RUSSIAN FEDERATION

Russian Federation

REGULAR REVIEW 2007

Part I:
Trends in energy and energy efficiency policies, instruments and actors
# TABLE OF CONTENTS

0. EXECUTIVE SUMMARY ................................................................. 3

1. INTRODUCTION .................................................................................. 5

2. BACKGROUND: ENERGY POLICIES ................................................. 7
   2.1. Energy Policy - General Trends and Objectives ........................................... 7
   2.2. Energy Policy Implementation ......................................................................... 11
   2.3. Energy Prices ................................................................................................. 11

3. END-USE SECTORS ............................................................................... 13
   3.1. Housing (Residential) Sector ............................................................... 13
   3.2. Industrial Sector (including construction) ..................................................... 13
   3.3. Services Sector .......................................................................................... 13
   3.4. Transport Sector ......................................................................................... 14

4. ENERGY EFFICIENCY POLICIES ...................................................... 15
   4.1. Energy Efficiency Policy ............................................................................. 15
   4.2. Legal Framework ....................................................................................... 15
   4.3. Energy Efficiency Targets .......................................................................... 16
   4.4. Energy Efficiency Priorities ......................................................................... 16
   4.5. Energy Efficiency Financing ....................................................................... 17
   4.6. International Co-operation ......................................................................... 18
   4.7. Energy Efficiency Institutions ................................................................... 18
   4.8. Energy Efficiency Monitoring ................................................................... 19

5. ENERGY EFFICIENCY INSTRUMENTS AND MEASURES ............... 21
   5.1. Cross-sectoral Instruments and Measures ...................................................... 21
   5.2. Instruments and Measures in the Residential Sector ................................. 23
   5.3. Instruments and Measures in the Industrial Sector ....................................... 23
   5.4. Instruments and Measures in the Services Sector ....................................... 23
   5.5. Instruments and Measures in the Transport Sector ..................................... 23
0. EXECUTIVE SUMMARY

This Review presents the state and main issues in the area of energy efficiency in the Russian Federation within the context of the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects.

With its 2.5% of the global population, the Russian Federation has almost 45% of natural gas, 13% of oil, 23% of coal, and 14% of uranium potential world resources, i.e., almost 30% of traditional natural energy assets of the Earth while it produces more than 10% of the world’s primary energy.

At the same time, Russia’s economy energy intensity (adjusted by the purchasing power parity) is twice that of the United States, 2.3 times higher than the world’s average, and three times higher than in the European developed countries and Japan.

The main reasons for high energy intensity of the Russian economy are:

- Climatic conditions characterized by low average temperatures and requiring substantial use of fuel and energy for safe and sustainable energy supply to consumers;
- The economic structure characterized by a high share of energy intensive industries (more than 60% of the industrial sector) and a relatively low share in the GDP of services which have low energy intensity;
- Substantial amounts of outdated technological energy equipment;

The energy saving potential is estimated at 45% of the Russia’s current energy consumption.

High energy intensity affects economic and environmental indicators of Russia as follows:

- Affects competitiveness of the Russian producers;
- Entails extra financial costs (including investments) for the country’s energy supply;
- Results in substantial amounts of environment pollution;
- Increases the use of non-renewable natural fuel resource, especially hydrocarbons.

Recognizing the above factors the Energy Policies of Russia developed in the Energy Strategy of Russia through 2020 (as approved by the Government of the Russian Federation on August 28, 2003), considers improvement of energy efficiency (energy saving) as a vital economic policy direction of the state and envisages a 50% reduction of energy intensity of the Russian economy by 2020 as compared to 2000.
The following sections of this Review consider the status and prospects of energy efficiency in Russia, including energy mix, energy saving implementation mechanisms, influence of economic factors in enhancing energy efficiency, relationship between energy efficiency and environmental parameters of human life.

The Review demonstrates that in the last five years (2000-2005) the energy intensity of Russian Federation’s economy has reduced by 21% and describes prospects for further energy efficiency improvements, and some relevant measures to achieve this.

The Review also demonstrates that Russia is now in compliance with the Kyoto Protocol requirement not to exceed the 1990 levels of greenhouse emissions, and intends to respect these caps through the period specified by the Protocol.

Part one contains qualitative and quantitative estimates for energy efficiency indicators to illustrate the main points of this Review. Part two is mainly focused on quantitative indicators.
1. INTRODUCTION

The area of the Russian Federation is 17.1 million km² with the population of 143.5 million. The Russian Federation is a democratic federal law based state with a democratic form of government (Article 1 of the Russian Federation Constitution). The authority of the State is exercised by the President of the Russian Federation, the Federal Assembly (the Council of the Federation and the State Duma), the Government of the Russian Federation, courts of the Russian Federation (Article 11 of the Russian Federation Constitution). The President of the Russian Federation is the Head of State (Article 80 of the Russian Federation Constitution).

After a period of economic recession (1991-1998) when the GDP production dropped by 42.3% in 1999-2005 the country’s economy demonstrated rapid growth with the GDP growing by 44% at an average annual rate of 6.3%. Correspondingly, during the crisis period energy intensity per unit of production increased by 20.7% and in 1999-2005 decreased by 28%. The main economic and political objective of the State is improvement of standard and quality of life.

The Fuel-and-Energy Complex (FEC) with its high production capability plays an important role in Russian Federation’s economy. Thus, in 2005 the FEC accounted for 30.9% of the GDP production, 31.9% of industrial production, 63.8% of export earnings, and 57.9% of the budget’s tax revenues.
In 2006 the Russian Federation economy continued its successful growth driven largely by the FEC. Table 1.1 contains the main economic development indicators for the country as a whole and for the fuel and energy complex in 2006 and 2005 as compared to 2000.

**Table 1.1. Main Economic Development Indicators for Russia and its Fuel and Energy Complex in 2005 and 2006 as compared to 2000**

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual GDP growth (%)</td>
<td>110</td>
<td>106.4</td>
<td>106.8</td>
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<td>Compared to 2000 (%)</td>
<td>100</td>
<td>134.7</td>
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<td>Industrial Production Growth against 2000 (%)</td>
<td>100</td>
<td>128.4</td>
<td>130.4</td>
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<td>Primary energy production (Mtfe)</td>
<td>1408.3</td>
<td>1721.6</td>
<td>1762.6</td>
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<td>Including:</td>
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<tr>
<td>Oil (Mt)</td>
<td>323.5</td>
<td>470</td>
<td>480</td>
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<tr>
<td>Gas (Bcm)</td>
<td>583.9</td>
<td>640.8</td>
<td>656.3</td>
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<tr>
<td>Coal (Mt)</td>
<td>258.3</td>
<td>299</td>
<td>309</td>
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<tr>
<td>Electricity production by NPP and HPP (Bln kWh)</td>
<td>296.1</td>
<td>323.9</td>
<td>331.6</td>
</tr>
<tr>
<td>Total electricity production (Bln kWh)</td>
<td>877.8</td>
<td>953.1</td>
<td>991.4</td>
</tr>
<tr>
<td>Total energy exports (Mtfe)</td>
<td>557</td>
<td>796.7</td>
<td>803.7</td>
</tr>
<tr>
<td>Domestic energy consumption (Mtfe)</td>
<td>892.2</td>
<td>950.3</td>
<td>983.9</td>
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<tr>
<td>Energy intensity per GDP unit (%)</td>
<td>100</td>
<td>79.1</td>
<td>76.7</td>
</tr>
<tr>
<td>Electricity intensity per GDP unit (%)</td>
<td>100</td>
<td>80.9</td>
<td>78.5</td>
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2. BACKGROUND: ENERGY POLICIES AND PRICES

2.1. Energy Policy - General Trends and Objectives

The Energy Strategy of Russia through 2020 was approved by Decision of the Government of the Russian Federation № 1234-p of August 28, 2003 (ES-2020). According to this document the Energy Policy of Russia aims at the most efficient use of the natural fuel and energy resources and of the energy sector capabilities to ensure economic growth and improve the country’s population quality of life.

Figure 2.1.1. Energy Strategy of Russia for the Period till 2020

The Energy Policy of Russia established the following priorities:

- Comprehensive and reliable energy supply to the country’s population and economy at affordable prices, which should also provide incentives for energy saving; amelioration of risks and prevention of crisis developments.
- Reduction of the cost per unit of energy produced and used (through streamlining of consumption), application of energy saving technologies and
equipment, reduction of losses during production, processing, transportation, and sale of the fuel and energy products.

- Improvement of financial stability and efficiency of the utilization of the energy sector capabilities with a view to ensuring social and economic development of the country.
- Minimization of environmental impact of the energy sector based on economic incentives, improved production structure, introduction of new technologies of production, processing, transportation, sale and consumption of energy products.

Development of a civilized energy market and a level playing field for relations between the market entities and with the State represents the main instrument for achieving objectives set out in the ES-2020. In this context, the State, while limiting its functions as an economic entity, shall enhance its role in the development of the market infrastructure as a regulator of market interaction.

According to the EC-2020 the main state regulation mechanisms in the Fuel and Energy Complex envisage:

- Measures aimed at developing an efficient market environment (including coordinated tariff, tax, customs, antimonopoly, and institutional changes in the FEC);
- More efficient management of the state assets;
- Introduction of a system of forward looking technical regulations, national standards, and norms with a view to improving manageability of the energy sector development and promoting energy saving;
- Promotion and support of economic entities’ strategic initiatives in the area of investments, innovation, and energy saving.

Currently the Ministry of Industry and Energy, as instructed by the Government of the Russian Federation and with the participation of the ministries and agencies concerned, works on updating the parameters of the existing ES 2020 and develops the Energy Strategy of Russia through 2030.

Table 2.1 shows some of the main fuel and energy balance indicators of Russia (also calculated at oil equivalent values).
Table 2.1. Main Indicators of the Primary Energy Balance of Russia

<table>
<thead>
<tr>
<th></th>
<th>Unit 2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>Mtoe</td>
<td>992.4</td>
<td>1025.6</td>
<td>1061.1</td>
<td>1133.6</td>
<td>1187.5</td>
</tr>
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<td>Including:</td>
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<tr>
<td>Coal</td>
<td>Mt</td>
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<td>270.0</td>
<td>255.8</td>
<td>275.6</td>
<td>282.0</td>
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<tr>
<td>Mtoe</td>
<td></td>
<td>120.3</td>
<td>127.2</td>
<td>122.5</td>
<td>132.0</td>
<td>135.0</td>
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<td>Oil</td>
<td>Mt</td>
<td>323.5</td>
<td>348.0</td>
<td>379.6</td>
<td>421.4</td>
<td>459.0</td>
</tr>
<tr>
<td>Mtoe</td>
<td></td>
<td>324.1</td>
<td>348.5</td>
<td>379.9</td>
<td>422.2</td>
<td>459.8</td>
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<tr>
<td>Gas</td>
<td>Bcm</td>
<td>583.9</td>
<td>581.2</td>
<td>594.9</td>
<td>620.2</td>
<td>632.6</td>
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<tr>
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<td>469.7</td>
<td>480.9</td>
<td>501.4</td>
<td>511.4</td>
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<tr>
<td>Electricity production</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPP</td>
<td>Bln kWh</td>
<td>165.4</td>
<td>176.0</td>
<td>164.2</td>
<td>157.6</td>
<td>176.9</td>
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<tr>
<td>NPP</td>
<td>Bln kWh</td>
<td>130.7</td>
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<td>141.6</td>
<td>150.3</td>
<td>144.7</td>
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<tr>
<td>HPP+NPP</td>
<td>Bln kWh</td>
<td>296.1</td>
<td>313.0</td>
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<td>321.6</td>
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<td>Mtoe</td>
<td></td>
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<td>75.6</td>
<td>73.5</td>
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<tr>
<td>Share in primary energy</td>
<td>%</td>
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<td>7.4</td>
<td>6.9</td>
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<td>6.5</td>
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<tr>
<td>Total electricity including TPP</td>
<td>Bln kWh</td>
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<td>891.3</td>
<td>916.3</td>
<td>933.4</td>
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<td>Other energy including RES</td>
<td>Mtoe</td>
<td>4.6</td>
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<td>4.0</td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>Mtoe</td>
<td>28.6</td>
<td>21.7</td>
<td>21.7</td>
<td>24.2</td>
<td>20.7</td>
</tr>
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<td>Including:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal, coke, slate</td>
<td>Mt</td>
<td>25.7</td>
<td>28.1</td>
<td>20.9</td>
<td>25.2</td>
<td>22.2</td>
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<td>Mtoe</td>
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<td>9.6</td>
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<td>10.2</td>
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<tr>
<td>Oil</td>
<td>Mt</td>
<td>5.9</td>
<td>5.1</td>
<td>6.2</td>
<td>5.7</td>
<td>4.2</td>
</tr>
<tr>
<td>Mtoe</td>
<td></td>
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<td>5.1</td>
<td>6.2</td>
<td>5.7</td>
<td>4.2</td>
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<tr>
<td>Gas</td>
<td>Bcm</td>
<td>13.0</td>
<td>4.2</td>
<td>7.2</td>
<td>8.3</td>
<td>6.9</td>
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<tr>
<td>Mtoe</td>
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<td>3.4</td>
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<td>Mt</td>
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<td>0.2</td>
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<tr>
<td>Mtoe</td>
<td></td>
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<td><strong>TOTAL</strong></td>
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</tr>
<tr>
<td>Coal and coke</td>
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<td>64.2</td>
<td>75.9</td>
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<td>22.1</td>
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<td>5.2</td>
<td>5.1</td>
<td>6.2</td>
<td>6.6</td>
</tr>
<tr>
<td>Share of production</td>
<td>%</td>
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<td>16.3</td>
<td>18.2</td>
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<td>12.8</td>
<td>16.3</td>
<td>18.8</td>
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<tr>
<td>Mtoe</td>
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<td>11.4</td>
<td>12.8</td>
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<td>18.8</td>
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<tr>
<td>Oil</td>
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<td>188.3</td>
<td>223.8</td>
<td>257.6</td>
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<td>224.0</td>
<td>257.8</td>
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<td>Share of energy exports</td>
<td>%</td>
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<td>40.9</td>
<td>43.1</td>
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<tr>
<td>Share of production</td>
<td>%</td>
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<td>56.1</td>
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<td>Gas</td>
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<td>190.0</td>
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<td>149.4</td>
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<td>34.1</td>
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<td>30.0</td>
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<tr>
<td>Share of production</td>
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<td>31.2</td>
<td>31.2</td>
<td>30.6</td>
<td>31.7</td>
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<tr>
<td>Electricity</td>
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### Share of energy exports

