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Analysis

Energy Efficiency and Development of Renewables: Russia's Approach

By Vyacheslav Kulagin, Moscow

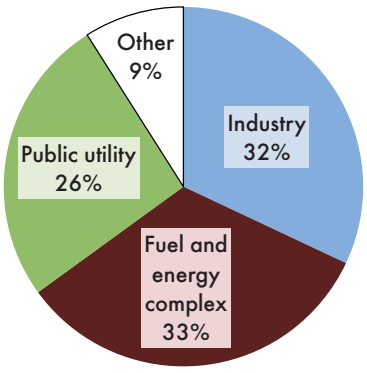
Abstract

Russia is not only one of the leading exporters of energy, but also a major consumer. Since energy has been relatively cheap in Russia, industry and households engage in extremely wasteful practices. Plans are underway to raise domestic prices for natural gas and electricity and bring them up to European standards. Hopefully, realistic prices will push the country toward a more efficient use of energy. The threat of global warming does not drive Russian policies. Rather, the main impetus for enhancing energy efficiency is to meet rising energy demands at home and maintain, or even increase, export volumes. This article provides an overview of the challenges and problems involved in increasing energy efficiency levels in Russia, and also analyzes Russia's potential to use renewable energies. The main problem is that Russia pays considerably less attention to energy efficiency and the development of renewables than Europe or the USA. This neglect arises from Russia's massive fossil fuel reserves, which provide little stimuli for an urgent development of alternative sources and the implementation of energy efficiency measures.

Energy Efficiency in Russia

Like many European countries, Russia considers increased energy efficiency, and consequently access to new energy-saving techniques, materials and equipment, a key element of a sustainable energy future. The potential of Russia's economy to save energy is huge. According to Russia's Energy Strategy to 2020 (approved by the Russian government in August 2003), the country has a potential to save some 360–430 million tons of oil equivalent (toe), which equals 39–47 percent of current annual energy consumption (see Figure 1).

Figure 1: Energy Saving Potential According to Russia's Energy Strategy to 2020



Source: Ministry of Industry and Trade of the Russian Federation

The Energy Strategy lists increasing energy efficiency as a key activity for the entire governmental economic policy and one of the main strategic targets. According to the Strategy, efficiency should be part of a broad range of governmental energy policies, including the rational use of subsoil resources, the development of domestic energy markets, and improved regional and external energy policies. The liberalization of the domestic energy market, which the Strategy specifies in detail, should provide the basis for improvements in energy efficiency in Russia.

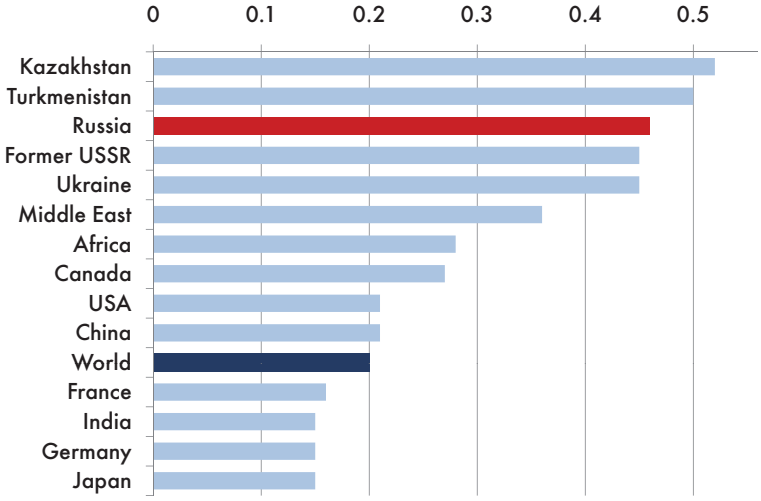
Another important element mentioned in the Energy Strategy is the development of renewable sources of energy. In April 2007, then-President Vladimir Putin in his address to the Federal Assembly highlighted that it is of great importance to elaborate and implement programs aimed at solving the task of improving the renewable sector of Russia's energy potential. In December 2007, then-Prime Minister Viktor Zubkov called 2008 the year of energy efficiency and innovations.

It is significant that more and more companies are creating sections within their enterprises which are exclusively dealing with the issue of enhancing energy efficiency. The major players in the efficiency business on the governmental level are the Ministry of Industry and Energy and the Ministry of Economic Development and Trade. At the subnational level, regional or local governments are taking the lead on these issues.

Russian GDP Energy Intensity

Currently, Russia is among the least effective countries in using energy resources. Russia needs 2.3 times more energy to produce one unit of GDP than the world average (see Figure 2 overleaf). According to Russian government evaluations, one-third of Russian fuel-energy resources are lost or consumed inefficiently. The main reasons for such wasteful consumption are:

Figure 2: GDP Intensity in Various Countries, 2006 (tons of oil equivalent/$ thousand in 2000 ppp)

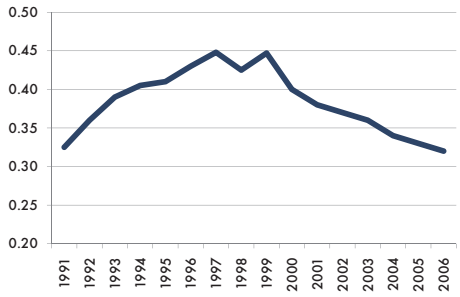


Source: IEA Key World Energy Statistics 2008

- low prices for energy resources;
- environmental and climatic conditions, particularly the low average annual temperature;
- economic structure, in which most of the economy is made up of energy-intensive operations (over 60 percent of industry), while only a relatively small share of GDP comes from the service sector, which has low energy intensity;
- outdated power technology equipment.

Russian GDP is also very gas-intensive, and low gas prices stimulate growing consumption. The efficiency of gas power units in Russia is 33 percent, while in Europe this figure is above 55 percent. In 1980–2003 gas consumption substantially grew in the public utility sector (this sector's share in gas consumption increased from 7.9 percent in 1980 to 14 percent in 2003). Though after the peak in 1996–98, gas intensity began to go down, data from the Energy Research Institute of the Russian Academy of Sciences (ERI RAS) indicate that Russian levels are still several times higher than average global indicators (see Figure 3).

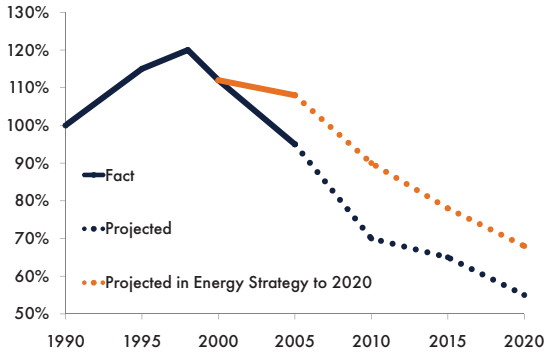
Figure 3: GDP Gas Intensity Evolution in Russia (cub. m/$)



Source: Energy Research Institute of the Russian Academy of Sciences (ERI RAS)

Reducing energy intensity in the economy has been even more rapid in recent years than specified in the current Energy Strategy. Particularly, in 2000–06 the specific GDP energy intensity went down by 23.3 percent, according to Russian government estimates (see Figure 4). Yet this decrease in the total energy intensity of the Russian GDP was caused not so much because of specific measures undertaken by the authorities, but because of changes in the Russian economic structure, which increasingly favors less energy-intensive sectors. We may expect a further decrease within the next 2–3 years, when new pricing mechanisms, the creation of a more competitive situation on the domestic energy market, and new public-private partnership mechanisms begin to function.

Figure 4: Change in Russian GDP Energy Intensity



Source: Ministry of Industry and Energy, IEA.

Russia's Energy Saving Potential

Of Russia's estimated energy saving potential (360–430 million toe), the Russian Energy Strategy to 2020 calculates that approximately 20 percent can be implemented at the relatively low cost of USD20 per ton of standard coal. The most expensive measures (at a cost exceeding USD50 dollars per ton of standard coal) comprise about 15 percent of energy-saving potential. Measures costing between 20 and 50 dollars per ton of standard coal, comprise the remaining two-thirds of the energy-saving potential and require considerable investment. The Strategy estimates that by 2020, the approximate levels of energy saving investment requirements in Russia will reach USD50–70 billion. According to the Minister of Industry and Energy Viktor Khristenko, plans are currently being elaborated which would make it possible to save 100 million toe annually by 2015.

ERI RAS estimates that about one third of all saving potential is with the fuel and energy complex, another third is concentrated in other industries and the construction sector, more than one quarter in the public

utility sector, 6–7 percent in transportation, and 3 percent in agriculture (see Table 1 below).

According to Russian government estimates, the total amount necessary to finance energy saving measures up to 2015 will comprise about RUR70 billion (USD2.86 billion), including 26.4 billion (USD1.08 billion) from the federal budget, 21.1 billion (USD0.86 billion) from regional budgets, and 22.5 billion (USD0.92 billion) from off-budget sources.

Certainly the government cannot provide enough money to meet the total investment requirements. That is why businesses interested in minimizing energy costs must provide the main contribution toward increasing energy efficiency.

Public Utilities and Heat Saving

Decades of low energy prices caused public utilities and consumers to waste generated heat. Most Russian cities and settlements are heated by centralized heat supply systems, which consist of a heat source (CHP station or boiler house), heat supply networks, and consumers.

Russia has almost three billion square meters of housing. The heat losses which occur through windows by themselves are comparable to the entire volume of energy generated by all of Russia's nuclear power plants, according to some estimates. Considerable losses also occur during the generation and transportation of heat.

Heat consumption in Russia equals approximately 1,650 million Gcal/year (236 million toe). One half of this amount is used to provide heat supply for residential buildings. According to the Russian Ministry of Industry and Energy, increased boiler efficiency and a larger share of combined heat and power generation could reduce fuel discharge by 25 percent or 105 million toe. The aggregated heat losses in the networks amount to approximately 450 million Gcal/year (64 million toe). The saving potential through advanced heat insulation, prompt leakage repair, reduced pipelines diameters, and partial decentralization of heat supply to end consumers amounts to 300 million Gcal/year (43 million toe).

Given that Russia lacks the resources to substantially improve the insulation of its buildings to the level of most advanced countries, we may realistically assume that Russia could reduce its total heat consumption using available means by some 550 million Gcal/year (79 million toe). The total size of real savings in heat supply networks and heat consumption may be estimated at 850 million Gcal/year (121 million toe).

The Russian state seeks to provide incentives for public utilities to reduce the amount of energy they waste. The Duma is currently considering the draft law "On Heat Supply," which should establish economic and legal incentives for technical upgrade projects. In July 2007, Russia adopted the Federal Law "On the Basis for Reforming Public Utilities," which provides efficient mechanisms to manage public utility systems and financial support for the implementation of resource-saving technologies. This financial support will benefit both regional and municipal governments.

