

# RUSSIA

- *Russia's primary energy demand is projected to grow at 0.7 percent per year over the outlook period; buoyed mainly by increasing demand for oil and gas in the industry and transport sectors.*
- *Significant energy conservation and economic restructuring efforts would help reduce the economy's very high energy intensity.*
- *Amendments to energy-related laws, regulations, and codes will stabilise the institutional framework and strengthen investor confidence; therefore facilitating the smooth inflow of investment into the energy sector.*
- *As a major world energy exporter, Russia is expected to strengthen regional energy trade and cooperation with both Northeast Asian and American neighbours, while maintaining a strong position in the traditional European market.*
- *Tapping hydrocarbon resources in the north of West Siberia, East Siberia and the continental shelves of the Arctic and Pacific Ocean's should augment depleting reserves from traditional oil and gas fields in other provinces.*

## RECENT ENERGY TRENDS AND ENERGY POLICY

Russia is the world's third largest energy consumer. Primary energy consumption has grown robustly over the last five years at 2.5 percent while GDP growth reached 7.1 percent in 2004, surpassing the average growth rates of the other G8 economies. In 2005, natural gas accounted for the largest share of primary energy consumption at 56 percent, followed by oil at 18 percent, and coal at 16 percent. Due to the extremely cold climate across the economy, the most important use of natural gas is space heating.

Russia meets all of its energy requirements by domestic production, having the world's largest natural gas reserves, the second largest coal reserves and the eighth largest oil reserves. However, with depleting oil and gas reserves in the economy's traditional oil and gas bearing provinces, the economy has been prompted to explore for new acreage.

Russia is the world's largest exporter of primary energy. In 2004, Russia exported a total of 520 Mtoe, of which 330 Mtoe was oil, 168 Mtoe was natural gas and 22 Mtoe was coal.<sup>94</sup> Energy exports have been the major driver for Russia's economic growth, accounting for 25 percent of GDP and 65 percent of export revenues.

As a result of Russia's increasing energy consumption over the past decade and the need to reduce the economy's energy intensity while sustaining Russia's export position, the Federal Government approved the "Energy Strategy of Russia to 2020", in August 2003, outlining the economy's long-term energy policy.

Important features of the policy include: a) greater emphasis on energy efficiency through

economic re-structuring and demand-side management; b) establishment of market-based energy pricing mechanisms; c) exploration and development of new oil and gas bearing provinces and modernization/expansion of export facilities; d) diversification of export markets; e) development and construction of new generation nuclear technologies, particularly closed nuclear fuel cycle; and f) refurbishment of gas-fired power plants with combined-cycle technologies.

The Federal Government has also recognised the importance of improving the economy's institutional framework through amendments to the Sub-soil law, tax codes and industry regulations to promote further investment in the energy sector.

## ENERGY DEMAND DRIVERS

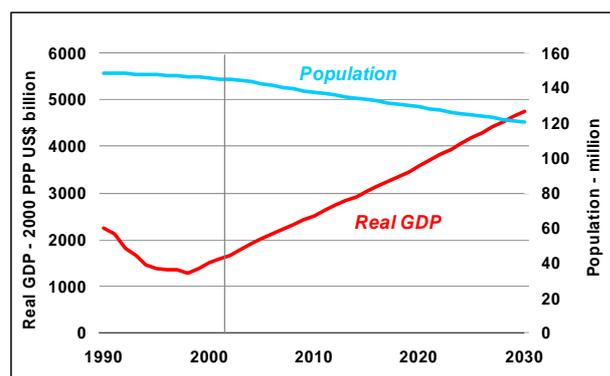
Russia's energy consumption is mainly driven by increasing economic activity, boosted in part by high world energy prices. GDP has grown steadily at an average annual rate of 5.1 percent since economic recovery started in 1999 as a result of the re-valuation of the national currency in 1998; later supported by soaring world energy prices starting in 2000.

Over the outlook period, GDP is expected to continue to grow, although at a slower pace increasing at an average annual rate of 3.8 percent.

By contrast, Russia's total population is expected to decline from 145 million in 2002 to 121 million in 2030 and will have a major impact in both the residential and commercial sectors, as standard of living improves across the economy. The urbanisation level is expected to increase from 73 percent to 78 percent, over the same period.

<sup>94</sup> BP (2005)

Figure 92 GDP and Population



Source: Global Insights (2005)

## OUTLOOK

### FINAL ENERGY DEMAND

Final energy demand is expected to grow at 1.0 percent per year over the outlook period, compared with the negative growth rate of 3.5 percent in the previous decade. The industrial sector is projected to account for the largest share at 51 percent, followed by residential (29 percent), transport (16 percent), and commercial (4 percent).