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<th>%</th>
<th>0.9</th>
<th>1.0</th>
<th>0.6</th>
<th>0.6</th>
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### Share of production

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<th>1.8</th>
<th>1.2</th>
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<th>0.7</th>
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### Oil products - Total

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<th>63.5</th>
<th>75.4</th>
<th>77.8</th>
<th>82.1</th>
<th>97.0</th>
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<td>75.0</td>
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### Share of energy exports

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<th>16.0</th>
<th>17.1</th>
<th>15.8</th>
<th>15.1</th>
<th>17.2</th>
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### Share of production

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<th>%</th>
<th>36.3</th>
<th>35.5</th>
<th>40.7</th>
<th>41.0</th>
<th>42.0</th>
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### DOMESTIC ENERGY CONSUMPTION

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<th>634.6</th>
<th>643.0</th>
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<td>Share of production</td>
<td>%</td>
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<td>62.7</td>
<td>60.7</td>
<td>57.9</td>
<td>56.2</td>
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### Including:

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<th>Mt</th>
<th>246.2</th>
<th>238.7</th>
<th>236.2</th>
<th>234.3</th>
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<tr>
<td>Mtoe</td>
<td>114.7</td>
<td>112.4</td>
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<td>112.2</td>
<td>109.5</td>
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### Share of energy consumption

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<tr>
<th>%</th>
<th>18.1</th>
<th>17.5</th>
<th>17.5</th>
<th>17.1</th>
<th>16.4</th>
<th>16.8</th>
</tr>
</thead>
</table>

### Share of production

<table>
<thead>
<tr>
<th>%</th>
<th>95.3</th>
<th>88.4</th>
<th>92.4</th>
<th>85.0</th>
<th>81.0</th>
<th>79.2</th>
</tr>
</thead>
</table>

### Oil and oil products

<table>
<thead>
<tr>
<th>Mt</th>
<th>127.2</th>
<th>126.8</th>
<th>122.8</th>
<th>123.9</th>
<th>124.3</th>
<th>125.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtoe</td>
<td>127.6</td>
<td>127.4</td>
<td>123.4</td>
<td>125.3</td>
<td>125.8</td>
<td>127.4</td>
</tr>
</tbody>
</table>

### Share of energy consumption

<table>
<thead>
<tr>
<th>%</th>
<th>20.1</th>
<th>19.8</th>
<th>19.2</th>
<th>19.1</th>
<th>18.8</th>
<th>18.8</th>
</tr>
</thead>
</table>

### Share of production

<table>
<thead>
<tr>
<th>%</th>
<th>39.4</th>
<th>36.5</th>
<th>32.5</th>
<th>29.7</th>
<th>27.4</th>
<th>27.0</th>
</tr>
</thead>
</table>

### Gas

<table>
<thead>
<tr>
<th>Bcm</th>
<th>396.0</th>
<th>404.4</th>
<th>411.2</th>
<th>425.0</th>
<th>435.5</th>
<th>439.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtoe</td>
<td>319.9</td>
<td>326.8</td>
<td>332.6</td>
<td>344.3</td>
<td>352.8</td>
<td>356.0</td>
</tr>
</tbody>
</table>

### Share of energy consumption

<table>
<thead>
<tr>
<th>%</th>
<th>50.4</th>
<th>50.8</th>
<th>51.7</th>
<th>52.4</th>
<th>52.8</th>
<th>52.6</th>
</tr>
</thead>
</table>

### Share of production

<table>
<thead>
<tr>
<th>%</th>
<th>67.8</th>
<th>69.6</th>
<th>69.1</th>
<th>68.5</th>
<th>68.8</th>
<th>68.6</th>
</tr>
</thead>
</table>

### Electricity

<table>
<thead>
<tr>
<th>Total</th>
<th>Bln kWh</th>
<th>863.8</th>
<th>875.5</th>
<th>880.1</th>
<th>903.6</th>
<th>926.7</th>
<th>941.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of production</td>
<td>%</td>
<td>98.4</td>
<td>98.2</td>
<td>98.8</td>
<td>98.6</td>
<td>99.3</td>
<td>98.8</td>
</tr>
</tbody>
</table>

### Including:

<table>
<thead>
<tr>
<th>Primary (HPP &amp; NPP)</th>
<th>Bln kWh</th>
<th>282.2</th>
<th>297.3</th>
<th>294.7</th>
<th>295.3</th>
<th>314.9</th>
<th>317.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtoe</td>
<td>68.2</td>
<td>71.8</td>
<td>70.8</td>
<td>71.0</td>
<td>75.7</td>
<td>76.3</td>
<td></td>
</tr>
</tbody>
</table>

### Share of energy consumption

<table>
<thead>
<tr>
<th>%</th>
<th>10.7</th>
<th>11.2</th>
<th>11.0</th>
<th>10.8</th>
<th>11.3</th>
<th>11.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPP</td>
<td>6.3</td>
<td>5.9</td>
<td>5.8</td>
<td>6.1</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>NPP</td>
<td>4.9</td>
<td>5.1</td>
<td>5.0</td>
<td>5.2</td>
<td>5.2</td>
<td></td>
</tr>
</tbody>
</table>

### Other primary energy including RES

<table>
<thead>
<tr>
<th>Mtoe</th>
<th>4.2</th>
<th>4.7</th>
<th>4.3</th>
<th>4.0</th>
<th>4.0</th>
<th>4.0</th>
</tr>
</thead>
</table>

### Share of energy consumption

<table>
<thead>
<tr>
<th>%</th>
<th>0.7</th>
<th>0.7</th>
<th>0.7</th>
<th>0.6</th>
<th>0.6</th>
<th>0.6</th>
</tr>
</thead>
</table>

## Summary Table I: Priority of Policy Objectives

Table I shows the Energy Policy priorities on a scale from 1 (the most important) to 5.

<table>
<thead>
<tr>
<th>Policy objective</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce total final consumption / GDP</td>
<td>1</td>
</tr>
<tr>
<td>Reduce dependency on energy imports</td>
<td>5</td>
</tr>
<tr>
<td>Diversification of fuels</td>
<td>2</td>
</tr>
<tr>
<td>Reduction of CO₂</td>
<td>2</td>
</tr>
<tr>
<td>Increase utilisation of indigenous primary energy sources</td>
<td>2</td>
</tr>
</tbody>
</table>
2.2. Energy Policy Implementation

At the federal level the energy policies are developed and implemented by: the Ministry of Industry and Energy, the Ministry of Economic Development and Trade, the Ministry of Finance, the Ministry of Natural Resources, the Federal Energy Agency, the Federal Nuclear Energy Agency, the Federal Antimonopoly Service, the Federal Tariff Service, The Federal Agency for Subsoil Use, the Federal Agency for Technical Regulation and Metrology, the Federal Service for Environmental, Technological, and Nuclear Oversight, the Federal Service for the Oversight of Nature Management.

At the Federal level the Ministry of Industry and Energy of the Russian Federation is responsible for improvement of the FEC functional efficiency, while the Federal Tariff Service is responsible for establishing prices for products and services of natural monopolies.

2.3. Energy Prices

2.3.1. Energy pricing policy

In the Russian energy markets the State regulates only prices and tariffs of the natural monopolies (electricity, gas, pipeline transport and others). Additionally, liberalized gas and electricity markets have been opened with the sales at prices not regulated by the State accounting for some 5% of the total sales. Currently a phased liberalization of electricity and gas prices is underway with a view to reaching market price levels (excluding supply to the population) by 2011-2012. Prices in all other FEC sectors have been liberalized.

State regulated prices are established by the Federal Tariff Service (FTS), as well as by Regional Energy Commissions within their authority (within limits established by the FTS).

There are no direct subsidies for energy, although prices are different for different population groups (cross-subsidies) mostly dictated by social considerations.

2.3.2. Price levels

Table 2.2 shows average energy prices and their development.

Given the big territory of the Russian Federation, gas prices are differentiated according to 11 territorial zones, and electricity tariffs – according to the Russian Federation constituent entities. Illustrative Table 2.3 (see the Annex) shows the 2005 electricity tariffs for population and industrial enterprises in different regions.
Table 2.2 Average Energy Prices

<table>
<thead>
<tr>
<th></th>
<th>Average December Prices</th>
<th>Consumer/producer price ratio for 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002</td>
<td>2003</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/'000 kWh</td>
<td>673</td>
<td>760</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>128.3</td>
<td>113.4</td>
</tr>
<tr>
<td><strong>Oil</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/'000 t</td>
<td>2991</td>
<td>4176</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>132.7</td>
<td>137.3</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/'000 m³</td>
<td>819</td>
<td>1008</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>139.9</td>
<td>122.6</td>
</tr>
<tr>
<td><strong>Power coal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/t</td>
<td>547</td>
<td>681</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>106.4</td>
<td>116.3</td>
</tr>
<tr>
<td><strong>Fuel oil</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/'000 t</td>
<td>3123</td>
<td>2915</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>132.1</td>
<td>91.5</td>
</tr>
<tr>
<td><strong>Gasoline</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/'000 t</td>
<td>8712</td>
<td>10152</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>97.8</td>
<td>119.1</td>
</tr>
<tr>
<td><strong>Diesel fuel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/'000 t</td>
<td>7036</td>
<td>9857</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>107</td>
<td>121.8</td>
</tr>
<tr>
<td><strong>Heat</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rouble/Gcal</td>
<td>288</td>
<td>317</td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>—</td>
<td>110</td>
</tr>
<tr>
<td><strong>Consumer prices (CPI)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>115.1</td>
<td>112</td>
</tr>
<tr>
<td><strong>Industrial product prices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% December year-on-year</td>
<td>117.1</td>
<td>113.1</td>
</tr>
</tbody>
</table>

Summary Table II: Energy Prices

<table>
<thead>
<tr>
<th>Energy Prices</th>
<th>Yes</th>
<th>No</th>
<th>Partly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there an independent regulator of energy prices?</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Are there any subsidies on energy prices?</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Are there any cross-subsidies?</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Are the environmental costs fully internalised?</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Do you have a tax related to energy consumption?</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Do you have a tax related to CO₂ emissions⁺)</td>
<td></td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>

⁺) Including gas transportation and distribution
⁺⁺) Pollution charges exist.
3. END-USE SECTORS

Energy consumption trends in the major end-use sectors are described below.

3.1. Housing (Residential) Sector

During the period 1990-2005, primary energy consumption rose by 8.9% (from 180 to 196 Mtoe). The period before 1995 was an exception when as a result of a general economic crisis in the country the energy consumption in the sector dropped by 3.1% (to 174 Mtoe).

During the same period, despite the overall drop of the energy consumption in the country, the share of residential consumption rose from 20.4% in 1990 to 29% in 2005. Electricity consumption in the residential sector increased in 2005 as compared with 1990 by 18% (from 182 to 215 bln kWh) and accounted for 22.9% of the country’s total electricity consumption.

Energy saving potential in this sector is estimated at 67-77 Mtoe or 26-27% of the total fuel and energy consumption.