It is important to note that in the sphere of the public utilities sector, the individual Russian regions adopt their own laws. For instance, for more than ten years Moscow uses a special decree "On Using Polyurethane Foam Insulation for Heat Network Pipelines," which forbids the usage of outdated materials for municipal properties. This decree specifies both administrative and technical activities, ensuring compliance. Due to this decree, hundreds of kilometers of heat supply networks have been built in Moscow using new technology. Beyond Moscow, other large Russian cities (St. Petersburg, Samara, or Ulyanovsk) have sought to implement modern technologies. However, on a national scale, the number of such efforts is modest.

Today, people and enterprises in many regions are taking advantage of heat saving technology on their own in their homes, offices and manufacturing facilities. They are installing multiple-pane windows, heaters with adjustable output levels and constructing modern CHP plants and boiler-houses. Yet, the situation is still far from satisfactory and there need to be greater incentives in order to push consumers

Table 1: Potential of Administrative and Technical Measures of Energy Resources Saving (estimated by ERI RAS by 2000 level)

Industries	Electric power (billion kWh)	Centralized Heat (million Gcal)	Fuel (million toe)	Total	
				million toe	%
Fuel and energy complex	29–35	70–80	99–110	120–135	33–31
Including power generation and heat supply	23–28	67–76	70–77	90–100	25–23
Industry and construction	110–135	150–180	49–63	110–140	31–37
Transportation	7–11	–	22–26	23–30	6–7
Agriculture	4–5	5	9–11	12–15	3
Public utility sector	70–74	125–135	51–60	95–110	27–26
Total	**220–260**	**350–400**	**230–270**	**360–430**	**100**

Source: Energy Research Institute of the Russian Academy of Sciences

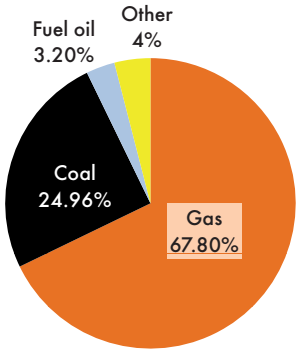
at both the federal and regional levels to implement more radical measures.

Energy Saving in the Gas Industry

Natural gas represents over half of Russia's primary energy consumption. According to BP's 2006 Statistical Review of World Energy, Russia was second only to the USA in gas consumption. Russia used 450 billion cubic meters (bcm) or 15 percent of global production, which equals the aggregate consumption of the six largest Western European countries: the UK, Germany, France, Italy, Spain and the Netherlands. Russia's domestic gas market is 2.2 times bigger than its exports to Europe and the CIS.

Gas is also the main source of electricity generation in Russia – about 68 percent (see Figure 5). Gas began to dominate electric power generation in the 1980s, when the USSR leadership decided to temporarily replace coal with gas, allowing time for domestic engineers to prepare new, safe coal and nuclear energy technologies. This "gas pause" has continued up to the present days and is likely to continue in the future.

Figure 5: Fuel Mix of Operating Power Plants



Source: Energy Research Institute of the Russian Academy of Sciences (ERI RAS)

One company – Gazprom – dominates the gas sector and energy efficiency measures in this area. In 2001, Gazprom adopted an Energy Saving Concept for the period to 2010, which includes measures to increase efficiency at virtually every stage – from gas production, to transportation, storage, processing and distribution.

Gazprom's stated goals with regard to energy savings are: to compensate for the lack of new field production and thus make sure that enough gas will be available for domestic and international costumers, to reduce operational expenses by cutting the amount of energy consumed and thus increase the competitiveness of Russian gas, and finally, to reduce emissions of greenhouse gases and harmful substances into the air.

In compliance with the concept, Gazprom's subsidiaries and organizations carry out ongoing work aimed to reduce their own natural gas consumption and marketable gas losses, and to save energy resources. In 2002–06, according to Gazprom data, gas producing and gas delivering affiliates of Gazprom saved 13.1 bcm of gas, 1.6 billion kilowatt-hours of electric energy and 703.9 thousand Gcal of heat energy due to the implementation of power saving technologies.

The priorities in the company's energy saving program for the period 2007–10 are even more ambitious: Gazprom wants to save 9.2 bcm of gas by 2010 and 1.212 thousand gigacalories of heat energy.

Burning Associated Gas

Gas flaring is yet another big problem and deserves special attention. The Russian Ministry of Natural Resources estimates that 35–40 bcm of associated oil gas is flared every year. According to estimates from the International Energy Agency (IEA) calculated on the basis of satellite pictures, the actual volume might be twice as high.

Associated oil gas (AOG) is a by-product of oil production. It is often simply flared because there is no infrastructure for its collection, transportation and processing. According to the Ministry of Industry and Energy, in 2006 Russia produced 57.9 billion cubic meters of AOG, of which 24.4 percent was flared. Large oil companies produce 83 percent of this gas.

In order to ensure higher utilization of AOG, the Ministry of Natural Resources decreed that oil companies must achieve 95 percent utilization by 2011. Russia's Ministry of Industry and Energy supports similarly strict measures, but has suggested a more realistic timetable. Aleksander Savinov, the head of the regulatory control division within the ministry's oil and gas department, declared that the ministry plans "to achieve an AOG utilization level of at least 85 percent by 2012 and 95 percent by 2015."

Russia's oil companies do not object to these government initiatives. Rosneft, which currently processes only 59 percent of its AOG, will allocate RUR67 billion (about EUR2 billion) within five years to raise the figure to 95 percent. Lukoil is going to invest RUR50 billion (EUR1.43 billion) in utilization through 2016. Lukoil currently estimates its AGO utilization level to be 75 percent. All in all, Russia's oil companies plan to invest some USD6 billion in AOG utilization over the next several years.

In the near future, the set of measures to solve AOG utilization problems may be expanded. One way is to make license agreements only on the provision that companies utilize at least 95 percent of their associated gas. At the same time, sanctions may be applied against subsurface resource users for failing to meet these targets, including the withdrawal of their license.

Some experts believe that 95 percent AOG utilization by 2011–15 in Russia is too ambitious a goal, as it took other countries decades to achieve this performance level. But there is no doubt that it is necessary to move in this direction.

Energy Efficiency in the Electricity Sector

The power sector represents yet another area for massive energy savings. According to ERI RAS estimates of 2000, the Russian energy saving potential may amount to 220–60 billion kWh, i.e. 23–8 percent of current electricity consumption. Energy efficiency increases in the electric power industry are possible at all stages, from power generation to the sale of energy to end-consumers.

Russia must raise prices to encourage electricity savings. Consumer tariffs should reflect the real market values in a specific region. Otherwise, the need for new capacities will snowball. The average sales tariff level in the wholesale market required for the development of new generational capacity amounts to 4.6–5.6 cents/kWh by 2010, and 6.0–6.3 cents/kWh by 2020.

There is a wide range of targeted regional programs for increasing efficiency in the distribution and consumption of electricity. These projects are mainly aimed at the reconstruction of power supply and power networks, and the installation of electricity meters. Increased information about how to save electricity will also play an important role.

Some state entities, such as schools, have replaced inefficient appliances with support from federal and regional authorities. Such upgrades make it possible to reduce power consumption by more than 50 percent. Unfortunately, such programs are sporadic and experimental and do not have a serious impact on the overall situation in the industry.

Renewable Energy Sources

Currently, the share of non-conventional energy sources in Russia's overall energy output (which equals about 991 billion kWh) is less than 1 percent. While Russia is rich in hydrocarbons, there are certain parts of the country where conditions allow for the relatively easy development of certain renewable energy sources. These are the northern coast regions with big wind energy potential, the southern regions with lots of sunshine per hour, and, of course, the regions with numerous rivers, including small ones, providing opportunities for hydropower development.

According to some evaluations, the overall potential of renewable energy sources is about 4.6 billion tons of standard coal a year, which is five times more than the total fuel-energy consumption of Russia. The economically viable potential of renewables has been evaluated at 270 million tons of standard coal a year, which is a little more than 25 percent of Russia's annual consumption.

There are already companies in Russia that deal with wind energy, yet Russia has few large wind power systems at present. Peat and firewood are the traditional renewable energy sources in Russia, which are also most common and available to people. The Energy Strategy estimates the total peat reserves in Russia at 162.7 billion tons (at 40 percent humidity). The richest regions are the northern areas of the European part of the country, the Urals, Western Siberia and the North-West. Given appropriate conditions, peat reserves may be renewable. The annual peat growth rate in Russian marshes is 250 million tons. The peat reserves within the developed fields allow production equivalent to 7 percent of annual coal consumption.

Due to the low labor and energy intensity of peat production, simple transportation routes and small distances of transportation, peat remains competitive in some regions, compared to other imported solid fuels. Moreover, peat features low content of pitch and serum, which produces few harmful emissions during burning. In 2000, Russian power plants used 1.7 million tons of peat.

Firewood is now used by 5 million households, consuming over 50 million cubic meters of timber. Within the framework of centralized sales, fuel-supply enterprises sell about 6 million cubic meters of timber. It is necessary to maintain the existing capacities for firewood preparation and create new ones on the basis of forestry, timber industry and fuel enterprises.

Urban domestic wastes, particularly as a source of biogas, are an important local fuel. Unlike biogas production in agriculture, urban enterprises for solid domestic waste (SDW) utilization possess the necessary financial and technical foundation to equip SDW landfills with equipment to collect and use the biogas.

In mid-October 2007, Tatarstan President Mintimer Shaimiev announced the construction of a biofuel plant – the first of its kind in Russia. The plant will annually process more than 1 million tons of grain. Rye, wheat and corn will be the raw materials for the plant. According to State Duma Speaker Boris Gryzlov, today Russia could use 14 million tons of grain for bioenergy sector development.

The poor legal framework partly explains the slow development of non-conventional energy sources in Russia. However, in 2006 the Ministry of Industry and Energy, together with RAO UES, the electricity monopoly, proposed a draft law "On the Use of Renewable Energy Sources in the Russian Federation." The draft law contains a mechanism for governmental support of development in this important sector. As estimat-

ed by the Ministry of Industry and Energy, if the proposed law is adopted and its programs implemented, the share of renewables in the overall energy balance may reach 3–5 percent as early as 2015, and increase up to 10 percent in 2020.

The most accelerated growth of renewable sources is expected in the field of wind and hydro energy (especially small-sized power plants). The main investors in renewable energy are expected to come from small and medium-sized enterprises, located where connection to public electric networks is either impossible or expensive.

What Stimulates Energy Saving?

While there is growing awareness of the need to promote energy efficiency measures and renewable energy sources, many federal and regional initiatives remain on paper. What will drive improved energy-intensity levels are not administrative and technical measures, but the fact that Russia's economy is in the process of a profound transformation. Such changes are visible in the priority development of less energy-intensive industries (particularly, trading and services) and the accelerated growth of less energy-intensive industrial production.

