A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Transformation of the Russian energy policy in 2003-2008: successes and fails of the energy strategy

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ABSTRACT OF THESIS submitted by:
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for the degree of Master of Science and entitled: Transformation of the Russian energy policy in 2003-2008: successes and fails of the energy strategy

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The importance of analysis of the energy strategy of Russian Federation in 2003-2008 is significant, due to the rising importance of the energy sector and its unresolved challenges. The current thesis provides such an analysis by comparing two Russian energy strategies, developed in the period under study.

The analysis is made by comparing the performance of the existing strategy and the discussion in the new one on the three selected sectors: energy efficiency, oil and gas complex and nuclear energy. The theoretical framework along with the historical background of the Russian and Soviet strategy making in the energy sector is also provided

The thesis reveals the inadequacy of the current policy and expected policy changes comparing to the rate of the development of the energy sector and the growth of its main problems.

Keywords: energy policy, transformation, energy strategy, energy efficiency, oil and gas complex, nuclear program, Russia

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

ECS	**Energy Charter Secretariat**
EIA	**Energy Information Administration**
EWG	**Energy Watch Group**
FEC	**Fuel and energy complex**
FSSS	**Federal State Statistical Service**
GDP	**Gross Domestic Product**
GW	**Gigawatt**
GWh	**Gigawatt hour**
IAEA	**International Atomic Energy Agency**
IES	**Institute of Energy Strategy**
INSC	**International Nuclear Safety Center**
IES	**Institute of Energy Strategy**
MTOE	**million tones of oil equivalent**
MW	**Megawatt**
NPP	**Nuclear power plant**
OPEC	**Organization of the Petroleum Exporting Countries**
UES	**Unified Energy Systems**
SCST	**State Committee on Science and Technology**
VVER (WWER)	**Water-Water Energetic Reactor**
PJ	**Petajoule**

1. INTRODUCTION

1.1. Baseline

The state energy policy determines the strategic priorities of the energy sector development and the main objectives and threats. Therefore, the importance of the energy strategy for the stakeholders in energy sector is doubtless, although the strategy in the case of Russia has declarative nature due to the specificity of its legislation. The Russian energy sector plays a traditionally important role in overall economical growth. It is important to mention that the Russian energy strategy implies the consideration of the fuel and energy complex, which include many additional relevant aspects: economic, environmental and social. Therefore, performance of the energy strategy can be extended to the overall of performance of the Russian national policy. Particular significance the energy sector acquired in 2003-2008, when the export price for oil and gas experienced tremendous rise. This period of 2003-2008 is in the main focus of the thesis.

Generally, the theory of the strategy making does not single out the strategy making for the energy sector. However, the general correlations between the energy sector strategy making and, for example, business sector take place, since the object under study in both cases has complex structure. Moreover, the general goal of any strategy is to bring the strategic advantage by determining the proper balance of the existing resources (Bagadasarian 2008). In other words the goal is to adequately address the challenges and analyse the trends in order to achieve maximum profit in long term perspective.

The Russian strategy making in energy sector experienced several changes during 1990's. However, it did not stop at that point, and in the period 2000-2008 the transformation of the energy strategy, and thus energy policy, continued. The main reason for that was the parallel transformation of the Russian energy sector and formation of the new challenges and threats. That is why the Energy strategy till 2020, which is currently in force, is now being substituted by the new Energy strategy till 2030.

Russian energy Strategy till 2020 was adopted in 2003 and is still the main source of guidelines for energy policy. The development of this strategy has many correlations with its predecessors, starting from the first post-Soviet energy strategy of 1995. However, it has also lots in common with the Soviet programme of 1983, although the minor differences exist. Therefore, the current Energy Strategy can be adequately estimated only considering the historical background and analyzing general trends and traditions of energy strategy making in Russia.

