1990 baseline.³⁵

Having an emissions limit, Russia qualifies for the project based investment mechanism, namely Joint Implementation (JI). JI allows for cooperation among Annex I countries on emissions reduction projects. The total planned emission reductions through JI projects are the equivalent of 276,530,771 tons of CO₂, half of which are focused on the energy sector. About 50 projects in the energy sector are planned to reduce emissions by 120 million tons up to 2012. It should be noted that none of the projects above have been registered but are in the validation/determination phases of the JI procedure.

What are the effects of health, climate change and environmental issues/ concerns on the current and planned power generation portfolio?

Health, climate and environmental issues have some impact on the power generation mix according to the majority of the respondents. However, the weighting of these issues is very low

Environmental concerns

Russia is the world's third largest emitter of greenhouse gases behind China and the United States. Greenhouse gas emission is considered the main cause of global warming which may lead to more floods, heat waves, droughts and rising sea levels.

Russia's emissions mostly arise from burning fossil fuels; the country has significant opportunities to limit its emissions via more efficient use of energy. In theory, it can sell any surplus on carbon markets by staying under its 1990 levels.

Kyoto Protocol³²

In order to rein global warming the world's industrialized nations (with the exception of the United States) signed the UN's Kyoto Protocol, which sets targets on national greenhouse gas emissions.

Russia ratified the Kyoto Protocol on 16 February 2005³³. Russia, as an Annex I country of the Protocol, has set an overall green house gas emission limit in Annex B of the Protocol targeting the maintenance of emission levels from 1990. That year was selected as a base year when Russia's emission was equivalent to 3.32 billion tons of CO₂. Following the collapse of the Soviet Union in 1991 Russia's greenhouse gas emissions decreased drastically, bottoming out at 1.98 billion metric tons in 1998.³⁴

32 Source: The Kyoto Protocol is a set of rules to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), an international environmental treaty which was produced with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The Kyoto Protocol establishes legally binding commitments for the reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride), and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by "Annex I" (industrialized) nations, as well as general commitments for all member countries. As of January 2009, 183 parties have ratified the protocol, which was initially to have been adopted for use on 11 December 1997 in Kyoto, Japan and which entered into force on 16 February 2005. Under Kyoto, industrialized countries agreed to reduce their collective GHG emissions by 5.2 percent compared to the year 1990. National limitations range from 8 percent reductions for the European Union and some others to 7 percent for the United States, 6 percent for Japan, and 0 percent for Russia. In the non-binding "Washington Declaration" agreed on 16 February 2007, Heads of governments from Canada, France, Germany, Italy, Japan, Russia, United Kingdom, the United States, Brazil, China, India, Mexico and South Africa agreed in principle on the outline of a successor to the Kyoto Protocol. They envisage a global cap-and-trade system that would apply to both industrialized nations and developing countries, and hoped that this would be in place by 2009.

33 Source: United Nations Framework Convention on Climate Change, www.unfccc.int

34 Source: United Nations Framework Convention on Climate Change, www.unfccc.int

35 Source: UNFCCC: National greenhouse gas inventory data for the period 1990–2006

“It is necessary to protect the environment, because our power stations are rather polluting.”

- Major financial institution -

and progress on them in Russia in the near future is not likely because focusing on these issues can put the brakes on the economy and the benefits, in the context of Kyoto Protocol, are not yet clear.

“All these aspects related to various environmental projects should be treated very carefully - they seriously slow the growth of economy....”

- Survey participant -

“The only influencing factor is the Kyoto Protocol. This influence is reflected in projects that can be defined as joint cooperation via the Kyoto Protocol, receiving additional financing due to the selling of quotas. In terms of current projects, I do not think that anyone has ever paid attention to these questions.”

- Major financial institution -

Nevertheless there are examples of some small corrective amendments in terms of environmental progress and pollution reduction. The new environmentally friendly technologies are starting to be applied to some power facilities. These projects are not large though. Currently, larger investments in the environmental sphere are not scheduled.

What is Russia’s commitment to fostering a carbon-sensitive economy over the next five years?