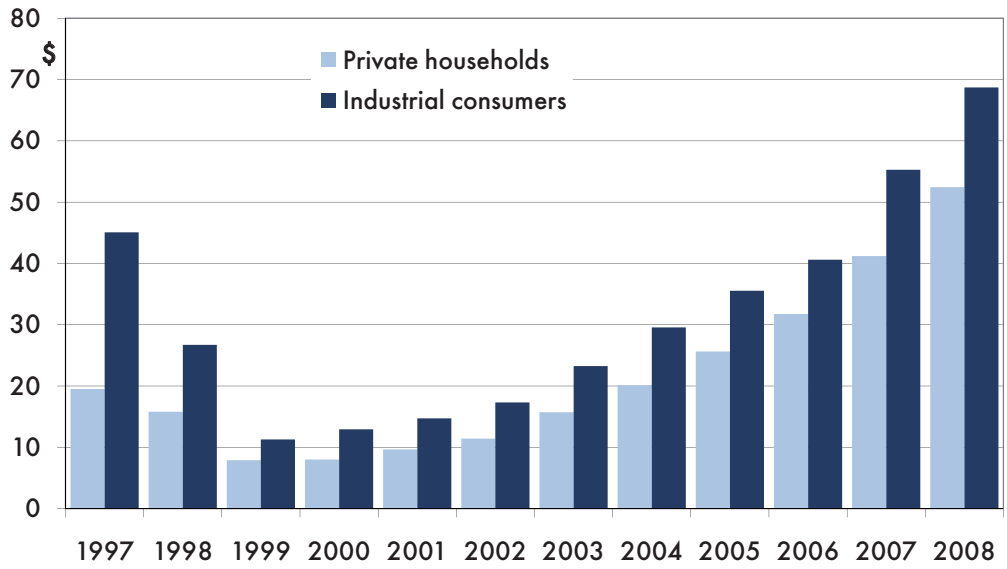
As a result of all energy saving factors, according to Russia's Energy Strategy to 2020, the total GDP energy intensity will go down between 2005 and 2030 by 1.6 times in the moderate and 2 times in the optimistic scenario. The GDP electricity intensity will go down in 2005–20 by 1.4 times in the moderate scenario (slower than the total energy intensity), and by more than 2 times (faster than the total energy intensity) in the optimistic scenario, which can be explained by varying rates of increased electrification.

Higher prices is another incentive for energy savings. In this regard, the decision of the Russian government to increase domestic gas prices is important. The government plans to increase the gas price up to the level where sales to domestic and foreign markets are equally profitable, using long-term five-year contracts with electric power organizations, and resolutions ordering the increase of the electricity share which should be sold at non-regulated prices. The gradual implementation of these measures should be completed by 2015 (see Figure 6).

Another key element is demand management, which is actively used in foreign countries. Its main idea is the creation of economic consumer incentives to reduce energy consumption, particularly at the moments of peak load, thus lowering the need for generating capacities. The most common ways to achieve these goals include installing meters and introducing differentiated tariffs with variable rates for periods of peak and low loads, as well as using interruptible energy supply contracts, which make it possible to lower the load or disconnect consumers during peak hours.

Apart from this, administrative measures, such as regulations for equipment efficiency and building codes, are needed to restrain wasteful consumption. According to estimates by the Ministry of Industry and Energy, the development and introduction of prospec-

Figure 6: Russian Average Regulated Gas Tariffs



Sources: JSC Gazprom, orders of Federal Tariff Service.

tive regulations, standards and procedures in the near future will make it possible to reduce hydrocarbon production losses by 15 percent, while new control and accounting systems will assist energy resource consumption by 10–15 percent.

To stimulate energy savings, a sophisticated governmental policy is needed. The federal five-year program "Energy Efficient Russia" expired in 2006, a new program is now under development. In April 1996, Russia adopted the Federal Law "On Energy Saving" which is currently being revised. There are already 45 regional laws "On Energy Saving," but it is necessary to conduct further work at all levels to increase the energy efficiency of the Russian economy.

Informational support plays an important role in the implementation of energy and gas saving programs. A dearth of reliable, unbiased information prevents people from purchasing energy efficient equipment and applying saving measures.

Currently, the Russian government is elaborating a range of financial incentives (including taxes) to encourage energy saving. This effort is taking into account both international experience and the results of such activities in Russia at the regional level.

Prospects of International Cooperation in Energy Saving

Presently, Russia is actively cooperating on issues related to increasing energy efficiency, both multilaterally (within the EU-Russia energy dialogue, within the G8) and bilaterally. In 2006, a Memorandum of Cooperation in Energy Efficiency was signed between the Ministry of the Economy of the Netherlands and the Ministry of Industry and Energy of the Russian Federation. The Joint Energy Efficiency Working Group of the Russian Ministry of Industry and Energy and the US Department of Energy has been at work for ten years. In 2007, a Russian-German Energy Efficiency Forum took place in Moscow.

Giving special attention to energy efficiency as a critical instrument for reducing the energy intensity of Russia's economy and ensuring energy security, Russia and the EU in 2000 decided to launch a regular "Energy Dialogue." In February 2006, the coordinators of the Energy Dialogue (Russian Minister of Industry and Energy Viktor Khristenko and EU Energy Commissioner Andris Piebalgs) put forward a joint energy efficiency initiative. Specific implementation measures were discussed by Russian and European experts at a seminar in Moscow on October 26, 2006, and at a conference of energy agencies and energy saving centers in Kazan on December 6, 2006.

An important element of joint work with other countries is the implementation of the Kyoto Protocol, which provides Russia with two main sources of investment to be used for energy saving needs. First, these are joint implementation projects, when foreign companies, restricted by emission limits, invest in projects in other countries (with considerably lower costs) and receive, in turn, the rights for increased emissions. The second mechanism is international emission trading. Russia, which currently has a great reserve of such quotas, may transfer them to other countries and obtain funds for the implementation of priority energy-saving programs.

The mechanisms have already begun to be used. In late 2006 Gazprom Marketing & Trading carried out the first transaction in the European CO2 emissions trading market. The deal with Deeside Power Limited involved gas sales and CO2 emission permissions in exchange for electric power.

In 2007, RWE AG (Germany) signed a contract to improve energy efficiency at the Russian electricity company EES Rossii in exchange for access to Russia's emissions trading market. In the near future, Russian and foreign companies may achieve a new level of cooperation concerning projects focused on joint implementation and emissions trading mechanisms. This should be supported by the implementation of cutting-edge energy-saving technologies.

There is no doubt that the growing energy efficiency of the Russian economy will increase the robustness of the global energy system, reduce development risks and make it more sustainable. Russia's growing involvement in international cooperation will promote more effective energy dialogue in the fields of energy resources supply, scientific and technical progress and the environment.

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Analysis

Improving Russian Energy Efficiency: Next Steps

By Andreas Goldthau, Budapest

Abstract

Russia has enormous potential to increase its energy efficiency. It suffers from the lack of modern heating systems in housing, outdated infrastructure and equipment in energy intensive industrial sectors, natural gas leaks from pipelines during transmission and distribution, and oil companies flaring associated gas at their wells. To address these problems, Russia should provide incentives to reduce flaring, increase domestic prices for gas, breakup the Gazprom monopoly on the pipeline system, and improve the legal framework for international cooperation. The EU has only indirect levers on Russian domestic policy, so it should work to convince Russia that reducing domestic demand serves both Russian and European interests, help Russia cash in on its efficiency potential, and sponsor small-scale energy efficiency projects that could encourage additional efforts at the grassroots level.

Russian Economic Growth and Energy Consumption Have Not Decoupled Yet

Following annual GDP growth rates of up to 10 percent since the turn of this century, Russia expects further growth close to two-digit figures in the coming years. Following the typical developmental path of mature, but growing, industrial economies, Russian energy consumption is projected to increase less than its GDP. Despite its current economic expansion, Russian energy intensity is expected to fall significantly, according to the 2003 Russian Energy Strategy, by 26–27 percent per unit of GDP over 2000 levels by 2010, and by around 50 percent by 2020.

While this is good news, a closer look at this trend reveals some less encouraging facts. At present, Russia still uses around 350 kg of oil equivalent per USD100 or 3.2 times more energy per unit of GDP than the EU-25. The figure is even higher in some branches of manufacturing, such as in the chemical/petrochemical and metals sectors. Even if Russia continues to constantly improve its energy consumption to GDP ratio during the upcoming years, its economy will still be considerably more energy intensive than the European average. Especially in gas, Russian consumption is daunting – both in relative and absolute terms. According to IEA estimates, domestic Russian energy demand is projected to grow significantly, from 148 million tons of oil equivalent (mtoe) in 2005 to 187 mtoe in 2030. While the Russian government plans to foster the use of coal more prominently in the country's primary energy mix, projected to rise from today's 20 percent to 22 percent in 2020, natural gas will still carry the burden of providing for more than 46 percent of total Russian energy consumption in 2020.

Renewable energy sources remain negligible. In absolute numbers, this means that domestic annual Russian gas consumption, presently hovering around 430 billion cubic meters (bcm), will reach 499 bcm in 2010 and 512 bcm in 2020 according to the Energy Strategy's "optimistic" scenario. In a "pessimistic" scenario, it is still projected to be 439 bcm in 2010 and 464 bcm in 2020. The IEA forecasts consumption of 516 bcm in 2015 and 586 bcm in 2030, more or less in line with "optimistic" Russian projections.

These figures are worrisome for several reasons. First, in the face of climate change concerns, a high degree of energy efficiency is key for entering the low carbon age. Major industrial nations – Russia is among the top ten – have an important role in taking the leadership on this issue. Second, given the looming tight supply of fossil fuels, energy efficiency in the world's largest producer country is key to securing energy supplies to consumer nations. In fact, the European call on Russian gas is expected to rise significantly during the upcoming decades. According to the IEA, European gas demand will increase from presently 550 billion cubic meters (bcm) to around 780 bcm in 2030. In this light, Gazprom, the state-controlled Russian gas monopolist, has recently signed a number of long-term contracts with its European customers that include substantial increases in exports. Given recent doubts about Gazprom's ability to meet demand and serve its contractual obligations, increasing domestic energy efficiency would translate into greater supply for export markets and thus enhance the energy security of European customers. In all, leveling Russian energy (i.e. mostly gas) consumption would thus both serve climate purposes and increase supply on strained Eurasian gas markets.

Hence, the European Union has a strong interest in addressing this issue.

Reducing Gas Consumption Is Key, and So Is Flaring

Especially in natural gas, which presently makes up for more than half of Russian primary energy consumption, there exists a huge potential to raise the level of energy efficiency. Out of more than 600 billion cubic meters (bcm) of annually produced gas, around 400 bcm are used in domestic households, industry, transport, and heating and power plants. Put differently, Russia, a USD1.4 trillion economy in 2007, consumed 4.5 times as much gas as Germany, a USD3.3 trillion economy at that time. This differential results from a number of reasons, notably the lack of modern heating systems in housing, outdated infrastructure and equipment in energy intensive industrial sectors, and a power sector hobbled by strong Soviet legacies. At least as important, however, are vast volumes of natural gas lost before they even reach consumers or production facilities. These volumes either leak from pipelines during transmission and distribution, are burned in compressor stations, or constitute associated gas, flared by oil companies instead of being fed into the distribution system. According to official Russian figures, 14.9 bcm of gas were flared in 2005; by contrast, IEA estimations suggest that, in 2004, 41 bcm of Russian gas were flared. Combined with additional volumes leaking from pipelines or being burned in compressor stations, the IEA estimates an annual loss of almost 70 bcm – the equivalent of one third of Russian exports. Based on satellite photos, a recent Worldbank study, carried out by the US National Oceanic and Atmospheric Administration, suggested that the actual flaring rate is even higher, amounting to more than 50 bcm, or a third of the world's total. Hence, while increasing the efficiency of Russian energy use as a whole is imperative, these figures reveal that already a reduction of distribution losses and of flared gas could save considerable amounts of gas. According to the IEA, at least 30 bcm could be saved annually by disincentivising flaring and by investing in maintaining and improving transmission and distribution systems.