1.2. Research question and objectives

Whereas the soviet energy strategies and early Russian strategies were analyzed by a number of authors (Arbatov et al. 2006; Ivanov 2004; Kokoshin 2007; Nekrasov 2007; Perera 2003), the analysis of adequacy of the current energy policy against the background of growing (in the period under study) GDP, was provided by much less number of authors. Additionally, major analyses of current Russian energy policy are made mainly in terms of reliability of export energy supply (IEA 2006; Hirsch 2008). The only monitoring was made by the institute (IES 2009), which developed the energy strategy and is interested in its good performance, and thus, cannot be considered as reliable source of data.

The Energy Strategy till 2030, which is going to be a successor of the current Energy Strategy and, therefore, will shape the Russian energy policy for the next decades, was not analyzed before. Therefore, there is a lack of research in this field, and stemming from this, the analysis of the transformation and gradual development of the energy policy cannot be sufficiently made.

Therefore, the process of the strategy and policy adaptation to the new circumstances as well as the evolution or degradation trends of the particular strategic directions represents the main interest of the current thesis. The finding of the positive and negative changing of the energy policy in comparison to the previous strategic directives is of particular attention. Thus, the research question that is being addressed in this thesis is how the energy strategy and energy policy of Russian Federation transformed during the period 2003-2008.

In order to address this question the research includes the following objectives:

- To analyze the performance of Russian Energy Strategy till 2020 in three main sectors during the period 2003-2008
- To analyze the Conception of Energy Strategy till 2030 and compare it to the existing Strategy till 2020 in terms of the strategy's implications on energy policy during the period under study
- To track the transformation of Russian energy policy in 2003-2008 rooting in the change of the Energy Strategies.

The necessity to analyze transformations of the different energy sectors during the period under study 2003-2008, as the evidence of energy strategy performance, is considered. The energy strategy covers such a complex object as fuel and energy complex, it has a very comprehensive and wide content. Since the detailed analysis of each direction and sector is not the aim of the current thesis, the three main aspects of the strategy policy were selected: energy efficiency, oil and gas complex, and nuclear energy. The adequacy of the Conception policy towards these three sectors is analyzed using the performance of the previous Strategy as base. Justification of the selection is provided in the methodology section.

1.3. Methodology

The data was collected by reviewing of Energy Strategy documents, official statistics and publications of international organizations. Publications of the experts in the field were also accurately considered. Another important source of data was interviews with experts who either take direct participation in the strategy making process or has valuable experience and knowledge of Russian energy sector. Interviews were especially valuable due to the closed, non-transparent process of Russian energy policy making. They gave the necessary insight and helped to avoid sometimes biased official data. Besides, the justification of choice of main energy sectors for the second chapter is also based on the interviews. Table 1 shows expert selection of main three sectors or priorities of the Russian Energy Strategy based on their importance and representativeness.

Table 1. Selection of the main sectors. Selected sectors are marked by grey colour.

	Chouprov	Kokorin	Kopylov	Kosharnaya	Litvak	Senova	Fedorov
Coal industry							
Oil and Gas complex							
Power generation							
Renewable energy (incl. hydro)							
Nuclear energy							
Energy Efficiency							
Energy security							
Environmental aspects							

As the result of the interviews, three major sectors were selected: energy efficiency, oil and gas sector, and nuclear energy. However, the correlations between many sectors were widely admitted by the experts. For instance, environmental aspects of the strategy are tightly connected to the energy efficiency and problem of associated gas in oil and gas complex. Therefore, this selection has a relative nature, since it does not put strict limitations on the issues.

1.4. Main findings

As a result of the research that has been made in this thesis several findings were made. The analysis showed that the real transformations of the Russian policy in accordance with the changes in the energy sector are quite disputable. Some challenges, where were not addressed during 2003-2008, were paid attention to, but the reasons of them along with the several significant obstacles were left unsolved.

The evolution of the strategy and policy takes place partially and does not have adequate speed, while the rate of the changes and depth of the challenges of the energy sector is constantly increasing. Therefore, in order to acquire really strategic meaning and nuture, the energy policy of the Russian Federation should have much more corrections and changes than it had during 2003-2008.