Russia has ratified the Kyoto Protocol, and some movement toward fostering a carbon sensitive economy already exists. The government understands the importance of environmental issues, but its actions have been reserved.

Progress has been made as evidenced by the fact that in the last 10 years people have started to talk and think about environmental issues and to take these aspects into account. The situation was very different in the past.

“I think that it is good that in the last 10 years Russia has even started to talk about it. Nobody even talked about it 10-12 years ago. We are on the right track, because we have started to implement projects which take the environment into consideration.”

- Major financial institution -

As far as the government is concerned, the difficult economic situation in Russia will receive more attention than environmental concerns for at least the next 2-3 years.

“I think nothing will change now. Only after the economy improves will we start thinking more about ecology.”

- Survey participant -

Key challenges

Russia faces challenges on many fronts. In the coming decades, it is of vital importance that Russia outlines an

appropriate regulatory regime for its energy market that attracts foreign investors and combats corruption.

Based upon survey data, the most important challenges determining the long term development of the country are connected to skills development, regulatory effectiveness, corporate governance, and assurance regarding private investments.

Does Russia have enough skilled labor available to lead and execute the necessary investments into the electricity sector in the next five years?

Currently, the demand for skilled human resources is not being fully met. Control unit engineers and maintenance specialists are especially in demand.

Additionally, most of the current power facility staff are aged, since many younger qualified staff left the industry in the 90’s when the sector underwent a slump. Older power specialists are often unaware of new technologies or the commercial aspects of the power business.

“Young, well-trained experts, primarily managers, are needed to implement construction of new capacities and grids. Unfortunately in previous decades there was a dramatic decline in this sector.”

- Major financial Institution -

Numerous measures are being taken by the responsible authorities to address this issue. The educational training for the energy sector in Russia is strong. There is an adequate amount of universities providing qualified specialists for the industry which are

situated in various regions of the country.

Energy companies are also working with universities and organizing special programs for students to attract them to the energy sector.

“Our company, for example, launched a department in Krasnoyarsk University, which will train students to our exact specifications.”

- Survey participant -

Nevertheless, respondents have mentioned that in some of the specializations a lack of staff is apparent but in the current economic slowdown the educational sector should be able to keep pace with demand.

Technology suppliers

The development of the energy sector depends highly on the availability of technical suppliers providing efficient, environmentally friendly technologies. The Russian power engineering industry, which was well developed in Soviet times, broke down during the transition period of the 1990s. So for the moment, the domestic industry can barely manage supplying the energy sector. Some foreign technical suppliers have also appeared on the Russian market in addition to domestic suppliers.

What are some possible approaches for Russia to fulfill the increasing demand for equipment and technology services of the electricity sector over the next five years? How will suppliers be able to serve this demand?



The Russian power engineering industry, which was well developed in during the Soviet Union, degraded during the transition period of the nineties. So, for the moment, Russia's domestic industry can barely manage supplying the energy sector. Equipment for implementing current investment programs and necessary modernization is insufficient. Additionally, the power engineering industry is not regulated by the government and it is up to the investors to take the lead on setting priorities.

Much progress was made by publishing the official governmental program on the energy sector development - "The General Scheme of Power Industry Facilities Installation in 2015-2020". Foreign suppliers are now present in the Russian market.

Companies with production capacities on Russian territory will have an advantage over those that produce equipment for the Russian energy sector abroad, because equipment produced in Russia is less expensive. This is the main

motivation for foreign companies in forming joint ventures and starting production on Russian territory.

It is also important to note that not all equipment segments in Russia are in absent. Regarding gas turbines and boilers, Russian equipment, according to some, is superior to that manufactured abroad. In the field of nuclear generation, via Atomstroyexport Russia is participating in some foreign projects as well.

Financial and economic crisis

The energy sector represents the backbone of the economy, so consequently the global financial and economic crisis has influenced its development as well.

What are the expected effects of the global financial turmoil on Russia's electricity market in the next five years?