Figure 93 Final Energy Demand



Source: APERC Analysis (2006)

### Industry

Industrial energy consumption fell sharply in the early 1990s following the dissolution of the Soviet Union, however demand is projected to recover and grow at an average annual rate of 1.6 percent until 2030. The growth rate will be less than half the growth of industrial sector's value-added, at 4.1 percent per year during the same period, resulting in a substantial decline in energy intensity<sup>95</sup> at an average annual rate of 2.4 percent. The expected

<sup>95</sup> The amount of energy needed to produce a dollar's worth of industrial sector's value added.

technological retrofitting of industrial facilities and the effects of subsidy cuts on energy prices would contribute to the decline in industrial energy intensity. Many of the economy's industrial facilities are antiquated and technologically obsolete. National statistics show that in 2002, the average age of industrial facilities and equipment was 20 years.<sup>96</sup> The replacement of these facilities is crucial for the development of Russia's industry and through the introduction of advanced technologies, energy savings could be realised. Moreover, higher energy prices are expected to provide the major stimulus for energy efficiency improvements in the long term. Therefore, by 2030 industrial energy demand is expected to reach only to a similar level in 1992 despite the substantial increase in industrial activities.

Over the outlook period, a significant change in the fuel mix is expected. Natural gas is projected to represent the highest growth of 2.4 percent per year, and will account for 34 percent of industrial energy demand in 2030. In addition, oil and electricity are projected to grow robustly at 2.2 percent and 2.1 percent per year, respectively. The increasing share of gas, electricity and oil in industrial energy demand is as a result of manufacturer's increasing on-site heat generation. Demand for refinery gas as a feedstock for ethylene is projected to grow at 4.2 percent per year reflecting the rapid growth of ethylene production of 4.5 percent per year.

### Transport

Russia's transport energy consumption has been declining from 1992 to 2002 at an annual rate of 3.7 percent. Economic downturn has reduced the volume of passenger travel by about 30 percent and freight traffic by about 20 percent. Lack of modern transportation infrastructure, including highways and ports, has been the bottleneck for inter-city passenger travel and logistics activities.

With the projected economic growth and subsequent increases in energy demand of 1.3 percent per year, substantial increase in passenger travel and freight traffic are expected; driving further growth in transport energy demand. Rising income and development of vehicle manufacturing industries will gradually increase passenger vehicle ownership from around 148 per 1,000 populations in 2002 to about 450 per 1,000 populations in 2030.

Energy demand in road transport will maintain the largest share at around 70 percent, and is expected to grow at an annual rate of 3.0 percent over the outlook period. In urban areas, the improvement in living standards and increased

<sup>96</sup> GKS (2004)

vehicle production will facilitate the shift from public transportation systems to passenger vehicle utilisation for commuting, thereby resulting in a two-fold increase in gasoline demand. Economic recovery will increase the distance of freight movement. With the expected increase in road freight traffic, the government is planning to upgrade the existing highway networks and developing new ones. Over the outlook period, trucks are expected to replace a substantial portion of rail for freight movement as export of manufactured products to neighbouring European countries continues to grow in the future.

With the steady growth of all transport sub-sectors, per capita transportation energy demand will grow from 0.37 toe in 2002 to 0.63 toe in 2030.

### Residential and Commercial

Energy consumption in the residential and commercial sectors in 2002 accounted for 33 percent of total final energy consumption, half of which was heat. However, the energy efficiency of heat generation is low. The government planned to improve the efficiency of heat generators, district-heating systems, and the insulation of apartment and office buildings. A structure shift in design and type of construction for buildings is expected over the outlook period; meaning more energy-efficient apartment and office buildings. The synergistic effect of the government's energy efficiency programs and decline in population will result in limited energy demand growth, mainly driven by the additional space heating and lighting requirement for new buildings, particularly in the residential sector.