Solution Lies in (De)Regulation

A first and crucial element in improving Russian energy efficiency lies in a classical textbook recipe: an increase in domestic gas prices. At present, prices are far below levels of Western European consumers, fostering an inefficient use of energy. In 2006, average domestic Russian gas prices were only 17 percent of West European prices, 29 percent when taking into account transit charges. In industry, cheap gas discourages plant owners from investing in energy-efficient machinery; in the housing sector, it prevents investment in modern boilers and heating systems; and in the power sector, it serves as a deterrent to modernizing equipment, preserving a situation in which a majority of Russian electricity is still being produced in Soviet-manufactured, inefficient power plants.

In order to change this situation and to allow market incentives to take over, the present Russian dual pricing system needs to be abolished. Designed to subsidize Russian households and domestic manufacturers, Russian federal law provides that Gazprom has to serve the domestic gas demand, regardless of the market situation. The company has to cover consumption of Russian households and industry at governmentally set prices, which are not adjusted in times of high demand. The Russian government has acknowledged the need for reform in order to achieve the goals set in its Energy Strategy. On November 30, 2006, the Russian Cabinet approved a plan to increase natural gas prices for industry by 15 percent in 2007, and by another 25 percent in the subsequent 3 years. In 2011, the domestic gas market for industrial consumers is supposed to be entirely deregulated, with prices reaching parity with world levels on a net back basis. Yet, while these steps point in the right direction, price increases are to partially exclude the important residential sector, which makes up 12 percent of consumption and constitutes some estimated 30 percent of overall potential in energy efficiency gains. Moreover, the government has recently decided to postpone the initially planned price adjustments, and to cap increases at 40 percent of 2006 levels until 2011. This points to a considerable slowdown of the adjustment process. Finally, for a domestic gas market to fully function, the supply side has to be designed to respond to market signals, too; yet, the Russian gas market remains dominated by a monopoly – Gazprom.

This brings us to the second crucial element in improving Russian energy efficiency: an at least partial deregulation of the Russian gas sector. Besides accounting for around 85 percent of domestic gas production, Gazprom at present also controls the entire pipeline system, which enables the company to restrict third party access to the grid. Since Gazprom prevents other producers from exporting gas, they are left with the less profitable and eventually loss-making domestic market. Consequently, oil producers flare associated gas rather than feeding it into the pipeline system, while independent gas producers have little incentive to invest. First cautious attempts to introduce elements of competition to the Russian gas market, such as the 2006 gas exchange, were doomed to fail due to existing mar-

ket structures. As Gazprom can arbitrarily set prices for the use of its pipeline grid, it was able to give itself an edge in transportation costs while charging prohibitively high transit fees to independent gas producers. Splitting up Gazprom's de facto monopoly on the domestic pipeline infrastructure would create incentives for oil producers to feed gas into the system rather than flare it, and foster investment in maintenance and the system's overall efficiency.

A third element consists in providing an adequate domestic legal framework for international cooperation, such as the Joint Implementation (JI) mechanism under the Kyoto Protocol. Designed to reduce greenhouse gas emissions (GHG), JI enables countries and organizations to clear emission reduction credits with own, domestic commitments, and thus incentivizes investments in emission reductions abroad. In particular, the JI scheme fosters investment in climate protection measures where this goal can be achieved at most favorable costs. As the IEA has noted, Russia, and particularly its energy sector, is a highly interesting target for emission reductions under this scheme. As Russia's energy use per GDP ratio is still relatively high, energy efficiency projects are more cost-effective here than in, say, western European economies. With an adequate regulatory framework in place, foreign investment would presumably soar, providing the necessary capital for energy efficiency enhancing projects. Such a win-win situation is however hampered by lagging legal procedures and a general lack of interest on the part of the Russian administration. While the legal basis for JI projects was created in May 2007, there still exist several regulatory hurdles before the mechanism can start working. Most importantly, however, due to a sharp decline in industrial output and hence greenhouse gas emissions during the 1990s, Russia will reach its emissions reductions target, as laid down in the Kyoto Protocol, without any additional measures. Hence, it does not have a strong interest in adopting additional policies targeting GHG emissions and energy efficiency. Finally, given Russia's present growth rates and their potential to lift living standards close to Western levels, the Kremlin will show little inclination to trade domestic economic development against long term global climate goals. As a consequence, Russia has already indicated that it will not support a cap on the use of fossil fuels as part of a Post-Kyoto deal, a policy which will also directly affect efforts to enhance energy efficiency levels.

Where Can the EU Play a Role?

The European Union, committed both to reducing GHG emissions and to rendering future gas supplies more secure, has shown great interest in improving Russia's energy efficiency levels. Yet, the main existing frameworks to address this issue have proven to be too weak to create clear commitments and yield results. The EU-Russian Partnership and Cooperation Agreement (PCA) provides that "cooperation [in the energy sector] shall take place within the principles of the market economy and the European Energy Charter […, promoting] energy saving and energy efficiency"; yet, given the PCA's non-binding character, little has been achieved in terms of concrete measures. Talks on a new PCA, to be started soon, will prominently feature energy issues; there is however reason for great doubt that Russia will subscribe to provisions limiting its *marge de manouvre* in the field of energy, both domestically and abroad. The EU-Russian Energy Dialogue, basically a forum of mutual exchange, entails a number of small scale assistance projects, financed through the EU-Russia Cooperation Program, that aim at improving energy efficiency levels and providing for a necessary harmonization of standards. Projects include energy efficiency measures in Arkhangelsk, Astrakhan and Kaliningrad, harmonization of technical standards in the gas sectors, and an EU-Russia Energy Technology Centre. While these are important steps, they remain small scale and are a fraction of what would be needed to stimulate real impact.

Hence, since existing instruments such as the Dialogue provide no direct lever, the EU has only indirect means to influence changes in domestic Russian policies. One would be to convince Russian partners of an obvious win-win situation: slowing down rising domestic gas demand through enhanced energy efficiency programs and more market-based gas pricing would both serve the goal of fostering climate protection policies as it would free supply potentials for exports and enhance European energy security. Especially when bearing in mind that Gazprom recently had to accept a significant increase in the prices it pays for Central Asian gas – mainly needed for the domestic Russian market – the economic argument may bear fruit.

Second, the EU should encourage Russia to cash in on its great energy efficiency potential. Germany' Dresdner Kleinwort Wasserstein and Russia's Gazprombank have recently set up a joint emission trading venture to tap the expanding market for GHG securities. US investment house Merrill Lynch has also entered the Russian carbon trading business in a USD200 million deal. These figures and activities suggest that the Russian GHG/carbon/energy saving credits market is believed to entail great prospects. In order to take full advantage of this potential, several regulatory steps need to be taken by Russian authorities, including the establishment of a national emissions trading scheme (ETS). The EU should assist in the process of taking these steps

and provide technical assistance in adopting the necessary measures.

Finally, the EU should continue to foster small-scale energy efficiency projects. While these will not entail great impact in total volumes, they may contribute to changing minds and attitudes, and support energy efficiency improvements at the grassroots level.

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Commentary

European Practices Offer a Good Model for Russia

By Peter Richards, Vienna

Eco-cities are mushrooming all over the world. China has a few in the pipeline. Several European towns are aiming for zero carbon emissions. California has huge solar projects and even oil-rich Abu Dhabi is investing in a carbon-neutral city, Masdar. Of the major world economies, Russia is one of the last to embrace renewables or efficient energy.

That is a pity, because its titanic stature in fossil fuel production could easily be matched in clean energy. Yet Russia is, according to Torsten Woellert, energy policy officer with the European Commission's Moscow delegation, wasting more energy flaring gas than it exports to Germany in any given year. The flares, burning millions of cubic meters of gas from oil wells instead of making use of it, are visible to any airline passenger flying over the country at night.

The dilapidated state of many Russian housing estates, a hangover from the Soviet Union days, is also responsible for enormous energy wastage in a country which has been renationalising its energy companies. The result is that energy is supplied by large energy companies having trouble keeping up with growing domestic energy demand but that are, at the same time, slow to cut back on waste. Meanwhile, the vast resources of the nation's forests as a source of biomass fuel remain untapped. Only Ukraine is performing worse, says Woellert.

True, there are some exceptions. Innovative projects include an energy-saving street lighting project in Arkhangelsk, a biomass power plant in Novgorod, a wind farm in Kaliningrad and a Renewable Energy and Energy Efficiency Partnership (REEEP) project to improve energy efficiency of buildings via building codes. The International Energy Agency (IEA) notes that Russia does take advantage of some well-established renewable technologies, producing 174,600 Gwh of hydropower and 410 Gwh of geothermal power in 2005. However, Russia only managed 7 Gwh of wind power and no solar PV electricity in the same year. By comparison, Germany produced 27,229 Gwh of wind, 1,282 Gwh of solar PV and 26,717 Gwh of hydropower that year.

Russia's weak track record, particularly in energy conservation, has prompted a series of meetings with its European neighbors. The talks began back in 2001, not long after Vladimir Putin took over as president. The dialogue, officially backed by top Russian politicians, aims to improve investment in clean and efficient energy, help the markets to open up and decrease negative environmental impacts. From 2008, the dialogue has converged on climate change and efficient energy, facilitated by an international energy consortium, the REEEP, and other stakeholders.

One of the goals from the European side is to help Russia develop policies that work. "The new Russian renewable energy law, which is more of an amendment to an existing power law, is somewhat decorative legislation that needs additional development," states Svetlana

Frenova, of the Russian Regional Environmental Centre (RREC), which is working with the parties concerned. Market rules still need to be established. Little guidance has been developed on how the market is structured, how to sell, or who can set the pricing.

Unlike many European countries, the central government has not put in place any feed-in tariffs for alternative sources of energy (preferential tariffs for energy produced by renewables that are higher than the price paid to energy produced by fossil fuels) or other support mechanisms or incentives. By contrast, many countries in Central Europe, such as Poland and the Czech Republic, have more advanced laws that are attracting investors into renewable energy.

Thus Europeans are confident they have something to offer Russia. It could benefit, they argue, from adopting its own version of successful European policies. In Europe, refrigerator and other electrical appliance energy labeling has worked well, and the most inefficient appliances have now been taken off the market. The European Union's buildings directive, setting energy efficiency standards, is also a model the Russians could use, they argue.