3.2. Industrial Sector (including construction)

Due to a drop of industrial production in the country in 1995 by 50.3% as compared with 1990 and by 25.7% in 2005 energy consumption in the sector dropped in 1995 by 35.2% (from 384 Mtoe to 248 Mtoe) and in 2005 by 15.7% respectively, i.e. to 323 Mtoe. In the period of 1990-2005 share of the sector in overall primary energy consumption increased from 43.6% to 48%.

Electricity consumption in this sector dropped from 560 billion kWh in 1990 to 382 billion kWh in 1995 and thereafter increased in 2005 in connection with relative growth of industrial production to 410 billion kWh. In 2005 the share of electricity consumed by this sector represented some 44% of the total consumption, while in 1990 it represented 52%.

The energy saving potential in this economic sector is estimated at some 100-123 Mtoe.

3.3. Services Sector

There is no statistical data on energy consumption in the services sector*.  

* In the Russian statistics transport is considered a service, while within the context of this review’s methodology transport is examined as an individual sector.
3.4. Transport Sector

Energy consumption of fuels in the transport sector in 2005 was 40 Mtoe (5.9% of the country’s total consumption), electricity – 75 Billion kWh (8%). Energy saving potential of this sector is estimated at 15-18 Mtoe (39-44% of consumption) of fuel and 7-11 Billion kWh of electricity amounting to 9-19% of consumption.
4. ENERGY EFFICIENCY POLICIES

4.1. Energy Efficiency Policy

The energy efficiency policy of the Russian Federation is stated in the current Energy Strategy of Russia through 2020. Energy cost minimization; better competitiveness, a balanced energy demand, and lower environment pollution represent the main motives for the energy saving policy.

Currently the Ministry of Industry and Energy, as instructed by the Government of the Russian Federation and with the participation of the ministries, agencies, and organization concerned develops a first version of the Energy Strategy of Russia through 2030.

4.2. Legal Framework

A series of Federal Laws provides a systematic framework for improvement of the economy’s energy efficiency.

Legal regulation of energy supply and energy efficiency is provided for in a number of Federal Laws, including: the Civil Code, the Tax Code, the Forestry Code, the Customs Code, the Urban Development Code, etc.

Additionally, a number of Federal Laws adopted in the country contribute to improvement of energy efficiency of the Russian economy, including the Law on Electricity Sector Reform, on Municipal Housing Sector Reform, as well introduction of a system of tariffs for exceeding air pollution quotas.

A specific Law on Energy Efficiency has been in force since 1996.

Currently the work on amendments to the Law on Energy Saving is being finalized. This draft law would envisage additional financial incentive mechanisms for energy saving activities, separation of energy saving competences between the Federal, Regional, and Municipal level authorities, promotion of increased production and sales of equipment that corresponds to the most advanced energy efficiency requirements, a linkage between addressing environmental and energy saving programs, use of renewable energy and alternative types of fuel, etc.


A number of draft laws amending some existing laws with a view to improving opportunities for the use of non-traditional energy and improving energy efficiency, and energy saving were developed, including:
The Water Code of the Russian Federation (introduced to the State Duma) – aimed at establishing special minimal water usage rates in connection with electricity generation at hydro generating facilities with the least impact on water bodies (submerged-type, and low-head HPPs etc.);

The Forestry Code of the Russian Federation (introduced to the State Duma) – envisaging the use of bio-fuels as a prerequisite for inclusion of forestry projects on the list of priority investment projects;

The Federal Law On State Regulation of Electricity and Heat Tariffs in the Russian Federation – aimed at implementing a policy of coordinated changes to electricity and heat consumption standards, as well as creating conditions that would encourage energy efficiency based on appropriate tariff regulation and pricing methods;

The Federal Law on Gas Supply in the Russian Federation – aimed at implementing a policy of a gradual increase of the gas prices, and establishing more stringent gas consumption standards, which, in the final analysis, should ensure rational and efficient use of gas by consumers.

Development of technical regulations is another crucial area of legal support. This year the Ministry of Industry and Energy of Russia plans to present to the Government of the Russian Federation more than 20 FEC related special technical regulations, including, among others, the Special Technical Regulation on Safety of Power Plants Using Non-traditional Energy Sources.

4.3. Energy Efficiency Targets

The actual per unit energy intensity was reduced in the 5 years through 2005 by 21%, against 15% forecast in the Energy Strategy.

Forecast of changes in the energy intensity per GDP unit and energy saving potential of the Russian economy are shown in Figure 4.3.1.

4.4. Energy Efficiency Priorities

Basically all energy end-use sectors are treated as equally important in terms of the need for better energy efficiency. The best impact is expected from improvements in energy intensity per unit of production in electricity sector, metallurgy and other energy intensive industries, as well as a result of an overall restructuring of the economy by reducing the share of the most energy intensive structures, which could bring about two thirds of the forecast decrease of per unit energy intensity. Market based economic methods are the main tools of the economic restructuring.
4.5. Energy Efficiency Financing

Energy saving activities are financed by federal and regional budgets and by economic entities’ own resources.

Federal and regional budget resources are used for energy saving activities in the amounts specified in the budgets. Such sums are generally used to attract private investments.

In the Russian Federation Constituent Entities energy saving funds may be established using resources of economic entities and regional budgets to be used for specific activities within the framework of regional energy saving programs. The Federal Law on Energy Saving envisages the right of economic entities to internalize in electricity tariff setting energy saving related costs and establish procedures for their use.

The following programs have contributed to financing energy efficiency activities and tasks: TACIS (EC), GEF, International Financial Corporation (IFC), FOREST (Russia – USA cooperation), BASREC etc.

Instruments of financing the energy saving measures from the Federal Budget are represented by the following Federal Earmarked Programs: Energy Saving of Russia (implementation period – 1998-2002), Energy Efficient Economy for 2002-2005 and through 2010 (implementation period – 2002-2006), Research and Development in
Priority Areas of Science and Technology Complex of Russia for 2007-2012 and National Technology Base for 2007-2011.


The main overall result of this Program should be a reduction of the Energy Intensity per GDP unit in 2015 by 62.5% of the 2006 level.

Currently more than 600 energy saving programs have been developed and implemented in 78 of the Russian Federation Constituent Entities: 50 regional, 93 sectoral (FEC, residential sector, education, etc.), and 462 municipal- and city level programs.

Energy saving and efficient energy use programs are integrated into regional and municipal programs of social and economic development and offer practical tools to address social, economic, and environmental issues.

4.6. International Co-operation

Presently, Russia cooperates actively in energy efficiency with many countries of the world within bilateral and multilateral formats. Russia – EU Energy Dialogue is vigorously pursued since 2000 with a special area dedicated to energy efficiency. Memorandum of Understanding between the Ministry of Industry and Energy of Russia and the Ministry of Economy of the Netherlands Regarding Energy Efficiency and Renewable Energy Sources was signed in 2006; the Joint Ministry of Industry and Energy of Russia and U.S. Department of Energy Working Panel on Energy Efficiency has been active for the last 10 years; efficient energy use issues are reflected in the documents of various intergovernmental commissions.

Russia is an active participant of international energy organizations such as CERA, IEA, IEF, Gas Exporting Countries Forum etc. and, for her part, provides information on its development plans of the Russian Fuel and Energy Complex.

International cooperation in the area of energy efficiency is also pursued on the basis of such instruments as the Kyoto Protocol and PEEREA.

4.7. Energy Efficiency Institutions

At the Federal legislative level, energy saving and energy efficiency fall within the competence of the Federal Assembly (The State Duma, and the Council of Federation. At the Government level, the major part of activities to improve energy efficiency in Russia is implemented by the Ministry of Industry and Energy together with the Ministry of Economic Development and Trade, Ministry of Regional Development, Ministry of Natural Resources, Ministry of Agriculture, the Federal Energy Agency, the Federal Agency of Atomic Energy, the Federal Tariff Service, and other agencies.
At the level of the Russian Federation Constituent Entities, the relevant functions are performed by the regional legislative and executive bodies.

In addition to government authorities, energy saving and energy efficiency are addressed by energy service organizations, associations, as well by energy producer and end-user economic entities.

Specialists in energy efficiency and energy saving are trained by relevant educational institutions and universities (energy and other technological universities).

The State Statistical Records System maintained by the Federal Service of State Statistics (Rosstat) contains data on fuel and energy consumption in industry, agriculture, transport, and residential sector.

The majority of the Russian Federation Constituent Entities have relevant energy saving management infrastructure. 75 centers, agencies, non-commercial partnerships, and 24 energy saving foundations operate in their territories.

4.8. Energy Efficiency Monitoring

At the Federal level an annual energy efficiency survey is conducted through comparison of energy intensity per GDP unit with the indicative targets of the Energy Strategy of Russia through 2020.

Similar evaluation is made in a number of the Russian Federation Constituent Entities regarding changes in their economy’s energy intensity per GRP (Gross Regional Product).

At the level of enterprises (economic entities) energy efficiency is monitored at their discretion and at their expense or with the involvement of energy service organizations.

In 2006 energy audit companies (283 organizations) registered with the MIE conducted more than 700 audits of MHS enterprises, various industrial sectors, electricity and heat facilities of RJSC UES and other energy companies, of JSC Gazprom, oil producing, and oil processing companies, railway facilities, petrochemical enterprises, social and cultural facilities etc.
### Summary Table III: Energy Efficiency Policies

<table>
<thead>
<tr>
<th>Energy efficiency policies</th>
<th>Yes</th>
<th>No</th>
<th>Partly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has an energy efficiency policy been developed?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is energy security a driving force for energy efficiency?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is climate change/environment a driving force for energy efficiency?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is sustainable development a driving force for energy efficiency?</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Is employment creation a driving force for energy efficiency?</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Is industrial competitiveness a driving force for energy efficiency?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is export of technology a driving force for energy efficiency?</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Is comfort perceived as a priority for improving energy efficiency?</td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Are international obligations a driving force for energy efficiency?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there an energy efficiency law?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is energy efficiency incorporated in other legislation?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have national targets been formulated?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a special fund for energy efficiency?</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Is there international cooperation in the field of energy efficiency policies?</td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. ENERGY EFFICIENCY INSTRUMENTS AND MEASURES

5.1. Cross-sectoral Instruments and Measures

Common instruments for the improvement of the energy efficiency in all sectors, as has been mentioned above, include:

- The Civil Code;
- The Tax Code;
- The Customs Code;
- Federal Law On Ratification of Kyoto Agreement;
- Forestry Code;
- Water Code;
- Urban Development Code;
- Federal Law On Energy Saving, which allows financial support for the implementation of energy saving programs and activities;
- Federal legislation on reforming electricity sector and housing and communal services;
- Federal Special Program “Energy Efficient Economy”, which identifies main program energy saving measures and the use of the Federal Budget resources in their implementation;
- Federal Earmarked Program “Research and Development in Priority Areas of Science and Technology Complex of Russia for 2007-2012”;
- Federal Earmarked Program “National Technological Basis for 2007-2011;”
- Regional energy saving programs, which identify major energy saving measures at a regional level and the use of regional budgetary resources in their implementation;
- State pricing policy, which develops price levels for s energy types produced by natural monopolies as electricity, heat, and natural gas;
- Norms and standards of state technical regulation, including building codes and others.

The above instruments and expected results of their implementation are described in Table 5.1.
<table>
<thead>
<tr>
<th>TYPE OF INSTRUMENTS</th>
<th>PROGRAMME DESCRIPTION AND AIMS</th>
<th>IMPLEMENTATION STATUS</th>
<th>EXPECTED RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Code of the Russian Federation</td>
<td>Develops judicious attitude of economic entities and natural persons towards resource use</td>
<td>Legal</td>
<td></td>
</tr>
<tr>
<td>Tax Code or the Russian Federation</td>
<td>Develops energy price benchmarks by limiting their consumption</td>
<td>Legal and financial</td>
<td></td>
</tr>
<tr>
<td>Customs Code of the Russian Federation</td>
<td>Encourages purchases of modern energy saving equipment.</td>
<td>Legal and economic</td>
<td></td>
</tr>
<tr>
<td>Forestry Code</td>
<td>Provides for energy uses of bioresources</td>
<td>Legal</td>
<td></td>
</tr>
<tr>
<td>Urban Development Code</td>
<td>Provides a framework for efficient energy uses in municipal and housing sectors</td>
<td>Legal</td>
<td></td>
</tr>
<tr>
<td>Federal Law On Ratification of the Kyoto Protocol</td>
<td>Provides a framework for limiting greenhouse gases emissions</td>
<td>Legal</td>
<td></td>
</tr>
<tr>
<td>Federal Law On Energy Saving, which allows financial support for the implementation of energy saving programs and activities</td>
<td>Instruments affecting all sectors (universal instruments)</td>
<td>Legislative</td>
<td></td>
</tr>
<tr>
<td>Federal Special Program “Energy Efficient Economy”, which identifies main program energy saving measures and the use of the Federal Budget resources in their implementation</td>
<td>Instruments affecting all sectors (universal instruments) Implementation period: 2002-2006</td>
<td>Special</td>
<td>Reduction of energy intensity per GDP unit in 2020 against 2000 by half</td>
</tr>
<tr>
<td>Federal Earmarked Program «Research and Development in Priority Areas of Science and Technology Complex of Russia for 2007-2012 »</td>
<td>Contains tasks related to appropriate, including energy saving, R&amp;D</td>
<td>Special</td>
<td></td>
</tr>
<tr>
<td>Regional energy saving programs, which identify major energy saving measures at a regional level and the use of regional budgetary resources in their implementation</td>
<td>Instruments affecting all sectors (universal instruments)</td>
<td>Special</td>
<td></td>
</tr>
<tr>
<td>State pricing policy, which develops price levels for such basic energy types produced by natural monopolies as electricity, heat, and natural gas</td>
<td>Instruments affecting all sectors (universal instruments)</td>
<td>Economic</td>
<td></td>
</tr>
<tr>
<td>Norms and standards for energy use (building codes, design standards, service regulations etc.)</td>
<td>Instruments affecting all sectors (universal instruments)</td>
<td>Economic</td>
<td></td>
</tr>
<tr>
<td>Market based economic methods that promote energy saving and economic restructuring</td>
<td>Instruments affecting all sectors (universal instruments)</td>
<td>Economic</td>
<td></td>
</tr>
</tbody>
</table>
5.2. Instruments and Measures in the Residential Sector
5.3. Instruments and Measures in the Industrial Sector
5.4. Instruments and Measures in the Services Sector
5.5. Instruments and Measures in the Transport Sector

Given the universal nature of the above instruments and energy efficiency improvement measures, they are equally applied in all energy end-use sectors. Because of this, there is no need to present data on the application of these instruments in individual sectors (residential, industrial, services, and transport). Summary Table IV (Instruments and Measures) is provided below.