Russia's residential energy demand is expected to grow slowly at 0.1 percent per year over the outlook period. The negligible growth in total residential energy demand would result from the decrease in both centralised heat and coal for small boilers, being compensated by the increase in more efficient natural gas, electricity and petroleum products. With energy efficiency improvements in housing, demand for heat energy is projected to decline by 0.6 percent annually, with the share in total residential energy demand declining to 41 percent in 2030 from 50 percent in 2002. Natural gas is projected to maintain the second largest share in total residential energy demand, accounting for 38 percent in 2030. By replacing coal by natural gas, natural gas demand is expected to grow at 0.8 percent per year, which is faster than the historical growth of 0.4 percent between 1992 and 2002. Consistent with income growth and improving living standards, electricity is expected to grow at 1.0 percent per year throughout the outlook period and

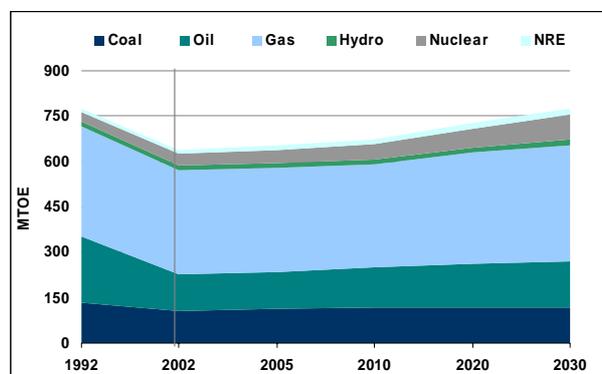
the share will increase to 12 percent in 2030 from 9 percent in 2002.

With efficiency gains, energy demand in the commercial sector is projected to decline at an average annual rate of 0.3 percent. The decline is mainly due to the decrease in heat demand, the share of which is expected to decrease from 52 percent in 2002 to 26 percent in 2030 in total commercial energy demand. Heat demand is projected to decline at an annual rate of 2.7 percent. Consistent with the value added for services industry growth, electricity demand is expected to grow at 2.2 percent per year over the outlook period. Consequently the share of electricity is projected to increase from 29 percent in 2002 to 57 percent in 2030, accounting for the largest share of total commercial energy demand. By fuel type, natural gas demand is projected to decline at 0.8 percent per year, slower compared with the 11.4 percent annual decline observed between 1992 and 2002. As a result, natural gas is expected to meet 10 percent of total commercial energy demand in 2030, compared with 12 percent in 2002. LPG is projected to continue to replace coal and compete with natural gas in the commercial sector. Subsequently, LPG demand is projected to grow slowly at 0.1 percent annually and account for a 5 percent share of total commercial demand in 2030.

### PRIMARY ENERGY DEMAND

The projected decoupling of economic growth and energy demand will result in modest annual growth in total primary energy demand of 0.7 percent, reaching 769 Mtoe in 2030. Nuclear is expected to grow the fastest at 2.8 percent per year, followed by renewables at 1.8 percent per year. Coal and natural gas are both expected to grow slowly at 0.4 percent per year.

Figure 94 Primary Energy Demand



Source: APERC Analysis (2006)

The high growth in nuclear energy is a result of the proposed policy to accelerate the build up of the nuclear industry, which includes the construction of

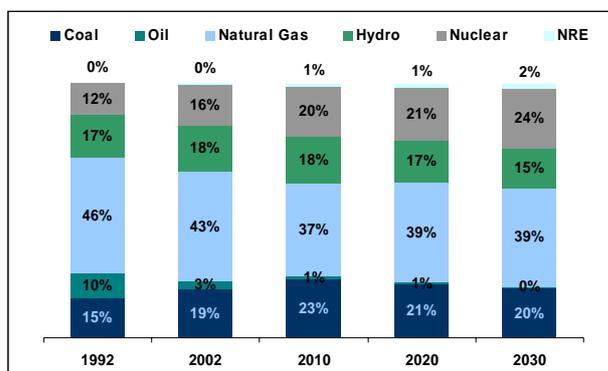
new generation reactors and the utilisation of closed nuclear fuel cycle. The unfavourable distribution of vast untapped hydro resources in East Siberia and the Russian Far East to electricity load centres in the European part of the economy will result in a relatively low 0.7 percent growth for hydro energy development. Although starting from a low base renewable energy will grow and account for the second highest average annual growth rate compared with other fuels, due to rapid development of biomass for heat generation, small hydro and wind energy for electricity generation.

Oil demand will increase at 0.8 percent per year over the outlook period driven by the high growth in demand for motor fuels and rapid industrial development, although its share in electricity and heat generation will decline. The increasing demand for natural gas and coal is mainly for electricity generation.