Russia, on the other hand, has not yet had the time to devise smart policies and they are still a low priority. "They are just not thinking about it, since the government is busy overcoming problems to increase energy production. But less energy consumption could be a relief as they cannot cope with consumption increases," asserts Woellert. These problems led, for example, to planned Moscow blackouts in 2006 to enable key services to get the power they needed.

Europe is still learning how best to incentivize and support renewable energy and energy efficiency. It is open to sharing experiences and providing support to Russia. This is in part due to energy security concerns as by lowering total consumption, there is more fuel for all. European dependency on Russian gas and oil has been well documented; it is Russia's major customer. Woellert contends that Russian energy efficiency is a key concern for Europe, since it has such major energy security implications. That, as well as climate change, is why the delegation is working on the case. And European countries buying fuel from Russia are, after all, a major source of revenue.

Some progress has been made. RAO UES, the state electricity supplier, has developed a program for renewable energy support and is going to produce about 20,000 MWt of power from renewables by 2020 (4.5 percent of power supply).

But, as with other countries, energy conservation is a headache. Russia will have to approach this particularly complex problem from all sides.

"It's a strategic issue that demands the decentralization and liberalization of the energy sector, so that more competition is allowed in," asserts Mikhail Kozeltsev, head of the RREC. Europe could offer some expertise in this area given its long struggle for liberalization. But, as in Europe, many of the stakeholders are not working together. Most energy conservation campaigning originates in local councils considering housing issues, while the utilities are centralized and not built to accept smaller, alternative supplies. At the same time, big industries, such as cement, need to cut back. Policies are implemented top down in Russia, but demand management is a bottom-up issue. The conflicts are considerable.

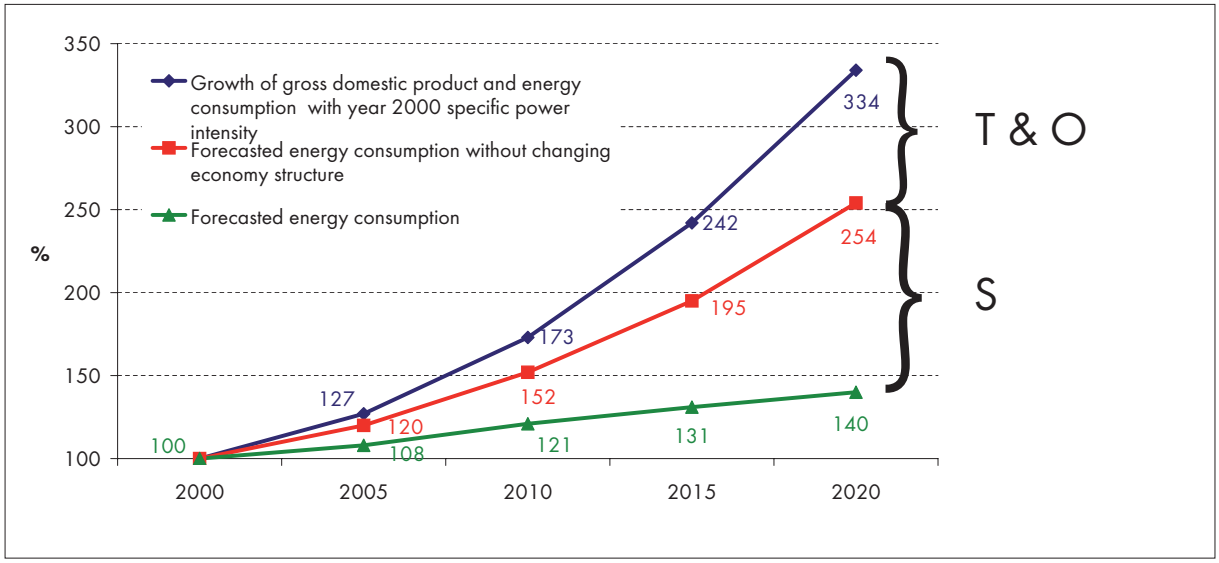
Yet new tools have been put in place in 2007. The Joint Implementation (JI) agreements under the Kyoto Protocol, in which the Europeans were heavily involved, are a lever they can now use to assist Russia, too. Russia has established a limit for greenhouse gas emissions reduction and/or their absorption that can be negotiated through JI projects in 2008–12 (300 million t of CO_2-equivalent per year). Several manufacturing, housing and energy sector projects are due to come through. However, approvals have been delayed.

About the author
Peter Richards is Communications Director at the Renewable Energy and Energy Efficiency Partnership (REEEP) in Vienna.

Statistics

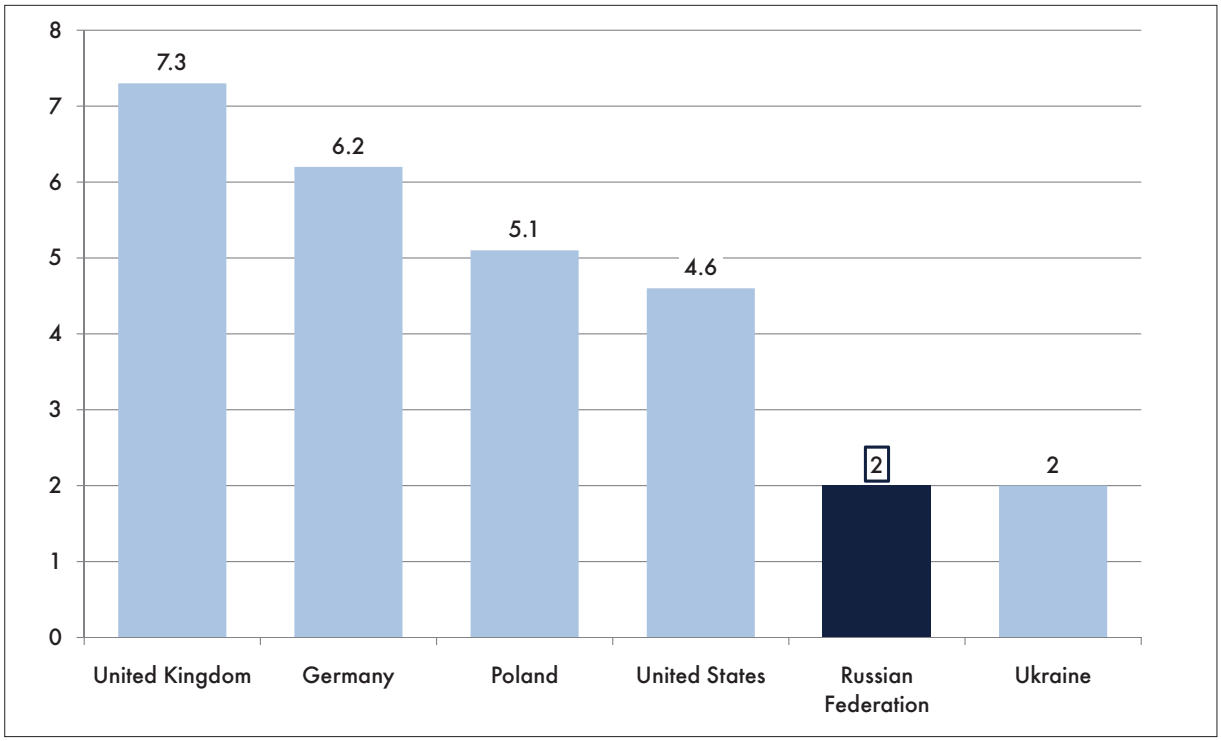
Energy Use and CO2 Emissions. Russia in International Comparison

Figure 1. Forecast of Increase in Russian Energy Consumption, 2000–2020



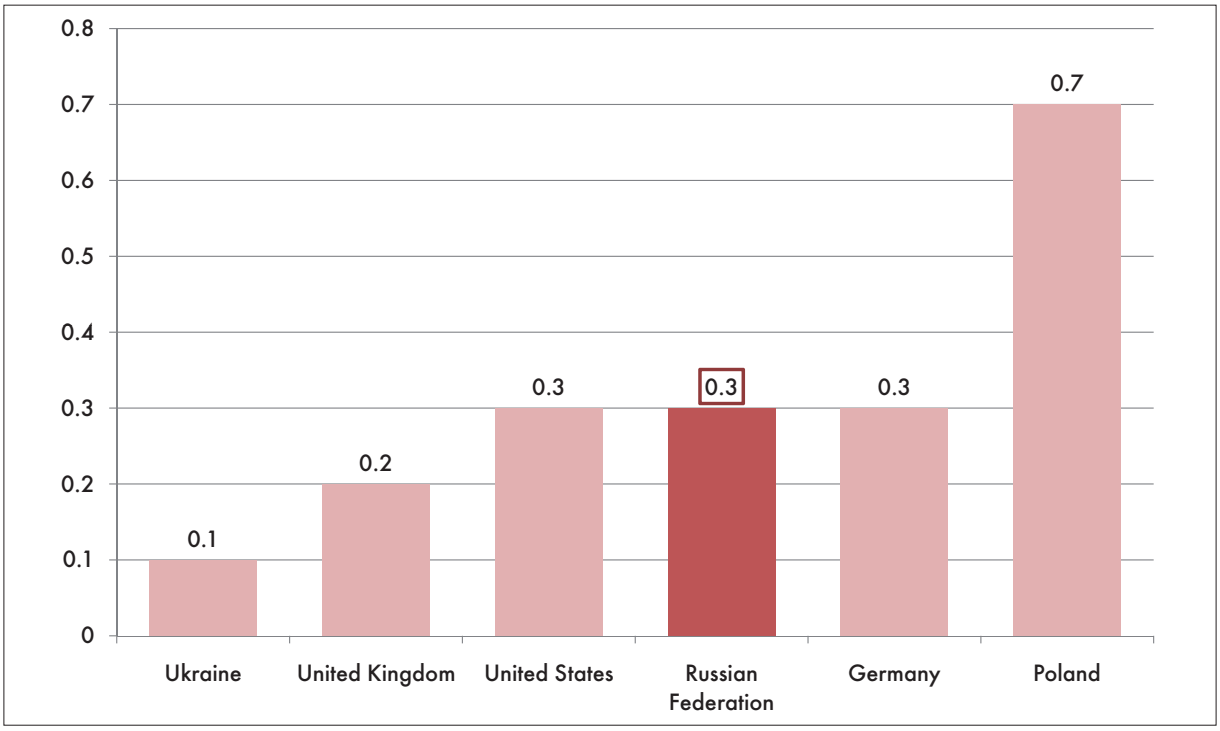
Source: Energy Strategy of Russia until 2020

Figure 2: GDP per Unit of Energy Use (2000 PPP US$ per kg of Oil Equivalent)