There are obvious negative consequences of the crisis in the electricity industry. These include a

“Construction in the energy industry is attractive during the financial crisis...because it is cheaper to build now.”

- Major market participant -

decrease in consumption and generation, and an increase in nonpayment for electricity resulting in reductions in revenue.

“There is simply a decrease in electricity consumption and an increase in nonpayment here – two basic consequences of any crisis. Of course, both are occurring now.”

- Survey participant -

Nevertheless, respondents mention one potential positive factor. If a company still has money for investment, this is the best time for the modernization of equipment or the construction of new generating facilities.

“The energy industry is a sector with a long-term investment cycle. Construction is attractive during the financial crisis, because constructors as well as technology suppliers all over the world are experiencing the downturn and are ready to reduce the prices, so it becomes cheaper to build now.”

- Major market participant -

As a positive effect of the crisis, fuel for thermal power stations has become cheaper now.

However, the crisis has made financing more difficult for the majority of investors:

“The decrease in consumption means a lack of money for the development of new projects. There are no accessible sources of financing. This will remain so in the next five years.”

- Major financial institution -

“Like every other sector of the economy, the energy industry has been harmed by the financial crisis. Energy consumption has decreased. There is a lack of free investment resources for the implementation of current investment projects.”

- Survey participant -

Still, technology suppliers are confident that the construction of energy facilities will not fully cease and when energy consumption recovers to its previous level, investors (state or private) will proceed with all frozen or paused projects.

“They are reducing and phasing down investment projects. They suspend current projects and keep an eye on energy consumption. If energy consumption recovers, construction will continue.”

- Survey participant -

What are the highest profile issues that will bear the most influence upon the future of the electricity sector? What factors will determine the next five years of the sector?

The most important issues influencing the future of the electricity sector in Russia are regulation and finding the balance between government and private investors. The current energy sector model is based on combining governmental support and regulation with a high volume of private investment, moving gradually toward a free power capacity market.

Private investments are urgently needed, but the position of the Government on regarding implementing the wholesale capacity market and finishing market legislation is not transparent, which is slowing down the progress of the energy sector. The restructuring process should be finalized.

“Russia must implement a wholesale market process and provide new investors in generation with the necessary conditions for normal operations. Otherwise the energy sector will not develop.”

- Major financial institution -

“...Certainly, we must improve the normative base, to publish new norms in this field. It is necessary to stimulate investment in the sector, because it is clear that the government will not manage to do it alone.”

- Survey participant -

Another very important issue according to the respondents is revision of the reform program and the revision of “The General Scheme of Power Industry Facilities Installation in 2015-2020”, because due to the financial crisis, the volumes of consumption and investment have decreased, and it is now essential to revise the development program regarding power generation and grids.

Concerning technological development, according to respondents it is necessary to increase the amount of nuclear power instead of thermal power within the generation mix.

Decreasing the prevalence of corruption has also been mentioned as one of the key priorities for the sector’s development.

5. Investment Opportunities

As described in this publication, Russia's electricity sector bears enormous potential for growth and business development, but exploitation of these opportunities requires tailor-made investment strategies and careful planning processes.

This study aims to help both domestic and international financial investors in identifying business opportunities in the Russian power sector throughout the asset lifecycle.

The main results of our assessment of the Russian power sector are outlined in the following chart.



Macro-economic trends

- Household electricity consumption is predicted to grow continuously over the next five years despite the global crisis.
- Before the crisis, Russia bore a strong and growing domestic market. Due to the crisis market development is currently experiencing a slowdown with an impact on both investments and demand for electric power, especially in the industrial and power sectors over the next two or three years.
- Demand for power will grow in the household, agriculture and industrial sectors when the crisis is over.
- The Russian population is using more and more different types of electric appliances, which in turn will facilitate growing consumption of electricity.
- Energy saving technologies in electricity consumption are likely to be increasingly utilized.