**ELECTRICITY**

Electricity demand is projected to grow at 1.9 percent, requiring the economy to increase installed generation capacity from 223 GW in 2002 to 352 GW by 2030. Natural gas would be the main input fuel for electricity generation with a share of 39 percent, followed by nuclear (24 percent), coal (20 percent), and hydro (15 percent). Electricity generation from renewables is expected to increase robustly at an average annual growth rate of 7.4 percent for the next 28 years; despite the share in electricity generation would remain relatively small at 2 percent in 2030. Oil will be the major fuel for remote on-site electricity generation in isolated areas, in particular for northern regions and the Russian Far East.

*Figure 95 Electricity Generation Mix*



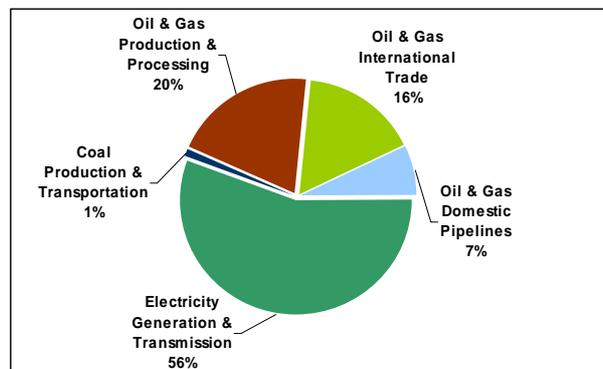
Source: APERC Analysis (2006)

**INVESTMENT REQUIREMENTS**

Total investment required over the outlook period is estimated between US\$709-923 billion. Of

this, expansion of electricity generation capacity and transmission would require investments of US\$405-513 billion. In addition, between US\$295-401 billion will be needed for oil and natural gas exploration, production and infrastructure development through 2030.

*Figure 96 Investment Requirements*

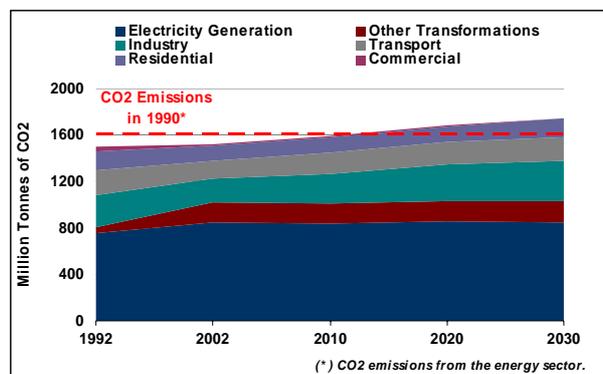


Source: APERC Analysis (2006)

**CO<sub>2</sub> EMISSIONS**

Over the outlook period Russia’s total CO<sub>2</sub> emissions from the energy sector are projected to reach 1,749 million tonnes of CO<sub>2</sub>, which is 9 percent higher than the 1990 level. The CO<sub>2</sub> emissions from the electricity sector are projected to contribute 48 percent of the total emissions or 843 million tonnes of CO<sub>2</sub>.

*Figure 97 CO<sub>2</sub> Emissions by Sector*



Source: APERC Analysis (2006)<sup>97</sup>

**MAJOR ISSUES**

**REDUCTION OF ENERGY INTENSITY**

Russia is the world’s third largest energy consumer, due partly to the antiquated and

<sup>97</sup> In the case of Russia, the historical IEA data from 1992 to 2002 combines the CO<sub>2</sub> emissions from electricity and heat generation into one sector. However, the outlook has disaggregated these into two sectors, namely; electricity generation and other transformations, which explains the sharp increase in other transformations sector.

technologically obsolete industrial and energy supply infrastructure. Over the last decade, few investments have been made to improve the economy's industries, which has given rise to Russia's industrial energy intensity increasing from 352 toe per US\$ million in 1992 to 381 toe per US\$ million in 2002, which corresponds to an annual growth rate of 0.8 percent. In addition, over the same period, electricity and heat supply systems have not been upgraded and are in critical need of modernization. Areas for modernization include refurbishment of electricity/heat generation facilities to improve energy efficiency, retrofitting of existing gas-fired power plants with combined-cycle gas turbine technology, implementation of clean coal technologies, and replacement of obsolete equipment on transmission networks and district heating systems.

Deregulation of gas prices is another critical issue for energy conservation and economic development. This will improve the economics of energy conservation by removing the energy waste potential partly encouraged by state-controlled low gas prices. Energy intensive industries, electricity generation and heat production have been subsidised by gas producers to the detriment of gas exploration and extraction development. Establishing fair energy pricing practices and eliminating subsidies and cross subsidies are critical for radical energy efficiency improvement and for attracting investments for energy infrastructure rehabilitation and construction.