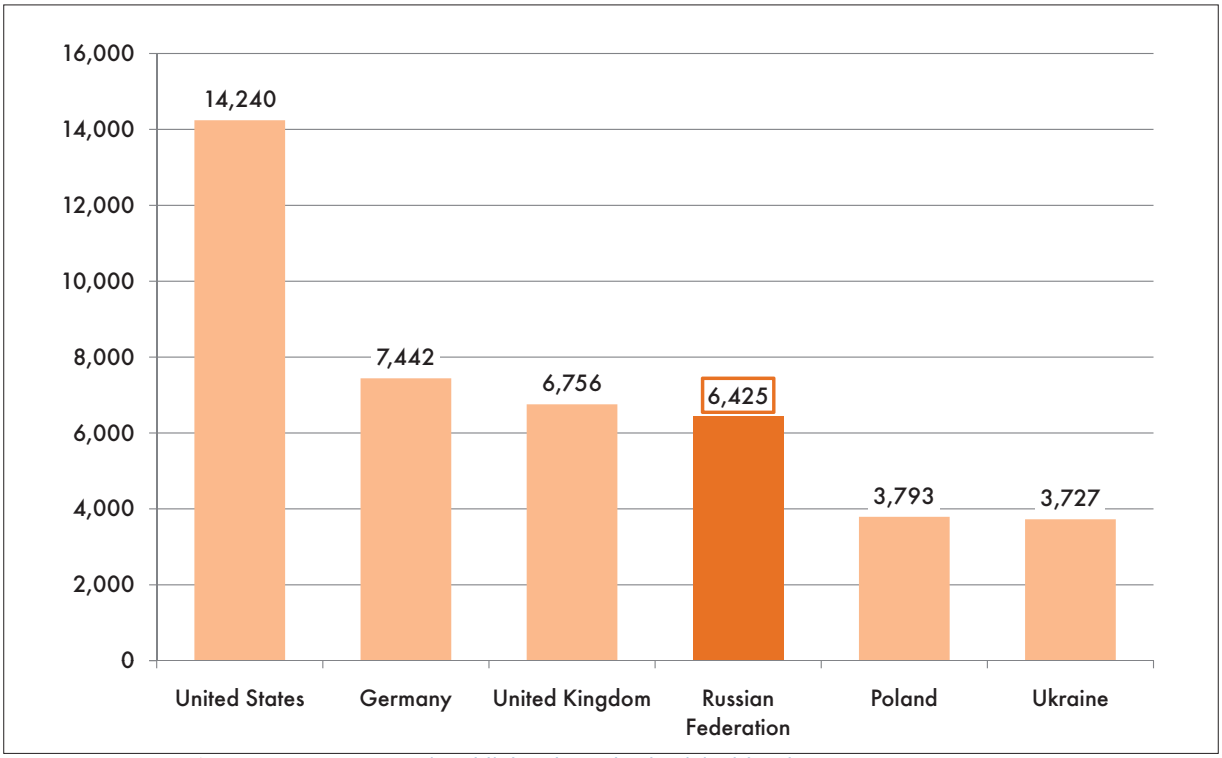
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 3: GDP per Unit of Energy Use (% Change 1990–2004)



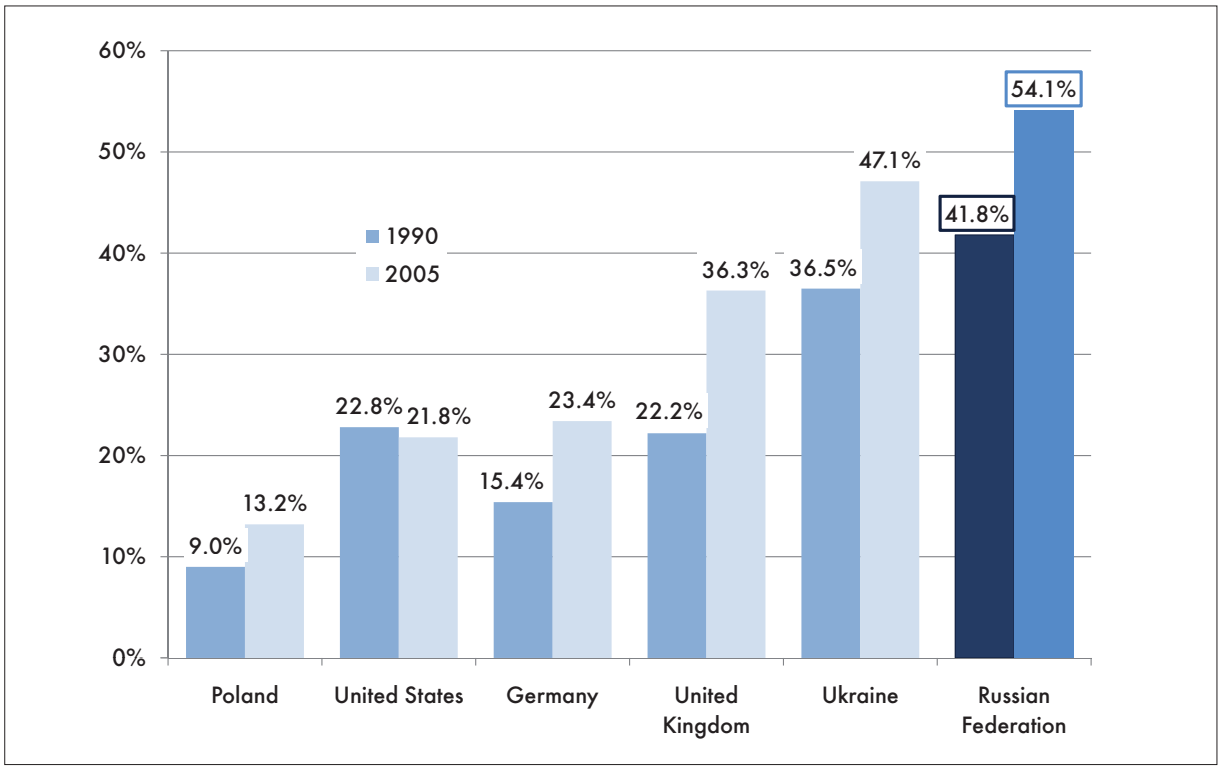
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 4: Electricity Consumption per Capita (Kilowatt-Hours)



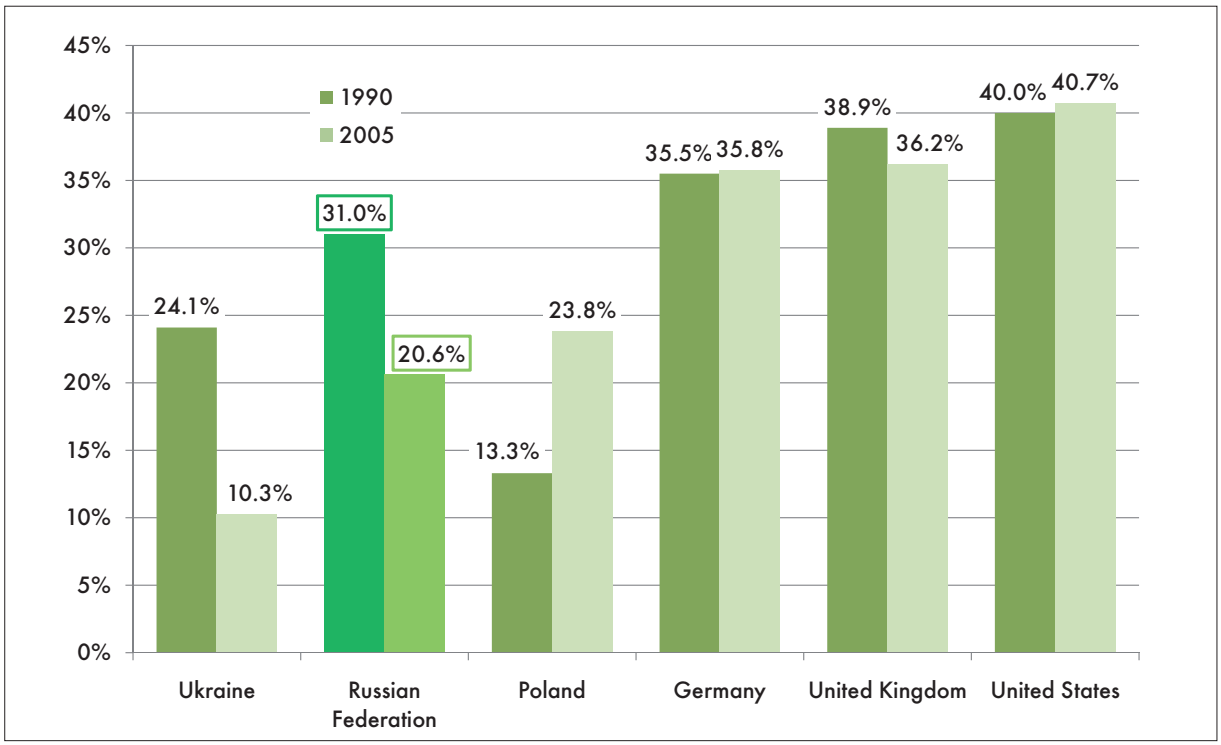
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 5: Gas (% of Total Primary Energy Supply)



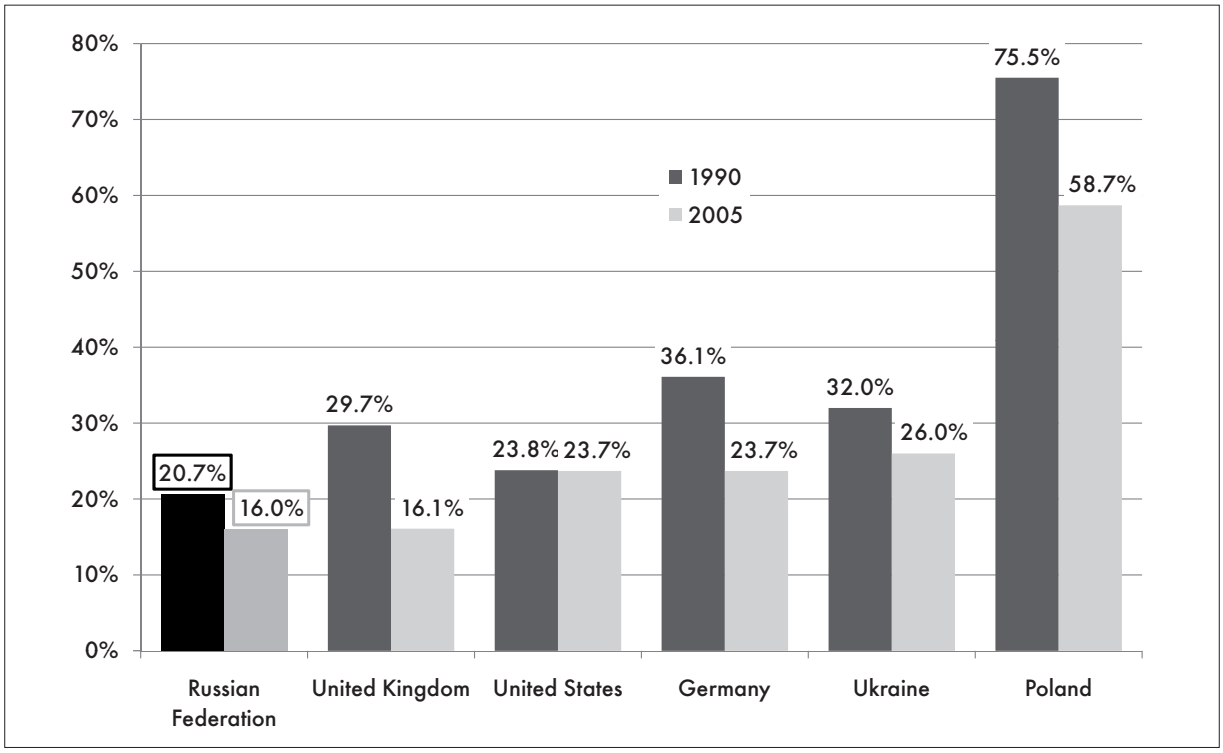
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 6: Oil (% of Total Primary Energy Supply)