Investment characteristics

- The electricity sector is one of the top priorities for the Government's political agenda. In spite of the crisis, the government does not intend to reduce the planned investment program in the energy sector.
- The government has prepared The General Scheme of Power Industry Facilities Installation for 2015-2020. This scheme is an official strategy for sector development which is well-known to all market players.
- Experts consider the crisis period as the best for investments into Russia due to the cheap assets, lower costs for construction and deferred demand.
- Currently, there are numerous private owners in the electric power market with robust investment programs.
- The intention of global technology suppliers to open manufacturing capacities in Russia.
- Unfinished outlining of regulation of the electricity market by the Government. Investors are waiting for these rules and implementation of a wholesale competitive capacity market.

Market factors

- Aging capacities in the electricity sector need to be expanded and improved, so the demand for high quality equipment could possibly increase in 2-3 years (following the crisis).
 - Expanding and improving installed generation capacity.
 - Supplying new metering and control technologies and equipment.
- Out-of-date equipment, especially in distribution grids.
- Reputable experience and know-how in nuclear, hydropower and heat energy sectors.
- Numerous unexploited water resources in Siberia and the Far East region, and big oil and gas reserves.
- Intent to reduce cross-subsidies in the electricity sector.
- Russia is a signatory to the Kyoto Protocol.
- Lack of specialized labor in the electricity sector, especially for alternative power sources.
- Lack of high quality energy sector equipment manufacturing within Russia.
- Various foreign high-tech companies are now operating in Russia, supplying technology, products and services for the electricity sector.

Acronyms

BRIC – Brazil, Russia, India, and China

CAGR – Compound Annual Growth Rate

DSO – Distribution System Operator

EIU – Economic Intelligence Unit

ENTSO-E – European Network of Transmission System Operators for Electricity

FGC UES – Federal Grid Company

FOREM – Federal wholesale electricity market

GDP – Gross Domestic Product

GE – General Electric

GHG – Greenhouse Gas

GOELRO – State Commission for Electrification of Russia

HPP – Hydro Power Plant

IDGC – Interregional Distribution Grid Companies

IEA – International Energy Agency

JI – Joint Implementation

NP ATS – Nonprofit Partnership Administrator of Trading System

PPP – Purchasing Power Parity

RAO UES of Russia – Joint Stock company United Energy Systems of Russia

RTS – Russian Trading System Stock Exchange

SME – Small and Medium Enterprise

TGC – Territorial Generation Companies

TSO – Transmission System Operator

UNFCCC – United Nations Framework Convention on Climate Change

USSR – Union of Soviet Socialist Republics

WEC – World Energy Council

WGC – Wholesale Generation Companies

WTO – World Trade Organization

KPMG's ENR Practice Overview

KPMG's Global Energy and Natural Resources (ENR) practice is dedicated to helping our firms' clients tackle the issues affecting them in today's operating environment. From global super majors to next-generation leaders, KPMG member firms strive to tailor our service offerings to specific client needs and deliver the highest standards.