Summary Table IV: Instruments and Measures

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Instruments</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normative</td>
<td>Financial</td>
<td>Information /awareness</td>
<td>Education/ advisory</td>
<td>Voluntary agreements</td>
<td>R&amp;D</td>
</tr>
<tr>
<td>Residential</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Industry</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Services</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Transport</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>
6. ACTORS IN ENERGY EFFICIENCY

In addition to the state authorities and other entities mentioned in section 4.7 above, numerous legal entities operate in Russia, which to a greater or lesser degree address energy saving and energy efficiency. On the whole, they include all energy consumers in all energy consuming sectors (economic agents), intermediary and marketing energy and fuel supply organizations, energy service companies, research and design organizations, educational establishments, as well as a certain segment of the mass media. Structures and characteristics of such actors are quite varied and within the context of continued formation, development and improvement of the market based economic management methods in Russia these actors represent work in progress. Bearing this in mind, providing a specific list of such actors would seem self-defeating in the conditions of Russia, for it would be quite long and less than informative.

What is important at this juncture, is that all energy consuming actors have a common interest to minimize fuel and energy costs (without a detriment to their economic results); and that, in the final analysis, is the basis for the development of energy saving mechanisms.

The actors in this area whose function is to promote energy efficiency and energy saving should receive incentives through performance based mechanisms. Such mechanisms are in the focus of energy saving activities of such various actors in Russia.
7. RENEWABLE ENERGY

7.1. Renewable Energy Potential and Supply

Economic, environmental and social effectiveness of the RES utilization in Russia is determined by their potential contribution to addressing the following issues:

- Ensure a sustainable heat and electricity supply of the population and industry (in line with the standards for similar climatic conditions) in the areas with decentralized electricity supply, primarily in the Extreme North regions and in the similarly eligible territories.

- Ensure a guaranteed minimum of electricity supply to the population and industry (especially in agricultural areas) in the territories with an unreliable centralized electricity supply (mainly within deficit power systems) and in the areas of decentralized electricity supply; prevent damage from accidents and brownouts, especially in rural areas and processing industries.

- Reduce harmful emissions from power plants in individual cities and populated areas with difficult environmental situation, as well as in leisure areas and resorts.

Russia has all the prerequisites to address these issues: Russian is endowed with various RES types, while a majority of the Russian Federation Constituent Entities have two or more RES types.

For the whole of Russia, economic potential of RES defined by their competitive capacity has been estimated conservatively at some 181 Mtoe, or some 20 % of the current domestic energy consumption (See Table 7.1). Actual amounts and development of RES utilization electricity and heat production are shown in Tables 7.2 and 7.3.

Table 7.1 Potential of Non-traditional Renewable Energy Sources in Russia

<table>
<thead>
<tr>
<th>Resource</th>
<th>Technical potential, Mtoe/year</th>
<th>Economic potential Mtoe/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small hydro</td>
<td>88</td>
<td>49</td>
</tr>
<tr>
<td>Premium geothermal</td>
<td>—</td>
<td>80</td>
</tr>
<tr>
<td>Wind energy</td>
<td>1400</td>
<td>8</td>
</tr>
<tr>
<td>Biomass energy</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>Solar energy</td>
<td>1610</td>
<td>2</td>
</tr>
<tr>
<td>Low-grade heat</td>
<td>136</td>
<td>37</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3271</strong></td>
<td><strong>181</strong></td>
</tr>
</tbody>
</table>

1) Economical potential is defined by comparison to the cost of traditional energy by region.
2) Technical RES potential (on an annual basis) is defined by technological possibility of their use.

Technical RES potential by region is characterized as follows:
- **Small power** — North-Western Federal District (FD) (15 Bln. kWh), Southern FD (15.5 Bln. kWh), Volga FD (9 Bln. kWh), Ural sky FD (13.2 Bln. kWh), Siberian FD (153 Bln. kWh), Far-Eastern FD (146 Bln. kWh);
- **Geothermal energy** — Southern FD, Siberian FD, and Far-Eastern FD;
- **Wind energy** — in the southern part of the country, North-Western FD, Far-Eastern FD;
- **Biomass** – North-Western FD (2.7 Mtoe), Central FD (8.2 Mtoe), Volga FD (7 Mtoe), Southern GD (4.8 Mtoe), Ural sky FD (5.6 Mtoe), Siberian FD (6.7 million), Far-Eastern FD (2.1 Mtoe);
- **Sun energy** – in the country’s South and Far East.

RES are mostly used for producing electricity and heat.

**Table 7.2 Heat Delivery in Russia Based on Renewable Energy Sources (thousand Gcal)**

<table>
<thead>
<tr>
<th>№</th>
<th>Plant type</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Biomass fired TPP</td>
<td>8900</td>
<td>9720</td>
<td>10668</td>
<td>15550</td>
<td>20939</td>
</tr>
<tr>
<td>2.</td>
<td>Small biomass boilers</td>
<td>45000</td>
<td>46000</td>
<td>46500</td>
<td>48000</td>
<td>48000</td>
</tr>
<tr>
<td>3.</td>
<td>Sun collectors</td>
<td>30</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>4.</td>
<td>Heat pumps</td>
<td>380</td>
<td>390</td>
<td>400</td>
<td>410</td>
<td>450</td>
</tr>
<tr>
<td>5.</td>
<td>Waste incinerator plants and units</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>7.</td>
<td>Geothermal heat supply systems</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1100</td>
<td>1150</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>57610</strong></td>
<td><strong>59441</strong></td>
<td><strong>60900</strong></td>
<td><strong>67393</strong></td>
<td><strong>72874</strong></td>
</tr>
<tr>
<td></td>
<td>Total heat supply in Russia without</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>residential (million Gcal)</td>
<td>1420.0</td>
<td>1440.0</td>
<td>1426.9</td>
<td>1445.3</td>
<td>1402</td>
</tr>
<tr>
<td></td>
<td>Renewables share</td>
<td>4.1</td>
<td>4.1</td>
<td>4.3</td>
<td>4.66</td>
<td>5.2</td>
</tr>
</tbody>
</table>
Table 7.3 Estimate of the Share of RES in Electricity Production in Russia Including Small Hydro

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total electricity production Bln. kWh</td>
<td>877.8</td>
<td>891.3</td>
<td>892</td>
<td>952</td>
<td>995</td>
<td>1080</td>
<td>1175</td>
</tr>
<tr>
<td>Including RES based</td>
<td>4.3</td>
<td>4.7</td>
<td>5.0</td>
<td>6.5</td>
<td>10.0</td>
<td>15.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Including:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Small &amp; micro hydro</td>
<td>2.3</td>
<td>2.4</td>
<td>2.41</td>
<td>3.0</td>
<td>4.0</td>
<td>5.7</td>
<td>8.0</td>
</tr>
<tr>
<td>2. Biomass &amp; waste TPP</td>
<td>1.9</td>
<td>2.2</td>
<td>2.43</td>
<td>3.3</td>
<td>4.3</td>
<td>6.3</td>
<td>11</td>
</tr>
<tr>
<td>3. Geothermal PP</td>
<td>0.06</td>
<td>0.09</td>
<td>0.15</td>
<td>0.2</td>
<td>1.2</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>4. Wind PP</td>
<td>0.003</td>
<td>0.04</td>
<td>0.06</td>
<td>0.1</td>
<td>0.5</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>5. Other (PV, tidal etc.)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>RES share in electricity production %</td>
<td>0.5</td>
<td>0.53</td>
<td>0.56</td>
<td>0.7</td>
<td>1.0</td>
<td>1.4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Table 7.4 Estimate of RES Share in Domestic Energy Consumption in Russia (except fire wood)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic consumption Mtoe</td>
<td>634.6</td>
<td>643</td>
<td>643.8</td>
<td>677.3</td>
<td>735.0</td>
<td>770.0</td>
<td>812.0</td>
</tr>
<tr>
<td>RES based electricity Bln. kWh</td>
<td>4.3</td>
<td>4.7</td>
<td>5.0</td>
<td>6.5</td>
<td>10.0</td>
<td>15.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Supply of RES based heat million Gcal</td>
<td>57.2</td>
<td>58.7</td>
<td>60.9</td>
<td>70.0</td>
<td>100.0</td>
<td>150.0</td>
<td>250.0</td>
</tr>
<tr>
<td>RES fossil fuel replacement Mtoe</td>
<td>7.4</td>
<td>7.8</td>
<td>8.1</td>
<td>9.6</td>
<td>13.9</td>
<td>20.8</td>
<td>34.3</td>
</tr>
<tr>
<td>RES share in primary energy consumption %</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>1.4</td>
<td>1.9</td>
<td>2.7</td>
<td>4.2</td>
</tr>
</tbody>
</table>

7.2. National Policy for Renewables Deployment

National RES use policy is implemented in accordance with the ES-2020, which identifies RES use targets in terms of fossil fuel and/or installed capacity replacement by 2010, 2015, and 2020.

Activities to promote the use of RES are envisaged within the Federal Earmarked Programs.
A draft law “On Renewable Energy Sources» is under development with a view to supporting RES utilization.

Instruments to encourage RES utilization are those employed in energy efficiency, as listed in Section 5 above.

Decision of the Government of the Russian Federation On Increasing Gas Prices to a Level of Equal Profitability of Domestic and Export Deliveries and on the Increase of the Share of Electricity Sold at Unregulated Prices. The above decisions should be fully implemented in a number of phases by 2011, which would, naturally, improve competitiveness and expand the scope of the RES utilization.

This measure forms a part of the state energy policies in the area of the RES utilization, which envisages implementation of a range of measures related to development of domestic fuel and energy markets, scientific, technological, and innovation-, as well as regional policies, including:

- Ensuring free access (connection) of RES based plants to centralized energy supply systems for the sale of energy produced;
- Diversification of regional energy supply and improvement of their self-sufficiency through a wider RES utilization, etc.

7.3. Renewables Policy Implementation

Results of renewables policy implementations are described above.

Implementation of the Russian renewables policy at the federal level is the responsibility of the Ministry of Industry and Energy, the Ministry of Economic Development and Trade, the Ministry of Regional Development, the Ministry of Natural Resources, the Ministry of Agriculture, the Federal Energy Agency, the Federal Agency of Atomic Energy and other bodies, and at a regional level – of administrations of the Russian Federation Constituent Entities.

At the level of industry these tasks are addressed by appropriate economic actors.
8. ENERGY AND ENVIRONMENT

8.1. General Trends and Objectives

Minimizing negative environmental consequences of fuel and energy sector operations with a view of ensuring a sustainable development of the country and society represents a strategic objective of environmental policy in the energy sector.

Environmental policy and more efficient use of energy are realized independently and, at the same time, are interrelated.

In accordance with the Energy Strategy of Russia environmental safety of the energy sector is one of the strategic objectives of the long-term state energy policies. Qualitative estimates of environmental effects of the fuel and energy complex for 2005 based on the final 2005 data and reporting returned a conclusion that main assertions and theoretical parameters of FEC – environment interaction have been realized, which was greatly assisted by the fact that energy efficiency of the Russian economy has improved faster than predicted by the Energy Strategy of Russia.