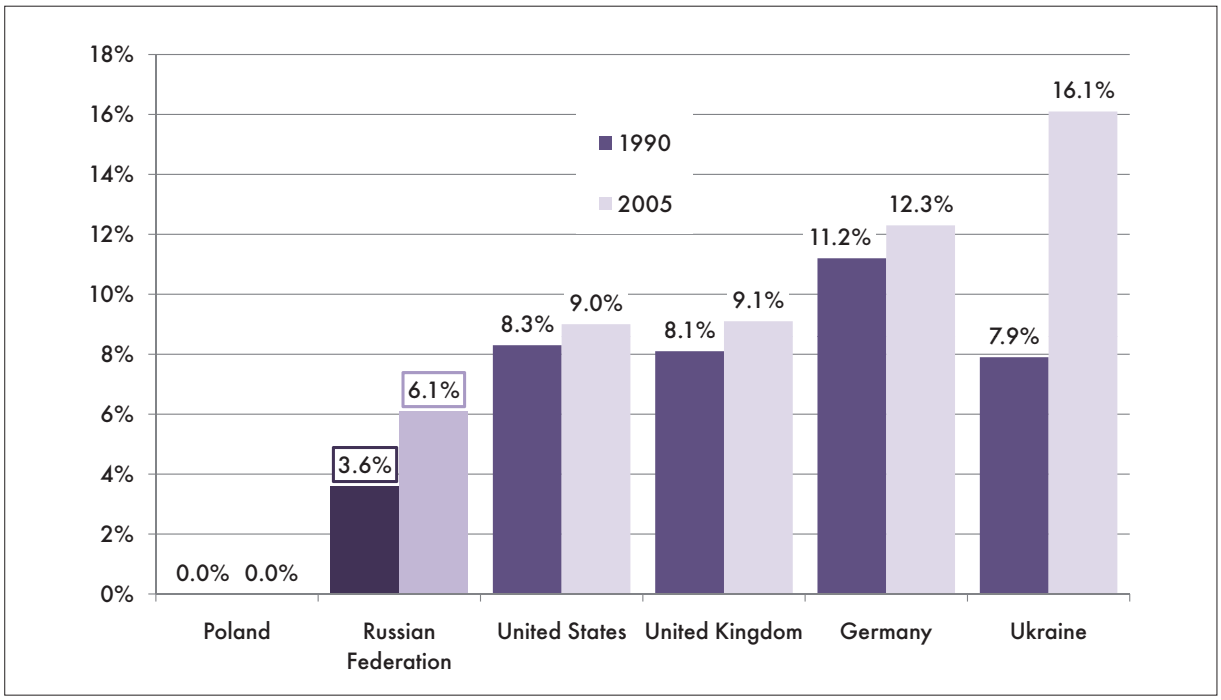
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 7: Coal (% of Total Primary Energy Supply)



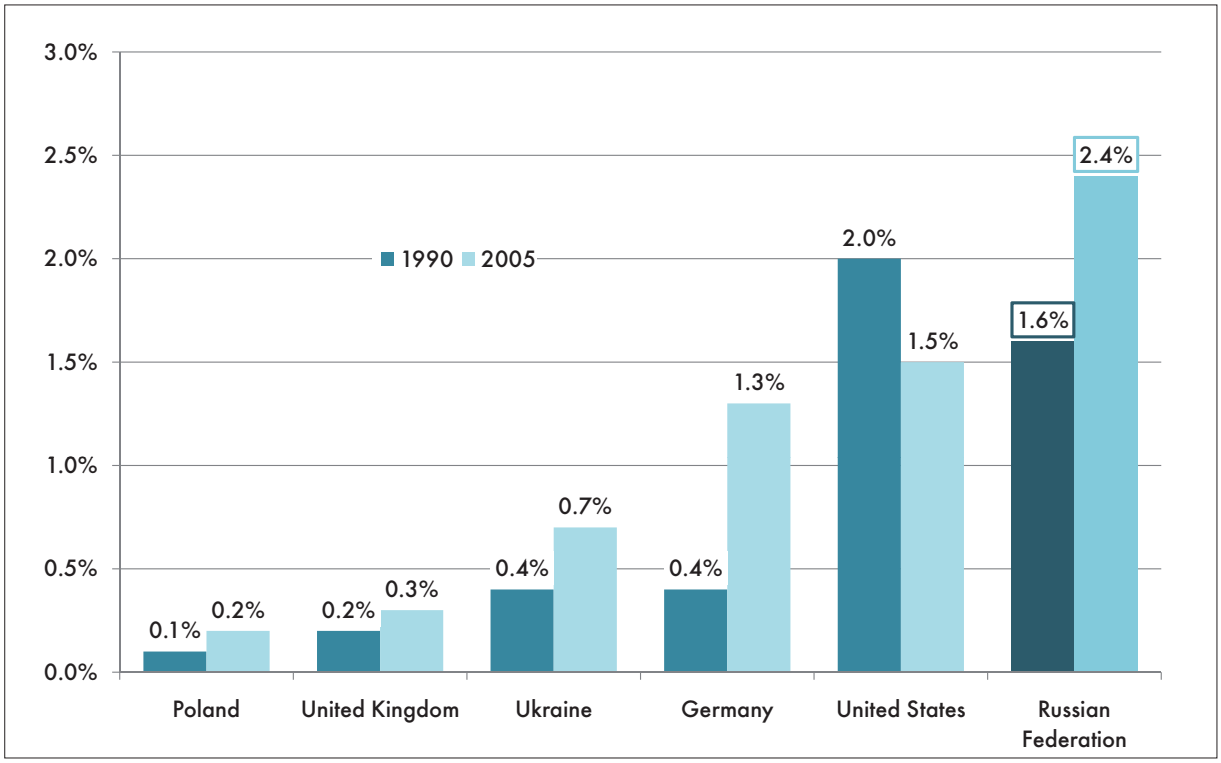
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 8: Nuclear Power (% of Total Primary Energy Supply)



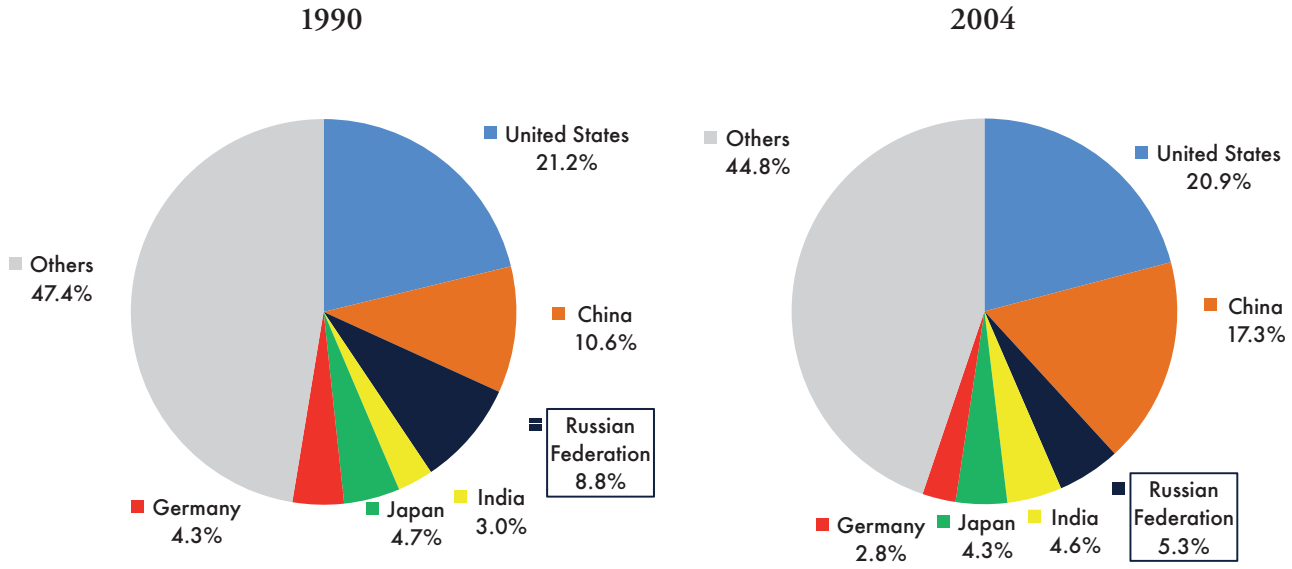
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 9: Hydro, Solar, Wind and Geothermal Power (% of Total Primary Energy Supply)



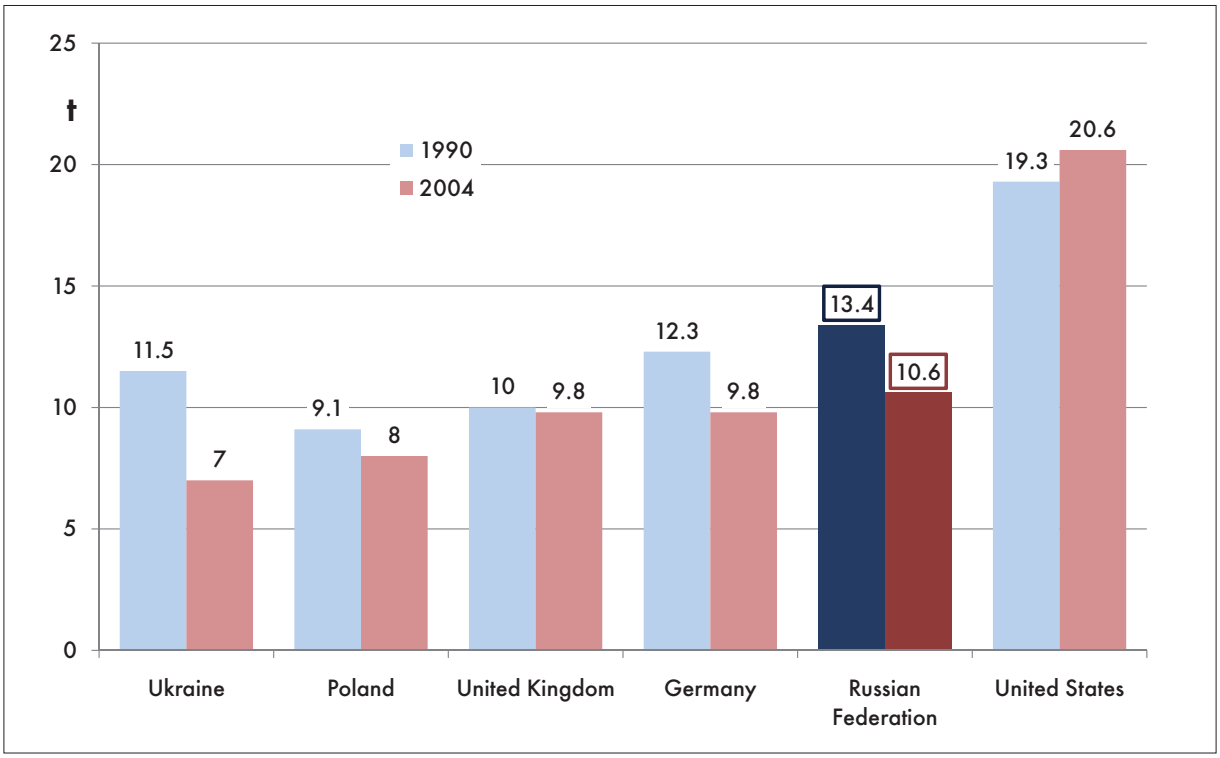
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 10: Carbon Dioxide Emissions – Share of World Total (%)