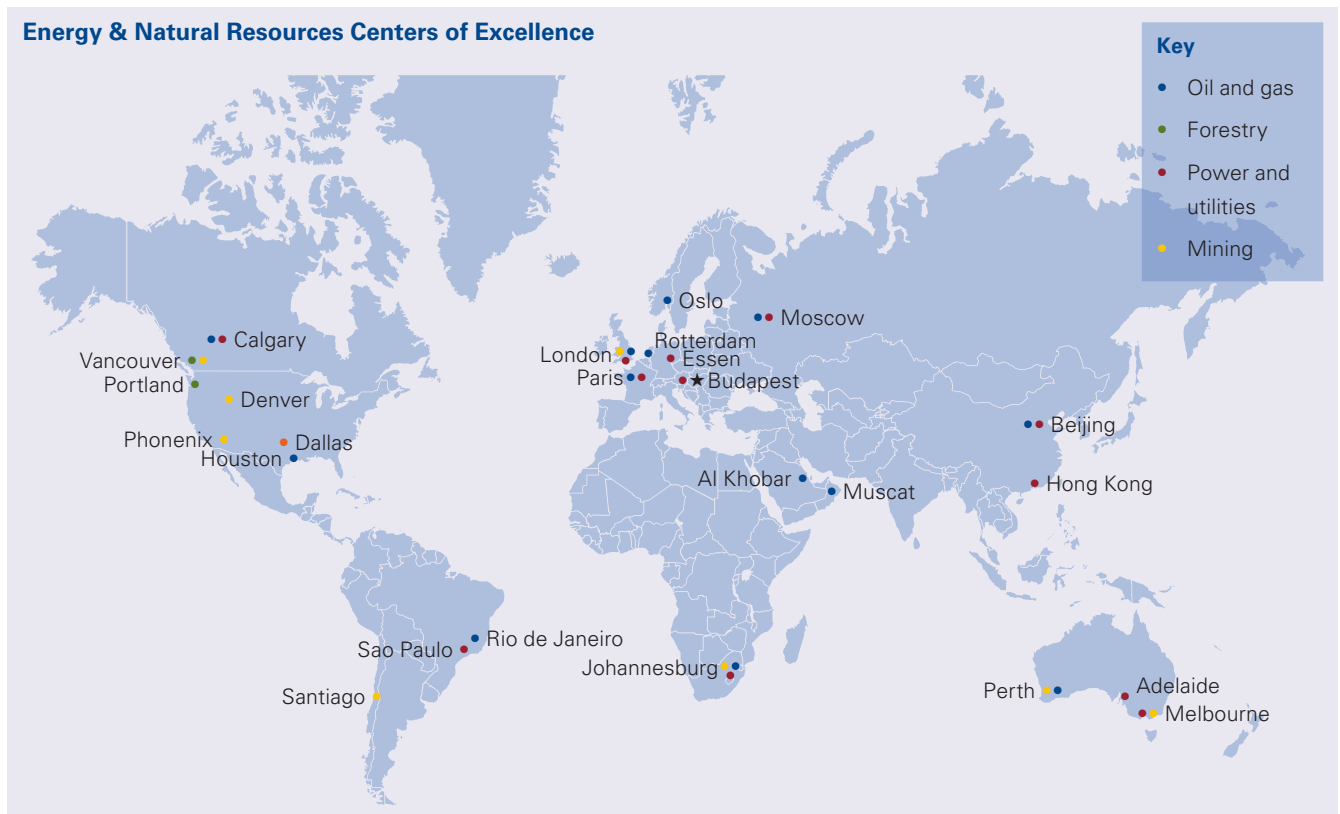
KPMG's Global ENR practice is organized through a global leadership team aligned with member firms' ENR practices. The global leadership team focuses on our strategic framework, reputation and performance, supported

by an executive group dedicated to driving their implementation, and measuring and communicating our performance. Our management team focuses on providing account management, proposals, marketing, knowledge management, and administrative support to KPMG client service teams operating in the ENR industries.

KPMG's ENR professionals help our member firms' clients address the complexities and challenges that affect their businesses by creating industry groups that tackle different areas of the

global energy marketplace. The industry groupings facilitate outstanding coverage of this vast industry, which are: Oil & Gas, Power & Utilities, Mining & Forestry.

KPMG firms have Centers of Excellence (CoE) throughout the globe, dedicated to the Oil & Gas, Power & Utilities, Mining, and Forestry sectors. These centers are strategically located near major hubs of activity within the industry. CoE teams of experienced KPMG energy professionals provide high quality advisory services to clients based in those specific areas.



KPMG's Global Power & Utilities Knowledge and Resource Center – Budapest, Hungary