As a result, while the GDP growth between 2000 and 2005 amounted to 34.7%, harmful emissions, including CO₂, from industrial activities only increased by 8%, i.e. have demonstrated a 20% decrease in per unit terms.

The FEC share in total harmful industrial emissions of Russia is slightly above 56%, including for solids – 58%, liquid and gas emissions – less than 56%, waste effluents – 23 %, and industrial waste – some 58%.

In addition to the main industrial processes and technologies related to energy uses in the power sector, in heat production, energy production and processing, some major emissions are caused by some individual reasons, e.g. insufficient utilization of associated and process gases during oil production and processing, recovery of coal associated methane, and losses of hydrocarbons during transportation as well as to the growing rates of the capital assets’ obsolescence, failure to introduce the latest efficient environment protection methods and equipment in the basic production processes.

At the same time, there have been certain positive changes in reducing water consumption through waste water recycling, more toxic waste have been decontaminated and recycled, including oil sludge and other industrial inputs.

With a view to implementing the main objectives of environmental management in the major FEC sectors environmental programs are developed and implemented to strengthen environmental management systems in accordance with international standards including ISO 14000 and ISO 9000 and other rules that determine environmental management and audit, as well as product quality.

Environmental effects of the Russian FEC and industry for 2000-2005 and a forecast through 2020 are shown in Tables 8.1-8.6.
It should be noted that in the statistical data for 2004-2005 recorded, and estimated environmental emissions of small and medium sized enterprises (including oil producers) were adjusted, similar to adjustment of emission volumes in accordance with new stricter monitoring requirements, the totality of which has resulted in a statistical increase of emission volumes against previous years by an estimated 7-8%.

In connection with Russian ratification of the Kyoto Protocol emission volumes and trends of greenhouse gases have acquired special importance and international relevancy. Of course, the benchmark level for permissible greenhouse emissions was specified by this document at 1990 when for Russia such emissions were at some 2400 Mt. This level, under Russia’s commitments may not be exceeded before 2008-2012. As a result of the economic crisis in 1990s, energy consumption and, consequently, greenhouse emissions dropped to 1600 Mt in 2000. In the following years, in connection with growing economy and energy consumption, greenhouse emissions increased in 2004 to 1708 Mt (CO2 equivalent) against the backdrop of changes in primary energy consumption pattern. By extrapolating this emissions trend as adjusted by a forecast of social and economic development with a view to doubling GDP, and changes in the energy sector structure, one may conclude that by 2010 such emissions could reach 1900 million to and by 2015 – 2030 Mt, i.e., reach 80% and 85%, respectively, of the Kyoto Protocol quota for 2008-2012. In other words, Russia’s commitments under the Kyoto Protocol would not hamper either rate or scale of the country’s development and, moreover, would offer a significant reserve, which could partially be used commercially within the context of emission trading.

![Greenhouse gas emission dynamics](image-url)
Due to an insignificant growth in 2005 of primary energy production and consumption, figures of environmental impact of the energy use are estimated at a level of 2004 with some deviation of individual indicators within 0.5-0.8% against 2004, and would be in line with environmental safety forecasts for the sector under the Energy Strategy of Russia.

8.2. Environmental Policy Implementation

Development and implementation of nature protection policies and environmental pollution control regulations fall within the mandate of the Ministry of Natural Resources of the Russian Federation, as well as the Federal Service for the Oversight of the Use of Natural Resources, the Federal Agency for Water Resources, Federal Agency for Forestry, and Federal Agency for the Use of the Subsoil.

The above agencies perform their functions in contact with other Federal, and regional authorities.

8.3. Environmental Levies and Taxes

A system of levies for environmental pollution (harmful emissions) and for water use is established and functioning in the Russian Federation.
9. ASSESSMENT AND FUTURE PLANS

Since assessment of energy efficiency, successful instruments, emerging difficulties in the area of energy efficiency, as well as of the recommended improvements to the National Energy Efficiency Improvement Program are interrelated and affect one another, all the above aspects of this Section are presented in a single body of text.

In accordance with the Energy Strategy of Russia through 2020 reduction of a per unit energy intensity of the economy is a vital strategic area and one of the key principles ensuring the country’s economic growth within the forecast parameters. According to theoretical parameters of the Strategy energy intensity per GDP unit should reach in 2005 the level of 85% of the 2000 level, and by 2020 – half of that. It is envisaged that the main tools for reaching the above indicators within the stipulated timeframe should be economic and sectoral restructuring factors driven by changes in market demand for goods and services, as well as modernization and technological innovation and improvement of production assets facilitated by additional investments into the country’s economy.

Analysis has shown that the actual reduction of the energy intensity was considerably greater than the Energy Strategy forecast (See Figure 9.1). According to verified data of the Rosstat of Russia the calculated per unit GDP energy intensity in 2005 was 78.9% of the 2000 level.

The electricity intensity of the economy had reduced at a somewhat slower pace, but still better than the Energy Strategy forecast, and in 2005 80.9% of the 2000 level (against 84.9% under ES-2020).

This faster improvement of both energy efficiency and electricity use efficiency of the economy is largely determined by structural changes in energy consumption where relatively low energy intensity GDP components and industries developed at a faster rate than more energy intensive sectors. Thus, in 2005 delivery of non-energy intensive services grew by 7.5% against the total GDP growth of 6.4%, while total industrial production grew by 4%. In particular, non-energy intensive processing industries demonstrated a growth of 6.1%, food processing – by 5.2%, production of finished goods – by 22.5%, while in the energy intensive industries: metallurgy – by 2.2%, electricity sector – by 2.2%.

Additionally, taking into account that energy and electricity consumption in the residential, domestic, and budget financed sectors remained practically unchanged with a significant GDP growth, it becomes clear that the main components of the resulting improvement of the economy’s energy efficiency are structural (responsible for 75-80% of improvement), while the share of technological components of potential energy saving is estimated at around 20-25%.

In other words, realization of the existing technological energy saving potential could result in even better improvement of the energy- and electricity intensity of the economy if measures are taken to provide incentives for energy users to implement energy savings.
Together with the analysis of energy efficiency in physical terms (toe/GDP Rouble) analysis of economic energy efficiency in monetary terms becomes ever more appropriate (Rouble energy/Rouble GDP), which also reflects fuel and energy price development, as well as changes in energy mix of the country.

Despite growing energy prices, share of energy costs in total costs by sector and for the entire economy remained practically unchanged through 2001-2005 at a level of about 14%, including being in the range of 14-16 % of total costs in the energy intensive sectors and around 5-7 % in non-energy intensive sectors. The only exception is electricity sector where share of the fuel costs, while also being reduced, still reaches about 50% of the total production costs due to specific nature of this sector.

Figure 9.1 Development of Per Unit Energy Intensity of the Russian Economy
It is necessary:

For environmental protection:
• To create prerequisites for priority use of RES in order to reduce fossil fuel consumption and protect the environment.

For internal energy markets development:
• Secure free access (connection) of RES producers to the centralised energy grids.

Within the regional policy:
• Diversification of regional energy supply and higher level of self-sufficiency through wider use of RES.

It is necessary to develop and adopt amendments to the Federal Law on Energy Saving, develop and adopt a law on Promotion of RES and other legislation, in order to ensure wider use of RES, securing fossil fuels resources for future generations, significantly improve energy supply to remote areas, and for improving the state of the environment in polluted areas.

Main implementation mechanisms of the Energy Strategy aimed at realization of technological and organizational potential of energy saving include:

• Development of an efficient market environment;
• Support of the economic entities’ strategic initiatives;
• Technical regulations.

Using the above mechanisms, the state energy efficiency policy is implemented based on the following principles:

• System approach;
• Strategic focus;
• Development of the necessary regulatory and legislative support;
• Utilization of private-public partnership mechanisms;
• Provision of the necessary information support.

Some of the main areas of the development of market environment in the energy saving and energy efficiency include: pricing policies and development of the fuel and energy resources trading institutions; development of competition; institutional development in the area of resource- and energy saving. These areas have developed at a different pace, but with an overall sufficient consistency.

In the first area the above mentioned Decision of the Government of the Russian Federation on Increasing Gas Prices to a Level of Equal Profitability of Domestic (except for long-term five-year contracts with electricity generators) and Export Deliveries and
on the Increase of the Share of Electricity Sold at Unregulated Prices, should be
mentioned. A phased implementation of these decisions should be completed by 2011.
Measures are taken to eliminate cross-subsidies in the electricity sector and to develop
gas, and petroleum products trade through exchanges (currently about 10 Bcm a year,
and in the future – up to 40-45 Bcm a year).

The Plan of Action to Reform the Electricity Sector is implemented successfully: at the
current stage work has been completed to create market entities (generating companies
and major electricity infrastructure organizations) and transition to new rules of
operation at the wholesale and retail markets; investment phase of the electricity sector
reform has been initiated. Rules of operation for retail electricity markets envisage their
gradual liberalization in parallel with the liberalization of the wholesale market, with a
transitional period of electricity supply to the population at regulated tariffs.

Public utility management companies (including for electricity, gas, heat, and water
supply), and energy service, and energy audit companies are established within the
framework of resource-, and energy saving institution building. The two Federal Laws
currently under development and examination, would provide a new impetus in this area.

Formation of new market entities and creation of such incentives for their economic
activities that would result in an economically feasible realization of enormous potential
for energy efficiency improvement – these are the expected main results of the market
environment creation. In essence, that would mean Russia’s entry into a new market: the
energy efficiency market.

As everywhere in the world, development and introduction of long-term rules, standards,
and regulations (long-term, because development and implementation of new regulatory
environment in this area should, obviously, be phased) is of major importance for
improvement of energy efficiency in the Russian economy. In accordance with the
principles mentioned above, such development covers both, the system of energy
consumption and energy efficiency benchmarks, and the system of standards (both
general national standards system, and basic national energy efficiency standards), and, of
course, a system of energy consumption recording and control.

Regarding benchmarks, one could identify a rather active work related to energy audits
and introduction of energy passports for energy intensive enterprises if the FEC,
industry, and residential sector (more than 5000 enterprises), reduction of fuel and
energy losses in production and transportation (the most immediate result being a 3-5%
reduction of hydrocarbon primary materials production losses, and electricity and heat
transmission losses).

Environmental requirements for road vehicles and motor fuels have been enhanced,
which should result also in the improved specific fuel consumption. Introduction of
energy efficiency benchmarks and payment of exceeding them is also planned.

Within the system of recording and control of energy consumption, it is envisaged to
ensure a more comprehensive oversight of rational and efficient FER utilization,
development of voluntary certification, as well as improvement of Building Codes and of the State Project Energy Efficiency Evaluation. In this regard, one is looking for a 10-15% reduction of the FER consumption.

Support for strategic initiatives of market entities plays a key role in the energy efficiency improvement, taking into account also the development of private-public partnership.

This support is provided within the framework of development and implementation of Federal Earmarked Programs, sectoral and regional programs, and projects.

A new Program “Improvement of the Energy Consumption Efficiency in the Russian Federation through 2015” is under development to replace the “Energy Efficient Economy” Federal Earmarked Program (for 2002-2006). Research is under way on Priority Areas of the Development of Science, Technology, and Equipment in the Russian Federation and on the List of Critical Technologies having a direct bearing on the improvement of energy efficiency (including technologies of nuclear energy, hydrogen energy, new and renewable energy sources, development of energy saving heat and electricity transportation, distribution and consumption systems, development of energy efficient engines and propulsion plants for transportation systems, nanotechnologies and nanomaterials etc.).

A wide range of sectoral development programs, FEC programs and master plans, energy company investment programs is developed and implemented. In particular, one could mention in this connection: the Strategy of Metallurgy Development through 2015; the Strategy of Chemistry and Petrochemistry Development through 2015; a the Set of Measures to Improve Competitiveness of the Forestry Industry; energy saving and investment programs of JSC Gazprom, JSC Lukoil, JSC Nornikel, Urals Mining and Metallurgical Company, JSC Severstal’ and others. Quite naturally, all these documents address saving of resources and energy.

Due to the fact that electricity and heat generation consume about 70% of all fuel and, as stated before, the share of electricity in industrial energy costs amounts to 46%, and heat – 21-43% in some industrial sectors, energy efficiency in production and consumption of electricity and heat are a priority. In this connection, in addition to technology improvements in this area, among organizational and institutional measures, which must be taken with a view to improving energy efficiency of the economy, measures to further develop electricity and heat markets should be envisaged. In addition to activities aimed at the development of competitive electricity market as envisaged by the Federal Laws «On Electricity» and «On Entry into Force of the Federal Law «On Electricity», and envisaged by the Resolution of the Government of the Russian Federation on the Electricity Sector Reform, long term electricity and heat futures markets (exchanges) are envisaged, which would facilitate discovery by energy users and independent producers of ways to develop competitive and more economically effective sources of energy, primarily heat, as well as electricity.