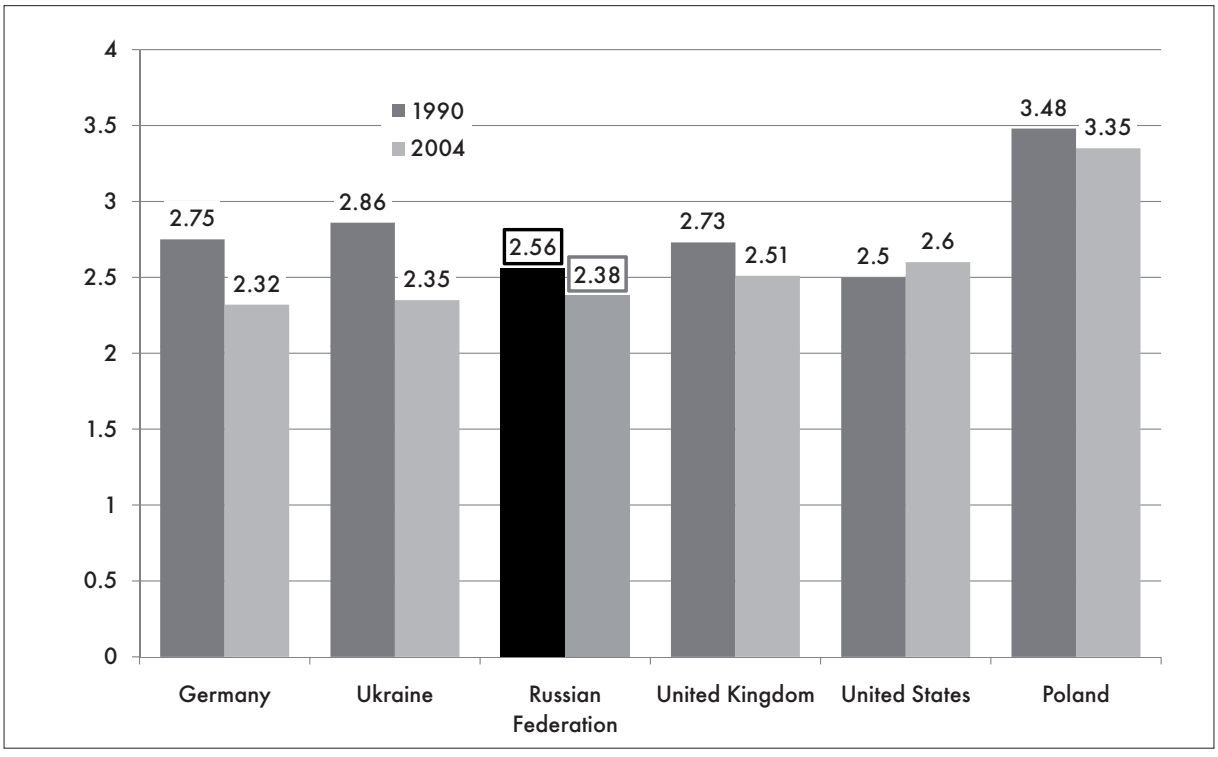
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 11: Carbon Dioxide Emissions – Per Capita (Metric Tons)



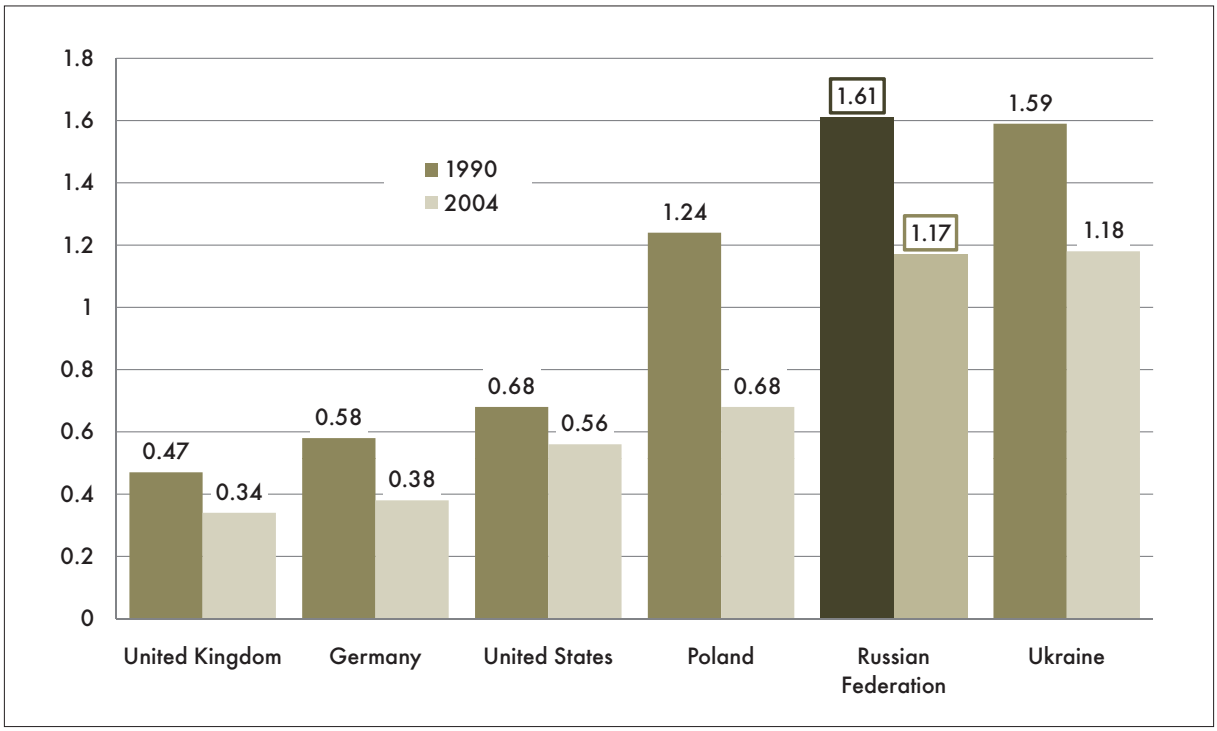
Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 12: Carbon Intensity of Energy (kt CO2 per kt of Oil Equivalent)



Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Figure 13: Carbon Intensity of Growth (kt CO2 per Million 2000 PPP US$)



Source: Human Development Report 2007/08; http://hdr.undp.org/en/statistics/data/

Compiled by Anna A. Petrova

About the Russian Analytical Digest

The Russian Analytical Digest is a bi-weekly internet publication jointly produced by the Research Centre for East European Studies [Forschungsstelle Osteuropa] at the University of Bremen (www.forschungsstelle-uni-bremen.de) and the Center for Security Studies (CSS) at the Swiss Federal Institute of Technology Zurich (ETH Zurich). It is supported by the Otto Wolff Foundation and the German Association for East European Studies (DGO). The Digest draws on contributions to the German-language Russlandanalysen (www.laender-analysen.de/russland), the CSS analytical network on Russia and Eurasia (www.res.ethz.ch), and the Russian Regional Report. The Russian Analytical Digest covers political, economic, and social developments in Russia and its regions, and looks at Russia's role in international relations.

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Research Centre for East European Studies [Forschungsstelle Osteuropa] at the University of Bremen

Founded in 1982 and led by Prof. Dr. Wolfgang Eichwede, the Research Centre for East European Studies (Forschungsstelle Osteuropa) at the University of Bremen is dedicated to socialist and post-socialist cultural and societal developments in the countries of Central and Eastern Europe.

The Research Centre possesses a unique collection of alternative culture and independent writings from the former socialist countries in its archive. In addition to extensive individual research on dissidence and society in socialist societies, since January 2007 a group of international research institutes is participating in a collaborative project on the theme "The other Eastern Europe – the 1960s to the 1980s, dissidence in politics and society, alternatives in culture. Contributions to comparative contemporary history", which is funded by the Volkswagen Foundation.

In the area of post-socialist societies, extensive research projects have been conducted in recent years with emphasis on political decision-making processes, economic culture and the integration of post-socialist countries into EU governance. One of the core missions of the institute is the dissemination of academic knowledge to the interested public. This includes regular email service with nearly 15,000 subscribers in politics, economics and the media.

With a collection of publications on Eastern Europe unique in Germany, the Research Centre is also a contact point for researchers as well as the interested public. The Research Centre has approximately 300 periodicals from Russia alone, which are available in the institute's library. News reports as well as academic literature is systematically processed and analyzed in data bases.

The Center for Security Studies (CSS) at ETH Zurich

The Center for Security Studies (CSS) at the Swiss Federal Institute of Technology (ETH Zurich) is a Swiss academic center of competence that specializes in research, teaching, and information services in the fields of international and Swiss security studies. The CSS also acts as a consultant to various political bodies and the general public.

The CSS is engaged in research projects with a number of Swiss and international partners. The Center's research focus is on new risks, European and transatlantic security, strategy and doctrine, state failure and state building, and Swiss foreign and security policy.

In its teaching capacity, the CSS contributes to the ETH Zurich-based Bachelor of Arts (BA) degree course for prospective professional military officers in the Swiss army and the ETH and University of Zurich-based MA program in Comparative and International Studies (MACIS), offers and develops specialized courses and study programs to all ETH Zurich and University of Zurich students, and has the lead in the Executive Masters degree program in Security Policy and Crisis Management (MAS ETH SPCM), which is offered by ETH Zurich. The program is tailored to the needs of experienced senior executives and managers from the private and public sectors, the policy community, and the armed forces.

The CSS runs the International Relations and Security Network (ISN), and in cooperation with partner institutes manages the Comprehensive Risk Analysis and Management Network (CRN), the Parallel History Project on NATO and the Warsaw Pact (PHP), the Swiss Foreign and Security Policy Network (SSN), and the Russian and Eurasian Security (RES) Network.

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