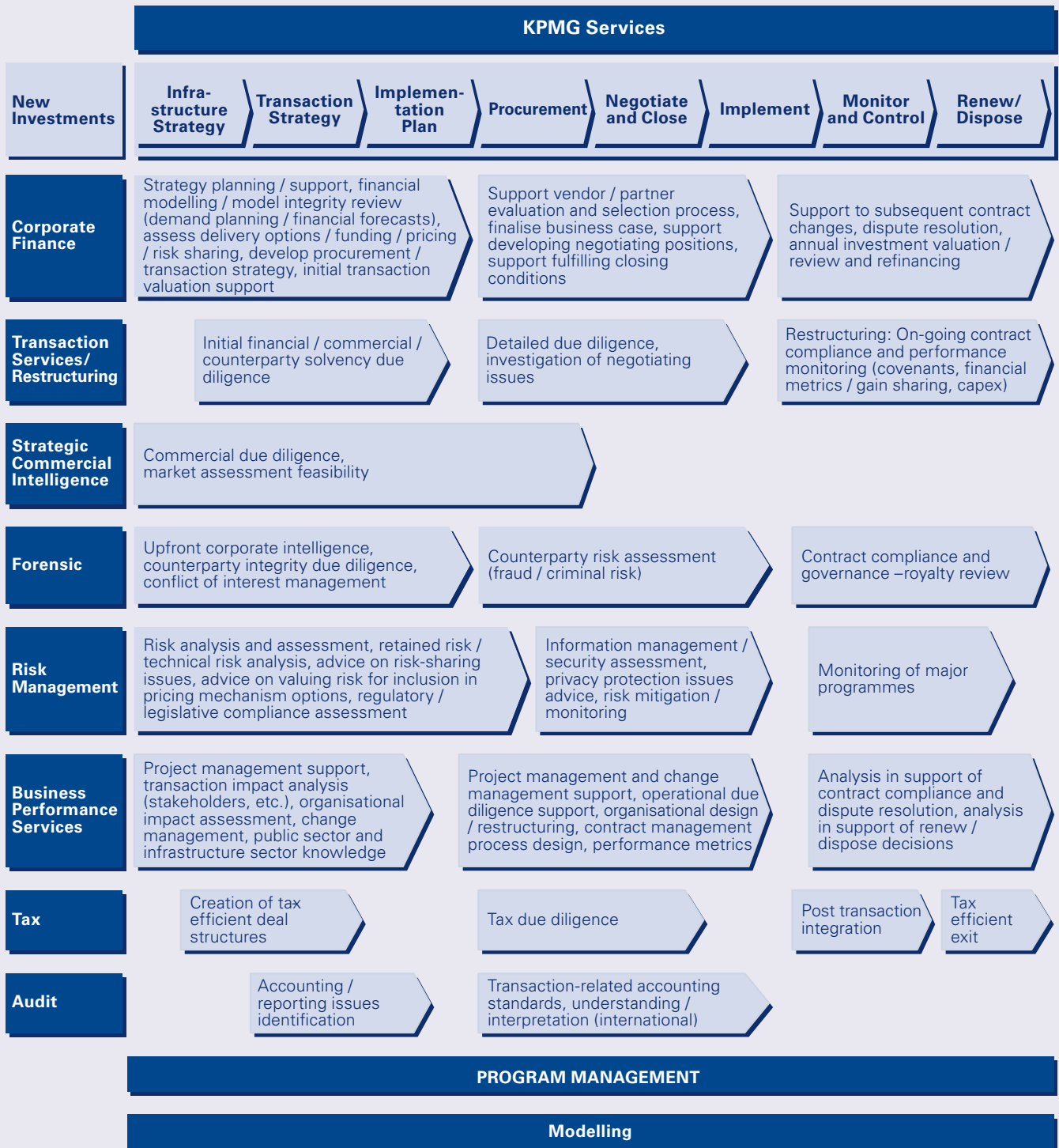
The Power & Utilities market has been developing at an extremely rapid pace globally in recent years. This fast development is characterized by large scale infrastructure projects that require a global base of experience and a high level of specialized industry knowledge.