The current Russian refining industry has the lowest yield of light products among APEC member economies, except for Mexico. Refinery refurbishing is urgent to meet strengthening fuel quality standards in Russia.

#### EXPANSION OF EXPORT FACILITIES AND OUTLETS

Upgrading and construction of advanced oil and natural gas production facilities – for example enhanced oil recovery – and exploration of new frontier areas are necessary to meet domestic demand as well as maintaining and increasing export capacity. Potential frontier areas under consideration are the natural gas fields in the Yamal peninsula, oil and natural gas bearing provinces in East Siberia and offshore areas in the Pacific and Arctic Oceans.

The expansion of export infrastructure and diversification of export destinations could contribute to the security of oil and natural gas markets. More than 90 percent of Russia's oil and gas production is currently exported to European economies. Therefore, the expansion of export infrastructure will

lead to a significant increase in exports to the Asia-Pacific and North America regions.

#### NUCLEAR INDUSTRY DEVELOPMENT

With advanced nuclear technology, Russia has a huge potential for utilisation of nuclear energy. The economy's national energy strategy has included: a) provision for the development of a nuclear fuel cycle that utilizes spent nuclear fuel to generate electricity, to meet the economy's growing electricity demand, and b) the export of nuclear-based technologies and associated services. However, nuclear electricity generation is likely to encounter challenges pertaining to public acceptance and international nuclear safety concerns, among others, just as in other economies.

#### IMPLICATIONS

In order to meet the growing domestic demand and maintain its position as the world number one energy exporter, Russia has to invest heavily in oil and gas exploration and development in new frontier areas.

The favourable combination of vast energy resources and access to the world's main energy markets provide a perfect opportunity for domestic and international businesses to invest in Russia, but a large amount of investment capital is required over the outlook period. Therefore, in order for these investments to be realised, it is critical that the government and the business sector ensure that funds are properly managed through amendment of the economy's laws and regulations.

Stable laws, tax codes and regulatory frameworks would help modernise Russia's energy industry and by facilitating smooth inflow of investment capital into the economy.

#### REFERENCES

- BP (2005). *BP Statistical Review of World Energy*.
- EDMC (2004). *APEC Energy Database*. Energy Data and Modelling Center, Institute of Energy Economics, Japan. Website: [www.ieej.or.jp/apec](http://www.ieej.or.jp/apec).
- EEE (2002). *Energy-efficient Economy up to Year 2010*. Website: [www.mte.gov.ru/docs/23/614.html](http://www.mte.gov.ru/docs/23/614.html).
- ES (2003). *Energy Strategy of Russia up to 2020*.
- US Energy Information Administration. (2006). *Russia: Country Analysis Briefs*. Washington DC. Website: [www.eia.doe.gov/emeu/cbas/russia.html](http://www.eia.doe.gov/emeu/cbas/russia.html).
- Federal State Statistics Service. (2004). Website: [www.gks.ru](http://www.gks.ru). (*in Russian*)

- Federal Nuclear Energy Agency. (2001). *SNF –Fuel for Future*. Website: [www.old.minatom.ru](http://www.old.minatom.ru).
- GOSSTROY (2003). *The Strategy of Development of a Construction Complex of the Russian Federation on Prospect till 2010*. Moscow. Website: [www.gosstroy.gov.ru/txt/str\\_pol\\_3.doc](http://www.gosstroy.gov.ru/txt/str_pol_3.doc).
- IEA (2002). *Russia Energy Survey, 2002*. Paris.
- IEA (2004). *Coming in from the Cold: Improving District Heating Policy in Transition Economies*. Paris
- Mastepanov, A.M. (2000, 2004). "Fuel and Energy in Russia." Handbook for Energy Complex Specialist. Ministry of Energy of the Russian Federation. Moscow.
- Ministry of Fuel and Energy of Russia (2003). *Basic Provisions of Russian Energy Strategy for the Period up to 2020*. Moscow. (in Russian)
- OECD (2002). "Russian Federation." OECD Economic Surveys 2001-2002. Paris.
- Transneft (2004). *East Siberia - the Pacific Ocean Pipeline Project*. Website: [www.transneft.ru](http://www.transneft.ru)
- The Central Dispatching Management of Federal Energy Commission (2006). Website: [www.riatec.ru](http://www.riatec.ru)
- Voropai N.N. (2004a). *Energy in the 21<sup>st</sup> Century: Conditions, Technology and Outlook, Volume I and II*. Energy System Institute. Nauka. Novosibirsk.