As stated above, market trade in electricity and gas at free prices is now being evaluated with a view to making a transition to a fully liberalized market in Russia as of 2011 (except for the population).
Greenhouse gases quota trading system under the 1997 Kyoto Protocol ratified by Russia in 2004 would be an important incentive.

Implementation of many of the above measures within the State competence should be taken on board in amending the Federal Law «On Energy Saving».

The idea of further improvement of existing and introduction of entirely new legal regulatory mechanisms in the energy saving area with a view to ensuring economic incentives for implementation of energy efficiency programs by fuel and energy producers and consumers taking on board the above considerations, should form the basis of the updated draft law.

The objective of the updated draft law should be to provide a legal basis for the development and implementation of financial, technical, and organizational measures aimed at achievement within a relatively short time of an optimal level of energy efficiency both, for individual economic actors, and for the economy at large.
10. MAIN CONSULTED SOURCES


3) National Communication of the Russian Federation provided under Articles 4 and 12 of UNFCCC and Article 7 of the Kyoto Protocol.


7) Annual reports of the Minprirody (Ministry of Natural Resources) of Russia «State Report of the State and Protection of Environment of the Russian Federation».
Russian Federation

REGULAR REVIEW 2007

Part II:

Indicators on Energy, Energy Efficiency, Economy and Environment
a. Introduction................................................................. 41
b. Macro-Economic Data .......................................................... 42
c. General Energy Data.............................................................. 42
d. Sector Consumption: Parameters and Energy Efficiency Indicators.... 43
e. End-Use Energy Prices for Various Market Sectors ....................... 46
f. CO$_2$ Emissions .................................................................. 46
a. Introduction


Part I covers qualitative data on energy and energy efficiency policies, measures and instruments, and actors. This part focuses on quantitative data.

The tables include data relevant to the use of energy. Furthermore information is asked on end-use energy prices and CO2 emissions.

Because the statistical reporting structure in the Russian Federation differs significantly from the structure and nomenclature of indicators suggested for this regular report, some parameters could not be reflected in this review. Moreover, as of the State Statistical System of Russia introduced a new system of indicators by main types of economic activities (OKVED), which replaced a previously used sectoral system. Therefore, some of the indicators given below are calculated indicators and are not verified by official statistics.
b. Macro-Economic Data

Table b.1. Gross Domestic Product

GDP and GDP (PPP) have been adapted with the Purchasing Power Parity – PPP in billion USD. The figures presented should be based on 2000 prices and 2000 USD exchange rate.

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<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>385.4</td>
<td>239.6</td>
<td>259.6</td>
<td>272.8</td>
<td>285.6</td>
<td>306.5</td>
<td>328.5</td>
<td>349.6</td>
</tr>
<tr>
<td>GDP (PPP)</td>
<td>1484.4</td>
<td>922.6</td>
<td>999.6</td>
<td>1050.6</td>
<td>1100.0</td>
<td>1180.3</td>
<td>1265.2</td>
<td>1346.1</td>
</tr>
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</table>

Sources: Rosstat and MEDT data, GU IES calculations

Table b.2. Number of inhabitants

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</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>147.9</td>
<td>148.4</td>
<td>146.6</td>
<td>146.0</td>
<td>145.2</td>
<td>144.6</td>
<td>143.8</td>
<td>143.1</td>
</tr>
</tbody>
</table>

Source: MEDT

c. General Energy Data

Table c.1.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Total Primary Energy Production</td>
<td>1299.6</td>
<td>985.4</td>
<td>992.4</td>
<td>1025.6</td>
<td>1061.1</td>
<td>1133.6</td>
<td>1187.5</td>
<td>1215.3</td>
</tr>
<tr>
<td>Net imports</td>
<td>−418.8</td>
<td>−311.0</td>
<td>−358.5</td>
<td>−374.4</td>
<td>−415.9</td>
<td>−463.1</td>
<td>−516.9</td>
<td>−536.7</td>
</tr>
<tr>
<td>Total Primary Energy Supply (TPES)</td>
<td>880.7</td>
<td>674.4</td>
<td>633.9</td>
<td>651.2</td>
<td>645.1</td>
<td>670.5</td>
<td>670.6</td>
<td>678.6</td>
</tr>
<tr>
<td>Total Final Consumption (TFC)</td>
<td>888.3</td>
<td>664.6</td>
<td>634.6</td>
<td>643.0</td>
<td>643.8</td>
<td>656.7</td>
<td>667.7</td>
<td>677.3</td>
</tr>
<tr>
<td>TPES/GDP (toe/ thous. 2000 US$)</td>
<td>2.3</td>
<td>2.8</td>
<td>2.4</td>
<td>2.4</td>
<td>2.3</td>
<td>2.1</td>
<td>2.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Total Electricity Consumption</td>
<td>258.1</td>
<td>202.0</td>
<td>207.6</td>
<td>210.4</td>
<td>211.5</td>
<td>217.2</td>
<td>222.7</td>
<td>226.3</td>
</tr>
<tr>
<td>Electricity produced from RES</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Heat produced from RES**</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
d. Sector Consumption: Parameters and Energy Efficiency Indicators

Table d.1. Total Final Energy Consumption (TFC) by end-use sector

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>17.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>504.1</td>
<td>503.9</td>
<td>508.6</td>
<td>511.6</td>
<td>550.3**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>11.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>51.0</td>
<td>51.6</td>
<td>57.4</td>
<td>62.2</td>
<td>61.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>18.1</td>
<td>16.7</td>
<td>13.2</td>
<td>12.1</td>
<td>11.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others*</td>
<td>61.4</td>
<td>70.8</td>
<td>77.5</td>
<td>81.8</td>
<td>25.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (TFC)</td>
<td>888.3</td>
<td>664.6</td>
<td>634.6</td>
<td>643.0</td>
<td>643.8</td>
<td>656.7</td>
<td>667.7</td>
<td>677.3</td>
</tr>
</tbody>
</table>

**Others** include residential sector, services, and other sectors in aggregated form and non-energy use

** Including construction (See Table d3)

Table d.2. Energy Efficiency Indicators for Households: Final Consumption of the Residential Sector by Energy Source

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Total Final Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Heat</td>
<td>50.1</td>
<td>50.41</td>
<td>50.72</td>
<td>51.03</td>
<td>51.34</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Oil products</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>d. Gas</td>
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<td></td>
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<tr>
<td>e. Coal</td>
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<td></td>
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<tr>
<td>f. Combust. Renew. &amp; Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor Area (’000 m²)</td>
<td>2450</td>
<td>2645</td>
<td>2787</td>
<td>2822</td>
<td>2853</td>
<td>2885</td>
<td>2917</td>
<td>2956</td>
</tr>
<tr>
<td>No. of dwellings (’000)</td>
<td>18279</td>
<td>18659</td>
<td>18909</td>
<td>18932</td>
<td>19015</td>
<td>19081</td>
<td>19095</td>
<td>19156</td>
</tr>
<tr>
<td>Residential use per dwelling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(toe/dwelling)</td>
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<td></td>
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<tr>
<td>Residential use per surface</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>(toe/m²)</td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Table d.3: Final Consumption of the Industry Sector by Energy Source in 2005
(Mtoe)

<table>
<thead>
<tr>
<th>Indicators industrial sector</th>
<th>Mining</th>
<th>Iron and steel</th>
<th>Chem. and petrochemical</th>
<th>Non-ferrous metals</th>
<th>Non-metallic minerals*</th>
<th>Food and tobacco</th>
<th>Paper pulp and print</th>
<th>Other</th>
<th>Construction</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>2439</td>
<td>20707</td>
<td>419</td>
<td>52938</td>
<td>596</td>
<td>830</td>
<td>808</td>
<td>215</td>
<td>953</td>
<td></td>
</tr>
<tr>
<td>Petroleum products</td>
<td>1413</td>
<td>1128</td>
<td>1407</td>
<td>11687</td>
<td>577</td>
<td>1466</td>
<td>970</td>
<td>224</td>
<td>18.872</td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td>14711</td>
<td>19669</td>
<td>22447</td>
<td>168407</td>
<td>5106</td>
<td>2831</td>
<td>10790</td>
<td>794</td>
<td>244.755</td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>23563</td>
<td>31448</td>
<td>9401</td>
<td>22124</td>
<td>2987</td>
<td>3557</td>
<td>11464</td>
<td>1.485</td>
<td>105.929</td>
<td></td>
</tr>
<tr>
<td>Heat</td>
<td>5878</td>
<td>8849</td>
<td>15419</td>
<td>18193</td>
<td>5803</td>
<td>5116</td>
<td>11875</td>
<td>1.130</td>
<td>72.263</td>
<td></td>
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<tr>
<td>Total</td>
<td>48.497</td>
<td>92.822</td>
<td>52.216</td>
<td>284384</td>
<td>15.217</td>
<td>15.322</td>
<td>38</td>
<td>3.772</td>
<td>550.265</td>
<td></td>
</tr>
<tr>
<td>Value added per sector (2000 USDx10^6)**</td>
<td>36708</td>
<td>13198</td>
<td>5890</td>
<td>24050</td>
<td>14.398</td>
<td>4145</td>
<td>10686</td>
<td>19927</td>
<td>129002</td>
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</tr>
<tr>
<td>Energy/value added (Mtoe/ 10^6 USD)</td>
<td>1.32</td>
<td>7.03</td>
<td>8.865</td>
<td>11.825</td>
<td>1.057</td>
<td>3.70</td>
<td>5.56</td>
<td>0.189</td>
<td>4.266</td>
<td></td>
</tr>
</tbody>
</table>

*Includes electricity, gas, and water production and distribution

**Estimated
### Table d.4. Energy Efficiency Indicators for Services (commercial and non-commercial): Final Energy Consumption of Services by Energy Source

<table>
<thead>
<tr>
<th>Indicators services sector</th>
<th>1990</th>
<th>1995</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
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<tbody>
<tr>
<td>Total Final Consumption</td>
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<td></td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>a. Electricity</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td>3.62</td>
<td></td>
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<tr>
<td>b. Heat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.98</td>
<td></td>
</tr>
<tr>
<td>c. Oil products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.31</td>
<td></td>
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<tr>
<td>d. Gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.30</td>
<td></td>
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<tr>
<td>e. Coal</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>g. Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>No. of employees (mil.)</td>
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<td></td>
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<td></td>
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<tr>
<td>Floor area ('000 m²)</td>
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<td></td>
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<tr>
<td>Value added (10^6 USD)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>159418</td>
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<tr>
<td>Energy/value added (Mtoe/10^6 USD)</td>
<td></td>
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<td></td>
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<td>0.0715</td>
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<tr>
<td>toe/Employee</td>
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<tr>
<td>toe/m²</td>
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</tbody>
</table>

### Table d.5. Transport indicators (2005)

<table>
<thead>
<tr>
<th>Indicators transport sector</th>
<th>Freight</th>
<th>Travel</th>
<th>Total</th>
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<tbody>
<tr>
<td>Total Final Consumption (Mtoe)</td>
<td></td>
<td></td>
<td>61.08</td>
</tr>
<tr>
<td>10^6 Tonne-km *</td>
<td>4675.7</td>
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<td>4675.7</td>
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<tr>
<td>TFC/10^6 tonne-km</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>10^6 Person-km *</td>
<td>–</td>
<td>396.8</td>
<td>396.8</td>
</tr>
<tr>
<td>TFC/person-km (TFC/10^6 person-km)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
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<td>Number of cars/1000 inhabitants</td>
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* 2004
e. **End-Use Energy Prices for Various Market Sectors**

Energy prices in Russia are differentiated by region and are structurally different from the suggested table format. Therefore, the data below are obtained from statistics and are not official.