1.5. Structure

This thesis comprises three chapters and conclusions section. The **first chapter** deals with the issues of theoretical nature and touches upon the Russian Energy Strategy till 2020. This chapter includes three sub-chapters in accordance with the topics they deal with. Thus, the first sub-chapter focuses on the theory of strategy making and in the framework of this area the following topics are being addressed: general concept of strategy making, strategy making in energy sector and energy system.

The second sub-chapter makes an introduction to the analysis of the Energy strategy till 2020 by examining the main trends and developments in the Russian (Soviet) strategy making and strategic planning. The background information about Soviet energy strategy and energy system is provided here and the development of the Russian strategy making during the period of 1991-2003 is analyzed in this part of the thesis.

The third sub-chapter contains the analysis of Russian energy strategy till 2020 in terms of its benefits and shortcomings. This analysis is made by providing the general description of the existing Russian Energy strategy, looking at the problems revealed under the Strategy and

possible methods of their overcoming, evaluating the environmental concerns of the Strategy and representation of the Strategy's shortcomings.

The **second chapter** contains the analysis of the Energy Strategy performance till 2020 in main three sectors during the period of 2003-2008. The sub-chapters are organized in accordance with the sectors. Thus, the first sub-chapter examines the issues connected to the oil and gas such as oil and gas production and oil peak theory. The second sub-chapter scrutinizes the topic of energy efficiency. The third sub-chapter deals with the nuclear energy. In terms of this sector the following issues are under examination: present nuclear capacity, possible increase of nuclear capacity, floating nuclear power plants and reactor technology and features.

The **third chapter** analyses the Conception of Russian Energy strategy till 2030. This analysis consists of two parts. The first sub-chapter provides general description of the new Energy Strategy of Russia till 2030. The second sub-chapter makes an examination of the three main sectors of the Energy Strategy till 2030 and compares it to the Strategy till 2020. The sectors that are analyzed in this sub-chapter go in line with the sectors, which were investigated in the second chapter, and therefore, they are: oil and gas, energy efficiency and nuclear energy. One more issue that this sub-chapter touches upon is the analysis of the outcomes of the comparison that were made previously.

The **conclusions** section summarizes the main issues that are under examination in this thesis and represents the main outcomes of the research.

2. ANALYSIS OF THE RUSSIAN ENERGY STRATEGY MAKING AND CURRENT RUSSIAN ENERGY STRATEGY TILL 2020

The understanding of current energy strategy of the Russian Federation and its role lies in the history of energy programs of the Soviet Union and general strategy-making theory. This chapter describes the framework of the strategy making in general and energy strategy-making peculiarities in particular. Besides, I try to fit the strategy programmes of the Soviet Union along with the history of Russian strategy-making in energy sector including current Energy Strategy till 2020 into the theoretical framework and explain the reasons for the current developments in the sector.

In order to do so, I will firstly look at the strategy making from the theoretical perspective and examine general concepts of strategy making, strategy making in energy sector and energy system. Secondly, I will investigate the development of the Russian (Soviet) energy strategy making and strategic planning by representing the background on Soviet energy strategy and energy system as well as on the development of the Russian strategy making during 1991-2003. Thirdly, I will focus my attention on the analysis of Russian energy strategy till 2020. I will provide general description of the strategy, elaborate on problems revealed under the Strategy and methods of their overcoming, touch upon environmental concerns of the Strategy and analyse the shortcomings of the Strategy.

2.1. Strategy making: theory and concepts

2.1.1. General concept of strategy making

Since strategy making theory implies very wide implications and fields, the definition of the strategy varies respectively. Depending on the area of implication strategy is:

- In business terms : narrow view - capabilities deployment and rational resource use in order to prevail in competition and achieve goals; broad view – optimal determination of the pivotal interests and goals of the company that are vital for further development as an institution (Burgelman 2002)
- In socio-economic terms: location of the goals and priorities of the development of the socio-economic system (region, country) for the medium-term and long-term prospects, along with the directions, resources and time for their accomplishment (Sorokozherdiev and Hasheva 2008)
- In military terms: the combination of determination of armed forces' objectives, development of the plans of military operations and campaigns, army building and training, potential enemy research, and organisation of interaction and maintenance of armed forces (Snesarev 2003)

Summarising all definitions, the main features of any strategy can be displayed as following: determination of priorities and objectives of the strategy area development; allocation of the necessary resources, time, and capabilities; forecasting of the future possible development of the strategy area by making polar scenarios of possible development.