As a focal point of Power & Utilities, KPMG's Global Power & Utilities Knowledge & Resource Center based in Budapest, Hungary (Central and Eastern Europe) consolidates global know-how and knowledge in a single location and takes a hands-on approach to match client needs with KPMG's

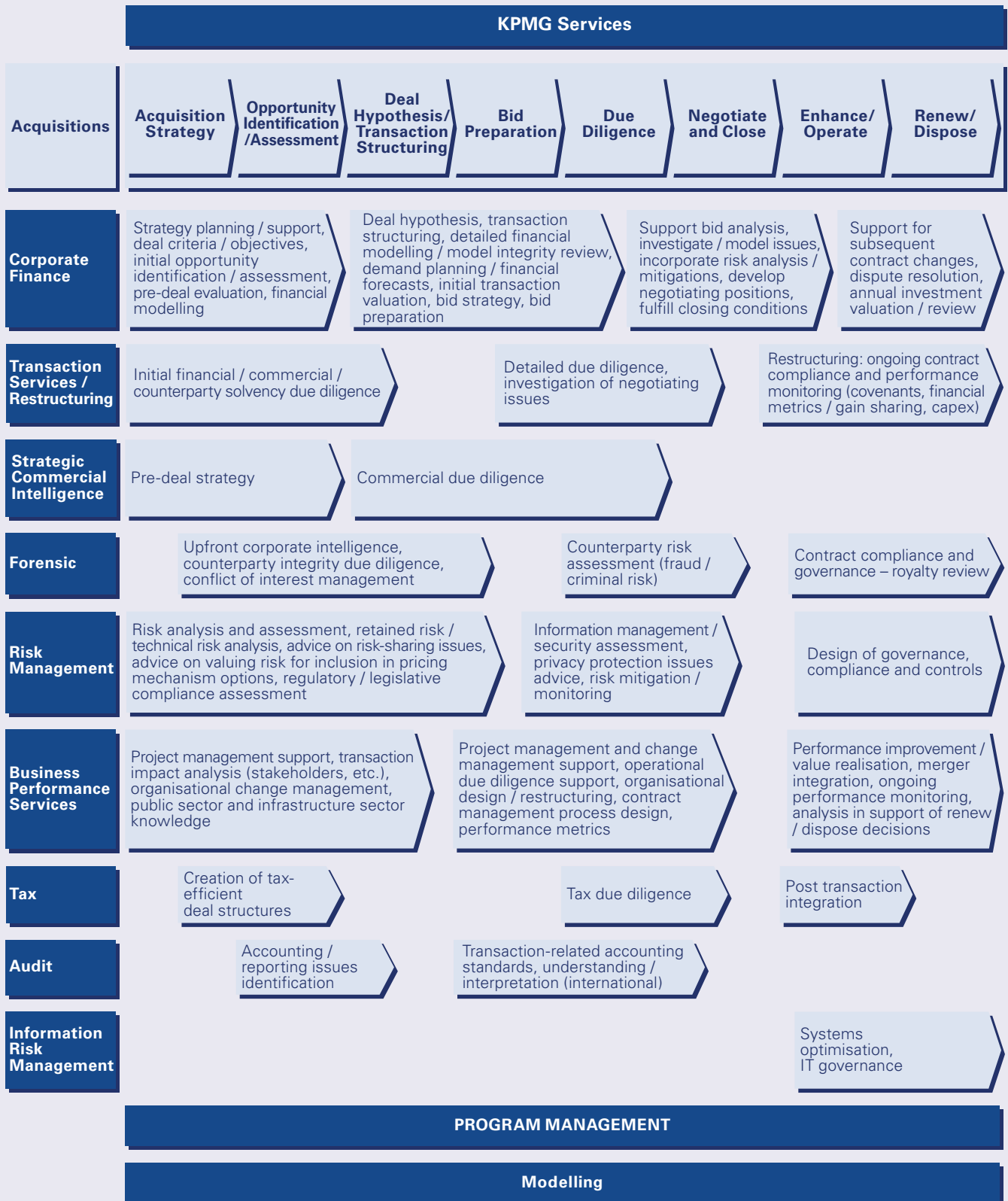
Centers of Excellence (CoE) across the globe that are best suited to providing professional advice and support that addresses clients' strategic and transactional activities.



Throughout the globe, KPMG member firms provide clients with offerings in relation to the following services:



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KPMG's "Think BRIC! Key considerations for investors targeting the power sectors of the world's largest emerging economies" publication series

"Think BRIC! Key considerations for investors targeting the power sectors of the world's largest emerging economies" publication series aim to highlight major trends and challenges shaping the evolution of the BRICs countries' power sectors over the course of the next decade in light of the global economic crisis. Perspectives of top-level executives and stakeholders of the BRICs power sector are included in these country reports which are based on a qualitative research and KPMG analyses.