**Table e.1. Energy prices for end use sectors 2005 (December) (Average for Russia)**

<table>
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<tr>
<th>Sectors</th>
<th>Unleaded gasoline 95 RON (litre)</th>
<th>Light fuel oil ('000 litres)</th>
<th>Diesel (litre)</th>
<th>Heavy fuel oil (tonne)</th>
<th>Nat. Gas (10^7 kcal GCV*)</th>
<th>Steam Coal (tonne)</th>
<th>Electricity (KWh)</th>
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<tr>
<td>Electricity generation</td>
<td>-</td>
<td>436.3</td>
<td>490.0</td>
<td>182.0</td>
<td>61.71</td>
<td>27.50</td>
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* Gross Calorific value

Sources: *Rosstat* statistical reports recalculated by GU IES

f. **CO\(_2\) Emissions**

**Table f.1. CO\(_2\) emissions from fuel combustion**

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<td>1700</td>
<td>1600</td>
<td>1610</td>
<td>1615</td>
<td>1620</td>
<td>1630</td>
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<td>Share electricity and heat production (%)</td>
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<td>1.0</td>
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Sources: : Part I Section 10 paras. 3, 7 of this review, and GU IES calculations.
## 2005 Electricity tariffs for population and industrial enterprises by Russian regions

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<th>Region</th>
<th>Own cost in Roubles</th>
<th>Established economically justified tariff in Roubles</th>
<th>Tariff for natural persons in Roubles</th>
<th>Service tariff for enterprises and organizations</th>
<th>Reference service per capita monthly consumption</th>
<th>Service value in Roubles calculated for:</th>
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Table 8.1 Environmental Impact of Russian Industry\textsuperscript{1} and Fuel and Energy Complex (without Nuclear Energy) for 1991-2005

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<th>Year</th>
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<th>2000</th>
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<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
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<td>8622.7</td>
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<td>15491.6</td>
<td>15842</td>
<td>15874.7</td>
<td>16732.5</td>
<td>16820.0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Solid</td>
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<td>6020.9</td>
<td>6435.2</td>
<td>7182.2</td>
<td>7332.6</td>
<td>8094.9</td>
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<td>13579.2</td>
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<td>Sulfur dioxide</td>
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<td>4954.8</td>
<td>4685.3</td>
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<td>Carbon monoxide</td>
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<td>1366.3</td>
<td>1635.8</td>
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<td>6766.5</td>
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<td>4169.1</td>
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<td>Nitrogen oxides</td>
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<td>1008.5</td>
<td>997.2</td>
<td>952.2</td>
<td>964.3</td>
<td>931.8</td>
<td>959.6</td>
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<td>1368.3</td>
<td>1367.8</td>
<td>1329.3</td>
<td>1343.4</td>
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<td>Hydrocarbons (excluding light organic compounds)</td>
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<td>1273.6</td>
<td>1292.7</td>
<td>1353.3</td>
<td>1206.9</td>
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<td>1404.9</td>
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<td>1771.2</td>
<td>741.8</td>
<td>1005.8</td>
<td>1026.5</td>
<td>1190.6</td>
<td>1237.9</td>
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<td>Water used million m\textsuperscript{3}</td>
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<td>31615.4</td>
<td>30571.6</td>
<td>30195.3</td>
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<td>56562</td>
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<td>39570.4</td>
<td>38304.6</td>
<td>37680.3</td>
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<td>Recirculated and recycled water million m\textsuperscript{3}</td>
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<td>78925.6</td>
<td>78343.2</td>
<td>79387.3</td>
<td>81801.9</td>
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<td>131180.6</td>
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<td>133101.5</td>
<td>132482.2</td>
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<tr>
<td>Total water discharge and surface reservoirs –million. m\textsuperscript{3}</td>
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<td>26674.8</td>
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<td>33775.2</td>
<td>32994.5</td>
<td>31912.5</td>
<td>31013.5</td>
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<td></td>
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<td></td>
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<tr>
<td>Contaminated waste water</td>
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\textit{Note}: nominator line — FEC data, denominator line — Russian industry.

\textsuperscript{1} Industry includes the energy production sector

\textsuperscript{*} Excluding losses in general purpose pipelines.
Table 8.2 Relationship between Human Industrial Activities and Environment in Russia in 2005, Including for FEC and its Sectors

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<th>All FEC sectors</th>
<th>Electricity</th>
<th>Oil production</th>
<th>Oil processing</th>
<th>Gas sector</th>
<th>Coal sector</th>
<th>Total FEC enterprises</th>
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<td>574</td>
<td>696.5</td>
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<tr>
<td>’000 ton</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Including:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Solid ’000 ton</td>
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<td>7.5</td>
<td>27.8</td>
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<tr>
<td>Liquid and gaseous ’000 ton</td>
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<td>Sulfur dioxide, ’000 ton</td>
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<td>37.8</td>
<td>95.5</td>
<td>29073.7</td>
</tr>
<tr>
<td>million m³</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Recirculated and recycled</td>
<td>135462</td>
<td>132782.5</td>
<td></td>
<td>74560.3</td>
<td>1870.5</td>
<td>4010.3</td>
<td>480.2</td>
<td>537.3</td>
<td>81458.6</td>
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<td>water million m³</td>
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<td></td>
<td></td>
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<tr>
<td>Total discharged waste</td>
<td>50894.6</td>
<td>31013.5</td>
<td></td>
<td>25092.5</td>
<td>16.8</td>
<td>318.8</td>
<td>26.6</td>
<td>476.9</td>
<td>25931.6</td>
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<td>water million m³</td>
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<tr>
<td>Including contaminated</td>
<td>17727.5</td>
<td>5597.3</td>
<td></td>
<td>680</td>
<td>3.8</td>
<td>200.5</td>
<td>11.2</td>
<td>415.9</td>
<td>1311.4</td>
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<td>million m³</td>
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<tr>
<td>Including without treatment</td>
<td>3424.2</td>
<td>1465</td>
<td></td>
<td>515.2</td>
<td>2.4</td>
<td>0.1</td>
<td>0.9</td>
<td>142.3</td>
<td>660.9</td>
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</table>

Table 8.3 History of Air Pollutant Emissions from Stationary Sources in Mt

<table>
<thead>
<tr>
<th>Economic sector</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Federation</td>
<td>19481.2</td>
<td>19829.4</td>
<td>20491.3</td>
<td>20425.3</td>
</tr>
<tr>
<td>Industry</td>
<td>15842.0</td>
<td>15874.7</td>
<td>16732.5</td>
<td>16820.0</td>
</tr>
<tr>
<td>Total FEC</td>
<td>8443.3</td>
<td>8622.7</td>
<td>9441.9</td>
<td>9482.5</td>
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</tbody>
</table>

including fuel and energy sectors

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil production</td>
<td>3113.4</td>
<td>3227.2</td>
<td>4195.0</td>
<td>4234.0</td>
</tr>
<tr>
<td>Electricity</td>
<td>3352.7</td>
<td>3446.6</td>
<td>3257.7</td>
<td>3216.8</td>
</tr>
<tr>
<td>Coal</td>
<td>819.5</td>
<td>763.9</td>
<td>757.3</td>
<td>761.2</td>
</tr>
<tr>
<td>Gas</td>
<td>536.9</td>
<td>591.2</td>
<td>650.7</td>
<td>696.5</td>
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<tr>
<td>Oil processing</td>
<td>620.8</td>
<td>593.8</td>
<td>581.2</td>
<td>574.0</td>
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</table>

*) Excluding losses in general purpose pipelines.
Table 8.4 History of Industrial and Consumer Waste, Mt

<table>
<thead>
<tr>
<th>Economic sector</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Federation</td>
<td>2034.9</td>
<td>2613.5</td>
<td>2634.9</td>
<td>2700.0</td>
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<tr>
<td>Industry</td>
<td>1989.2</td>
<td>2570.6</td>
<td>2599.4</td>
<td>2610.0</td>
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<tr>
<td>Total FEC</td>
<td>1113.9</td>
<td>1319.1</td>
<td>1502.1</td>
<td>1508.0</td>
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<tr>
<td>Including fuel and energy sectors</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>1053.7</td>
<td>1243.4</td>
<td>1442.9</td>
<td>1450.0</td>
</tr>
<tr>
<td>Electricity</td>
<td>57.4</td>
<td>73.1</td>
<td>57.5</td>
<td>56.0</td>
</tr>
<tr>
<td>Oil processing</td>
<td>1.6</td>
<td>0.9</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Oil production</td>
<td>0.9</td>
<td>1.4</td>
<td>0.6</td>
<td>0.8</td>
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<tr>
<td>Gas</td>
<td>0.25</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
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Table 8.5 Share of FEC in Environmental Pollution by the Russian Federation Industry in 2005

<table>
<thead>
<tr>
<th></th>
<th>Air emissions, %</th>
<th>Waste water discharge, %</th>
<th>Waste generation, %</th>
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<tbody>
<tr>
<td>Total RF industry</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total FEC</td>
<td>56.0</td>
<td>23.3</td>
<td>58.1</td>
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<tr>
<td>Including fuel and energy sectors</td>
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<td></td>
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<tr>
<td>Oil production</td>
<td>25</td>
<td>0.1</td>
<td>0.02</td>
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<tr>
<td>Electricity</td>
<td>19</td>
<td>12</td>
<td>2</td>
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<tr>
<td>Coal</td>
<td>5</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td>Gas</td>
<td>4</td>
<td>0.2</td>
<td>0.004</td>
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<tr>
<td>Oil Processing</td>
<td>3</td>
<td>4</td>
<td>0.03</td>
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53
Table 8.6 Forecast of the FEC Environmental Impact through 2020* Air Emissions

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</thead>
<tbody>
<tr>
<td>Total emissions</td>
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<tr>
<td>Electricity</td>
<td>7570</td>
<td>3857</td>
<td>5310</td>
<td>5896</td>
<td>6493</td>
<td>7570</td>
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<tr>
<td>Oil production</td>
<td>2345</td>
<td>1619</td>
<td>1288</td>
<td>1273</td>
<td>1278</td>
<td>1275</td>
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<tr>
<td>Oil processing</td>
<td>1436</td>
<td>736</td>
<td>878</td>
<td>932</td>
<td>1007</td>
<td>1019</td>
</tr>
<tr>
<td>Gas**</td>
<td>1825</td>
<td>502</td>
<td>1831</td>
<td>1926</td>
<td>2020</td>
<td>2049</td>
</tr>
<tr>
<td>Coal</td>
<td>662</td>
<td>604</td>
<td>450</td>
<td>480</td>
<td>500</td>
<td>615</td>
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<td>Total</td>
<td>13838</td>
<td>7318</td>
<td>9757</td>
<td>10507</td>
<td>11298</td>
<td>12527</td>
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<td>Solids</td>
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<tr>
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<td>2390</td>
<td>1164</td>
<td>1501</td>
<td>1677</td>
<td>1841</td>
<td>2283</td>
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<td>42</td>
<td>42</td>
<td>38</td>
<td>37</td>
<td>36</td>
</tr>
<tr>
<td>Oil processing</td>
<td>13</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Gas</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Coal</td>
<td>96</td>
<td>75</td>
<td>84</td>
<td>93</td>
<td>98</td>
<td>107</td>
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<tr>
<td>Total</td>
<td>2538</td>
<td>1297</td>
<td>1644</td>
<td>1825</td>
<td>1994</td>
<td>2443</td>
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<td>Liquid and gaseous (SO₂, NOₓ, CO, LOC, methane)</td>
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<td>5180</td>
<td>2926</td>
<td>3809</td>
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<td>4652</td>
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<td>1246</td>
<td>1235</td>
<td>1240</td>
<td>1238</td>
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<tr>
<td>Oil processing</td>
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<td>797</td>
<td>867</td>
<td>921</td>
<td>995</td>
<td>1008</td>
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<tr>
<td>Gas**</td>
<td>1817</td>
<td>776</td>
<td>1825</td>
<td>1920</td>
<td>2014</td>
<td>2043</td>
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<tr>
<td>Coal</td>
<td>566</td>
<td>380</td>
<td>366</td>
<td>387</td>
<td>402</td>
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<tr>
<td>Total</td>
<td>11301</td>
<td>6021</td>
<td>8113</td>
<td>8682</td>
<td>9303</td>
<td>10084</td>
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<tr>
<td>Including:</td>
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<tr>
<td>SO₂</td>
<td>3536</td>
<td>2236</td>
<td>2480</td>
<td>2758</td>
<td>3010</td>
<td>3313</td>
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<tr>
<td>NOₓ</td>
<td>1805</td>
<td>1324</td>
<td>1488</td>
<td>1594</td>
<td>1742</td>
<td>1992</td>
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<td>Methane</td>
<td>3357</td>
<td>2237</td>
<td>2270</td>
<td>2314</td>
<td>2378</td>
<td>2478</td>
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</table>

* Under a favorable economic scenario  
** 2005 -2020 – Including losses in general purpose pipelines
Russian Federation

REGULAR REVIEW 2007

Part II:

Indicators on Energy, Energy Efficiency, Economy and Environment

Based on IEA data
a. Introduction

This Part II of the Regular Review of the Energy Efficiency Policies of the Russian Federation under PEEREA is based on latest available IEA Energy Statistics.

Conversion of units:

Units are converted to Mtoe using the general conversion factors for energy.

1 Mtoe = 11.63 TWh
1 Mtoe = 4.1868x10^4 TJ;
1 Mtoe = 10^7 Gcal
b. Macro-Economic Data

Table b.2. Gross Domestic Product

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP</th>
<th>(billion US$2000)</th>
<th>GDP (PPP)</th>
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<td>1992</td>
<td>313.172</td>
<td>1231.402</td>
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<td>1995</td>
<td>239.71</td>
<td>941.356</td>
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<tr>
<td>2000</td>
<td>259.709</td>
<td>1038.121</td>
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<tr>
<td>2001</td>
<td>272.933</td>
<td>1077.58</td>
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<tr>
<td>2002</td>
<td>285.88</td>
<td>1134.744</td>
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<td>2003</td>
<td>306.886</td>
<td>1232.506</td>
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<td>2004</td>
<td>328.809</td>
<td>1309.123</td>
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<td>2005</td>
<td>349.85</td>
<td>1380.75</td>
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Table b.2. Number of inhabitants

<table>
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<tr>
<th>Year</th>
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<tr>
<td>1992</td>
<td>148.69</td>
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<td>1995</td>
<td>148.14</td>
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<td>2000</td>
<td>146.30</td>
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<tr>
<td>2001</td>
<td>145.90</td>
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<tr>
<td>2002</td>
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<td>2003</td>
<td>144.60</td>
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<td>2004</td>
<td>143.85</td>
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<td>2005</td>
<td>143.11</td>
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c. General Energy Data

Table c.1.