Effective strategic planning is able to provide the state with strategic initiative on the international arena, which is very important for participation in globalisation process. Any strategy is the choice of priorities, particular direction, consistency of actions, and determination of the latter spatially and temporally. When the strategy is made, it shapes and restricts the further policy in a long period of time (Kokoshin 2007). Hence, the strategy provides a *sui generis* self restriction. The state level strategy making implies the priorities arrangements among state bodies. Therefore, the process of optimisation as an essential part of the strategy will inevitably lead to the clash of the bureaucracy interests, making the strategy making process the tool of "big policy" (Kokoshin 2007). Besides, a vital feature of the successful strategy is its direct connection to the mechanism of policy making and implementation.

Typically, strategic planning is presented by two types:

- Indicative (with the important role of business) – the method of indirect influence on the economic players and entities. This type of strategic planning also determines important guidelines for corporate and business strategies (Petrova 2000).
- Directive planning (with the prevailing role of the state) – the development of well-grounded scenarios of the research subject evolution (Bagadasarian 2008). Figure 1 illustrates the general model of directive planning.

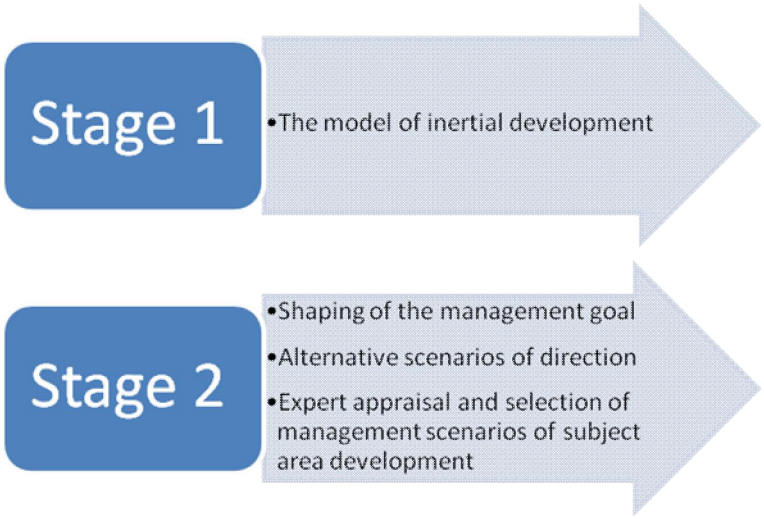

Fig. 1. Directive planning. Source: Bagadasarian 2008

The most effective way of strategy making is to combine both types of planning. However, in some particular cases the prevailing but not unique use of this or that type of planning is predetermined. For instance, the government-ruled sectors such as armed forces and most parts of transport systems and energy systems in Russia are typically shaped in this way (Kokoshin 2007). Nevertheless, in recent years the process of privatisation and decreasing state involvement has increased the role of business and therefore indicative planning in transport and energy sectors.

A very important part of strategic planning is the control over the implementation of the strategy and post-strategy analysis of the results. Without this process the evolutionary development of strategy is hardly able to proceed and the strategy will obtain only a declarative nature. However, the control period of the strategy is one of the weakest points in many states.

In the business theory, strategy making is typically divided into two categories: the learning school and the design school (Ansoff 1991; Mintzberg 1994). From a perspective of

knowledge, the learning school concentrates mainly on the planning, formal analysis, and strategic choices as pivotal base that support strategy makers with data. Hence, the role of explicit knowledge is highlighted. On the contrary, the school of design focus on the role of experience accumulation, the process of strategy making *per se* and implicit knowledge (Noda and Bower 1996; Burgelman 1988). However, several researchers propose to unite and combine two approaches in specific cases like oil industry (Grant 2003). Besides, the mentioned schools addressing, mainly classical strategy prospects, do not actually explain how implemented actions and analysis form the initial strategy (Volberda 2004).