Think BRIC! Key considerations for investors targeting the power sectors of the world's largest emerging economies –
Comparative study

This KPMG report sizes the investment needs of the power sectors in Brazil, Russia, India and China; including historical analyses from 2000–2008 and also projected investment needs until 2020 by assessing socio-economical, technical, environmental and legal aspects.



Brazil's electricity sector bears enormous potential for growth and business development, but accessing the opportunities

requires tailor-made investment strategies and careful planning processes. This study aims to help both domestic and international investors in identifying business opportunities in the Brazilian power sector throughout the asset lifecycle.



The **Russian** market is one of the largest on the planet. Scores of power plants feed almost 1 million gigawatt hours of electricity into a vast grid that

comprises some 3.2 million kilometers of cables that stretches across 11 time zones. More recently, the global financial crisis, along with the fall in the price of oil, has hit Russia hard but the Russian electricity sector is still a target for foreign investments.



India's population around 1.1 billion in 2009, is growing fast, and is expected to surpass that of China soon after 2020 – making it the largest in the

world. To fuel its economic growth, which is expected to be over 9 percent for most of the next decade, with electricity, total generating capacity should jump by 90 GW, to 241GW, with an increased emphasis on nuclear, clean coal and renewables, including solar and small-hydro.



China invested some USD 83 billion in the electricity sector in 2008. Longer term estimates predict that China will need to invest USD 2,765 billion

into the industry by 2030 to cope with its power demand – an estimated one quarter of the total global energy sector investment within that period. How will such a gigantic sum be spent, and what opportunities will it offer investors and suppliers?

Authors and co-authors of the "Think BRIC! Key considerations for investors targeting the power sectors of the world's largest emerging economies" publication series:

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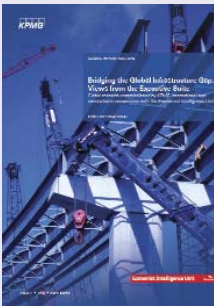
China`s Energy Sector – A Clearer View

The following KPMG report shares our observations on key trends in each area of the energy sector, from upstream oil and gas to power generation



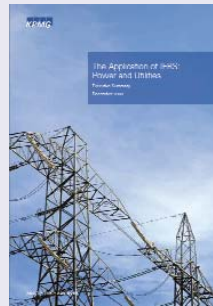
Central and Eastern European Nuclear Energy Outlook

A discussion of the nuclear energy industry in Central and Eastern Europe, this document discusses both the region as a whole and individual nations.



Bridging the Global Infrastructure Gap: Views from the Executive Suite

Global research commissioned by KPMG International and conducted in cooperation with the Economist Intelligence Unit



The Application of IFRS – Power and Utilities

The publication examines trends and challenges in implementing true IFRS across the Power and Utilities industry and is based on the reports of various companies across a variety of countries.



The Winds of Change

The Winds of Change is the 2009 version of an annual publication which discusses trends in M&A in the Renewable Energy Industry. Over 200 executives were surveyed, and supplementary interviews were carried out by the Economist Intelligence Unit.



Indian Power Sector – Rising up the Curve

The Indian power sector is going through an exciting growth phase-high GDP growth lead to increased demand, generation capacity, transmission and distribution.

About the KPMG Global Energy Institute (GEI)

The KPMG Global Energy Institute has been established to provide an open forum where industry financial executives can share knowledge, gain insights, and access thought leadership about key industry issues and emerging trends.

Power and utilities financial, tax, risk, and legal executives will find the GEI—and its Web-based portal—to be a valuable resource for insight on emerging trends.

To register for your complimentary membership in the KPMG Global Energy Institute, please visit www.kpmgglobalenergyinstitute.com.

For more information about the GEI, please e-mail us at globalenergyinst@kpmg.com.



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