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</thead>
<tbody>
<tr>
<td>Total Primary Energy Production</td>
<td>1118.672</td>
<td>953.933</td>
<td>966.478</td>
<td>996.115</td>
<td>1034.483</td>
<td>1106.887</td>
<td>1158.465</td>
<td>1184.857</td>
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<td>Net imports</td>
<td>-343.884</td>
<td>-325.555</td>
<td>-352.53</td>
<td>-374.809</td>
<td>-416.677</td>
<td>-467.208</td>
<td>-516.933</td>
<td>-538.177</td>
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<tr>
<td>Total Primary Energy Supply (TPES)</td>
<td>774.788</td>
<td>628.377</td>
<td>613.947</td>
<td>621.306</td>
<td>617.807</td>
<td>639.680</td>
<td>641.532</td>
<td>646.680</td>
</tr>
<tr>
<td>Total Final Consumption (TFC)</td>
<td>586.559</td>
<td>464.851</td>
<td>422.548</td>
<td>425.115</td>
<td>412.238</td>
<td>422.105</td>
<td>425.178</td>
<td>419.904</td>
</tr>
<tr>
<td>TPES/GDP (toe/thous.2000US$)</td>
<td>2.474</td>
<td>2.621</td>
<td>2.364</td>
<td>2.276</td>
<td>2.161</td>
<td>2.084</td>
<td>1.951</td>
<td>1.848</td>
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<tr>
<td>TFC/GDP (toe/ thous.2000US$)</td>
<td>1.873</td>
<td>1.939</td>
<td>1.627</td>
<td>1.558</td>
<td>1.442</td>
<td>1.375</td>
<td>1.293</td>
<td>1.200</td>
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<tr>
<td>TFC/population (toe/capita)</td>
<td>3.945</td>
<td>3.138</td>
<td>2.888</td>
<td>2.913</td>
<td>2.837</td>
<td>2.919</td>
<td>2.956</td>
<td>2.934</td>
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<tr>
<td>Total Electricity Consumption</td>
<td>65.047</td>
<td>53.176</td>
<td>52.333</td>
<td>53.151</td>
<td>53.168</td>
<td>54.372</td>
<td>55.516</td>
<td>55.898</td>
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<tr>
<td>Heat produced from RES**</td>
<td>3.220</td>
<td>2.937</td>
<td>2.662</td>
<td>2.617</td>
<td>2.513</td>
<td>2.273</td>
<td>2.793</td>
<td>2.822</td>
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d. Sector Consumption: Parameters and Energy Efficiency Indicators

Table d.1. Total Final Energy Consumption (TFC) by end-use sector

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>Residential</td>
<td>74.372</td>
<td>146.441</td>
<td>139.892</td>
<td>143.532</td>
<td>133.648</td>
<td>138.627</td>
<td>134.749</td>
<td>110.557</td>
</tr>
<tr>
<td>Industry</td>
<td>93.597</td>
<td>150.923</td>
<td>130.915</td>
<td>129.892</td>
<td>129.280</td>
<td>128.036</td>
<td>127.090</td>
<td>127.980</td>
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<tr>
<td>Transport</td>
<td>117.141</td>
<td>81.852</td>
<td>79.951</td>
<td>82.491</td>
<td>84.472</td>
<td>88.763</td>
<td>94.997</td>
<td>94.851</td>
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<tr>
<td>Others*</td>
<td>262.589</td>
<td>35.811</td>
<td>35.408</td>
<td>36.529</td>
<td>34.533</td>
<td>36.105</td>
<td>38.184</td>
<td>42.060</td>
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<tr>
<td>Total (TFC)</td>
<td>586.559</td>
<td>464.851</td>
<td>422.548</td>
<td>425.115</td>
<td>412.238</td>
<td>422.105</td>
<td>425.178</td>
<td>419.904</td>
</tr>
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</table>


* Others include Non-specified other sectors and Non-energy use

Table d.2. Energy Efficiency Indicators for Households: Final Consumption of the Residential Sector by Energy Source

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</thead>
<tbody>
<tr>
<td>Total Final Consumption</td>
<td>74.372</td>
<td>146.441</td>
<td>139.892</td>
<td>143.532</td>
<td>133.648</td>
<td>138.627</td>
<td>134.749</td>
<td>110.557</td>
</tr>
<tr>
<td>b. Heat</td>
<td>76.311</td>
<td>68.916</td>
<td>72.028</td>
<td>67.199</td>
<td>69.959</td>
<td>68.669</td>
<td>52.758</td>
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<tr>
<td>d. Gas</td>
<td>40.612</td>
<td>43.234</td>
<td>43.111</td>
<td>43.043</td>
<td>42.172</td>
<td>45.478</td>
<td>42.708</td>
<td>38.133</td>
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<td>g. Others</td>
<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
</tbody>
</table>

Floor Area ('000 m²)

No. of dwellings ('000)

Residential use per dwelling (toe/dwelling)

Residential use per surface (toe/m²)

Table d.3: Final Consumption of the Industry Sector by Energy Source in 2004

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Mining</th>
<th>Iron and steel</th>
<th>Chem. and petrochemical</th>
<th>Non-ferrous metals</th>
<th>Non-metallic minerals</th>
<th>Food and tobacco</th>
<th>Paper pulp and print</th>
<th>Other</th>
<th>Construction</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>0.403</td>
<td>10.383</td>
<td>0.015</td>
<td>0</td>
<td>0.662</td>
<td>0.167</td>
<td>0.003</td>
<td>0.207</td>
<td>0.023</td>
<td>11.863</td>
</tr>
<tr>
<td>Petroleum products</td>
<td>0.878</td>
<td>0.953</td>
<td>5.721</td>
<td>0</td>
<td>0.222</td>
<td>0.368</td>
<td>0.202</td>
<td>1.162</td>
<td>0.752</td>
<td>10.252</td>
</tr>
<tr>
<td>Gas</td>
<td>1.170</td>
<td>14.255</td>
<td>2.412</td>
<td>0</td>
<td>9.360</td>
<td>0.883</td>
<td>0.096</td>
<td>1.552</td>
<td>0.382</td>
<td>30.110</td>
</tr>
<tr>
<td>Electricity</td>
<td>1.985</td>
<td>12.836</td>
<td>3.437</td>
<td>0</td>
<td>1.323</td>
<td>1.213</td>
<td>0.300</td>
<td>6.463</td>
<td>0.812</td>
<td>28.369</td>
</tr>
<tr>
<td>Heat</td>
<td>1.907</td>
<td>7.715</td>
<td>13.467</td>
<td>0</td>
<td>2.044</td>
<td>5.049</td>
<td>1.160</td>
<td>14.473</td>
<td>0.986</td>
<td>46.801</td>
</tr>
<tr>
<td>Combust. Renew.&amp;Waste</td>
<td>0.006</td>
<td>0.167</td>
<td>0</td>
<td>0</td>
<td>0.001</td>
<td>0.034</td>
<td>0.009</td>
<td>0.363</td>
<td>0.004</td>
<td>0.584</td>
</tr>
<tr>
<td>Total</td>
<td>6.349</td>
<td>46.308</td>
<td>25.053</td>
<td>0</td>
<td>13.612</td>
<td>7.714</td>
<td>1.769</td>
<td>24.216</td>
<td>2.959</td>
<td>127.980</td>
</tr>
</tbody>
</table>

| Value added per sector (2000 USDx10^6) | |
|---------------------------------------| |

<table>
<thead>
<tr>
<th>Energy/value added (Mtoe/10^6 USD)</th>
</tr>
</thead>
</table>

Table d.4. Energy Efficiency Indicators for Services (commercial and non-commercial): Final Energy Consumption of Services by Energy Source

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Final Consumption</td>
<td>19.612</td>
<td>25.453</td>
<td>22.648</td>
<td>19.683</td>
<td>20.027</td>
<td>20.450</td>
<td>34.600</td>
<td></td>
</tr>
<tr>
<td>a. Electricity</td>
<td>5.572</td>
<td>5.164</td>
<td>5.527</td>
<td>5.705</td>
<td>5.622</td>
<td>5.689</td>
<td>6.004</td>
<td>9.541</td>
</tr>
<tr>
<td>c. Oil products</td>
<td>0.334</td>
<td>0.375</td>
<td>1.016</td>
<td>1.051</td>
<td>0.902</td>
<td>1.139</td>
<td>0.848</td>
<td>0.884</td>
</tr>
<tr>
<td>d. Gas</td>
<td>7.795</td>
<td>4.346</td>
<td>2.455</td>
<td>2.373</td>
<td>2.325</td>
<td>2.507</td>
<td>2.722</td>
<td>3.558</td>
</tr>
<tr>
<td>e. Coal</td>
<td>5.257</td>
<td>0.802</td>
<td>0.370</td>
<td>0.340</td>
<td>0.351</td>
<td>0.320</td>
<td>0.310</td>
<td>2.543</td>
</tr>
<tr>
<td>f. Combust. Renew. &amp; Waste</td>
<td>0.654</td>
<td>0.420</td>
<td>0.018</td>
<td>0.014</td>
<td>0.026</td>
<td>0.020</td>
<td>0.014</td>
<td>0.618</td>
</tr>
<tr>
<td>g. Others</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>


Table d.5. Transport indicators (2005)

<table>
<thead>
<tr>
<th>Indicators transport sector</th>
<th>Freight</th>
<th>Travel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Final Consumption (Mtoe)</td>
<td></td>
<td></td>
<td>94.851</td>
</tr>
<tr>
<td>10^6 Tonne-km</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TFC/10^6 tonne-km</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10^6 Person-km</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TFC/person-km (TFC/10^6 person-km)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Number of cars/1000 inhabitants</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Sources:
e. End-Use Energy Prices for Various Market Sectors

Table e.1. Energy prices for end use sectors 2005

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Unleaded gasoline 95 RON (litre)</th>
<th>Light fuel oil ('000 litres)</th>
<th>Diesel (litre)</th>
<th>Heavy fuel oil (tonne)</th>
<th>Nat. Gas (10^7 kcal GCV*)</th>
<th>Steam Coal (tonne)</th>
<th>Electricity (KWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households (Incl. ...% VAT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

* Gross Calorific value
Sources:

f. CO₂ Emissions

Table f.1. CO₂ emissions from fuel combustion

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CO₂ emissions (Mtonnes/year)</td>
<td>1882.44</td>
<td>1588.9</td>
<td>1513.46</td>
<td>1516.37</td>
<td>1503.09</td>
<td>1526.75</td>
<td>1528.78</td>
<td>1543.76</td>
</tr>
<tr>
<td>Share electricity and heat production (%)</td>
<td>58.71</td>
<td>59.50</td>
<td>60.58</td>
<td>60.37</td>
<td>61.22</td>
<td>61.80</td>
<td></td>
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</tr>
<tr>
<td>Share residential sector (%)</td>
<td>8.40</td>
<td>9.26</td>
<td>9.86</td>
<td>9.96</td>
<td>8.99</td>
<td>9.05</td>
<td></td>
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</tr>
<tr>
<td>Share industrial sector (%)</td>
<td>13.35</td>
<td>14.66</td>
<td>14.37</td>
<td>13.83</td>
<td>13.95</td>
<td>13.64</td>
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<tr>
<td>Share transport sector (%)</td>
<td>13.82</td>
<td>11.16</td>
<td>11.65</td>
<td>12.03</td>
<td>12.30</td>
<td>12.67</td>
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<tr>
<td>Share other sectors (%)</td>
<td>5.72</td>
<td>5.42</td>
<td>3.54</td>
<td>3.81</td>
<td>3.54</td>
<td>2.84</td>
<td></td>
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</tr>
<tr>
<td>Total CO₂/GDP (kg/USD 2000)</td>
<td>6.01</td>
<td>6.63</td>
<td>5.83</td>
<td>5.56</td>
<td>5.26</td>
<td>4.98</td>
<td></td>
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</tr>
<tr>
<td>Total CO₂/capita (tonnes/inhabitant)</td>
<td>12.66</td>
<td>10.73</td>
<td>10.4</td>
<td>10.48</td>
<td>10.43</td>
<td>10.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total CO₂/ TFC (tonnes/toe)</td>
<td>3.21</td>
<td>3.42</td>
<td>3.58</td>
<td>3.57</td>
<td>3.65</td>
<td>3.62</td>
<td></td>
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</tbody>
</table>