Although the strategy theory itself is being mostly implemented in economic and business fields, most of its framework can be extended to other fields like national strategy planning. Indeed, in spite of the scale difference, the similarities between strategies on the national and corporate levels can be easily seen: complexity and systemic type of the subject, limitation of resources, three levels of planning (international/company-environment, national/company, and industry-targeted/intra-company) (Burgelman 2005), and particular level of uncertainty due to market changes (Kaplan 2008). It should also be noticed that the state strategies obviously have more directive nature, while company strategies – more indicative. However, the ideal strategy combines two types, due to the complexity of the object.

2.1.2. Strategy making in the energy sector

The importance of strategy making in the energy sector for the long term is debatable due to the frequent cases of failed or imprecise prognoses of sector development. However, it should be noticed that the main idea of energy strategies is to analyse the existing proportions and trends in the development of the energy sector along with preconditions of that development

and “weak points” identification. Hence, the energy strategy is implied to have certain flexibility in order to address all that.

An example of this can be the oil crisis of 1973-1974, when owing to certain circumstances the prices for gasoline in the USA quadrupled (Frum 2000).The total consumption in oil dropped worldwide and the use of oil for different purposes also decreased. The consequences of that period can be easily tracked nowadays in the US: most of the appliances require less than half of the energy they used to thirty years ago; economy stickers and speed limits; significant increase of exploration and resources development within the US. However the pivotal result of that period was that after the USA significantly decreased their overall oil consumption President Nixon created the Energy Department, *ipso facto* laying down the basis for the national energy policy (Ikenberry 1986). Therefore, the oil crisis of 1973-1974 can also be considered as a starting point of US energy strategy making. However, other countries also started thinking about their energy policy.

Meanwhile, the USSR started to gain superprofits from exporting oil and, hence, turned its energy policy to sustain export of primary energy resources. In spite of the fact that all the investments were aimed at the development of the oil and gas industry, the incomes of their export were spent mainly on food import, and maintaining of traditional sectors – mostly on agriculture. Indeed, in this period particularly, the USSR started to import grain: in 1970 – export from the USSR was 3.5 million tons, in 1974 – the balance was zero, and starting from 1975 the import has increased dramatically reaching huge 45.6 million tons in 1985 (Arbatov *et al*. 2005).

Regardless the variety of the national features of the energy strategies, their main idea is the same: provide the economy growth with adequate and sustainable energy supply. However, in different countries the orientation and the means of reaching that strategy goal can be absolutely different. The state-supplier of the primary energy resources will identify possible markets alongside with the maintenance of their extraction and transportation, while the state-importer will mainly address the issues of security of the resources' import.

The energy strategy of the exporter or supplier of primary energy resources typically includes two main parts (Mastepanov 1997):

- Analysis of the actual conditions: volume and structure of export, obligations according to the international trade agreements, development and deployment of the existing export base, dynamics of the export prices and economic benefits from the export, and peculiarities of the external markets
- Development of the features of the export: export growth taking into account the national energy consumption, export structure with highlight of the main resources, and geographical structure of export

Besides, the structure of the energy sector and structure of the national economy *en masse* plays a significant role in determining whether the strategy will be more directive or more indicative. For instance, if the country has electricity generation and distribution (not grid) sector presented only by private companies, the energy strategy will probably be indicative concerning the electricity sector.

2.1.3. Energy system

The definition of energy system plays an essential role in understanding the energy strategy making. In a general sense, the system is the combination of interacting elements, which has a particular structure and properties. Concerning the energy sector, it is can also be called a set of components, united with the main goal: creation of comfortable life conditions through energy transformation. Another definition can be also made: energy system – is the human-made production system, tightly connected to the environment from the primary energy resources extraction to the final energy (Nekrasov and Sinyak 2004).

The formation and development of energy systems is connected to economic, social, industrial and environmental systems and does not directly depend on the political system (regime), being a result of society's economic and technical development. The political system can influence the speed of the energy system development, but the final direction cannot be changed (Nekrasov and Sinyak 2004).

The general energy system is traditionally divided into several functional systems: resource extraction, oil and gas, electricity generation, atomic energy and etc. However, the main issues of the energy system management are:

- Identification of the optimal proportions and trends in the development
- Well-timed detection of the new technologies, which can provide the development in a faster way than the existing ones
- Increasing the effectiveness of the main material, labour and energy resources.

Besides, timing plays a pivotal role in energy planning. Each period of the development should be analysed and the main trends should be identified. This analysis is one of the basics for any energy strategy.

However, nowadays energy systems in addition to their increasing complexity are not limited only by national borders but also depend and interrelate with regional and international energy systems. For instance, the electricity exports and imports along with trading of the primary energy resources constitute an important part of the energy strategies of many states. Hence, the policy which is addressing such systems should adequately take into consideration their multinational nature.

2.2. The development of the Russian (Soviet) energy strategy making and strategic planning

2.2.1. Background: Soviet energy strategy and energy system

To fully understand the traditions of energy strategy making in contemporary Russia, one should look through the development of energy strategy making in the USSR. The first document of energy planning in the USSR was developed in 1920 by the State Commission on Electrification and adopted by VIII All-Russian soviet Congress in December of the same year. It was based on scientific methodology including two main chapters: aggregated programme of development and electrification of the national economy for 10-15 years in 8 economic zones. The plan forecast 85% industry growth and 340% energy production (Turetskiy 1961). Besides, the financial side was also described and constituted 17 billion roubles in gold (Turetskiy 1961). The objectives of the plan were fulfilled by 1930-1933.The

balance of electrification was implemented for the first time and was implemented after that in all soviet energy strategies and directives.

It should also be noted that the Russian definition of fuel and energy complex (FEC) differs from the determination of the energy sector. FEC is a combination of different sectors unified by strong technical and economic ties. The main principle of TEC is common planning of the development of all the related fields (Solodovnikov 2006). However, the definition of FEC does not cover the whole energy sector. Therefore, FEC is a more specific term, but can be considered more suitable for energy planning issues. Typically, both terms are in use.

The balanced method of strategic planning implies the collation of the resources and needs, expenses and results, the coordination and matching of all the indicators of the plan in order to reach the desired balance (Kats 1932). Therefore, the main goal of this method is to eliminate certain disproportions in the national economy. Hence, by using this method the USSR addressed mainly current needs and misbalances in the national economy, missing *per se* the strategic level.

For the period of 1930-1950 energy planning was in fact included in the regular five-year plans for the national economy. Hence, one can say that in the USSR the development of the energy planning and energy in general was closely interrelated with other sectors of national economy. However, in 1950-1970 the regional development programmes started to play more significant roles in national policy making due to the following factors:

- Change of the political development direction at the end of 1950's by creation of the "sovnarhoz" mechanisms, implying the delegation of some economic regulation to local officials (Mertsalov 2001)
- Social-economic development of the USSR. The main indicators show that the main goals of the industrialization were reached by the years 1950-1960's (Shestakov 2006). The decisions of the communist party congress during this period settled the completion of the industrial society development in the USSR (Zinoviev 2007)

A good example of the "awakening" of the regional initiative is the proposal to build the Nizhne-Obskaya hydro power plant with a capacity of 5-6 million kWh near Salehard town. Later on the idea was rejected mostly due to the start of the intensive exploration of the West Siberian oil fields during the late 1960's (Komgort and Koleva 2008).

Energy strategic planning in the USSR was tightly connected to the State Committee on Science and Technology (SCST) formed in 1948. During the 1960's the SCST developed the system of state priorities, aimed to implement the best existing technologies in industry, mainly in fuel and energy complex. The direct results of that programme were the Bratskaya hydropower plant, the Beloyarsk and Novo-Voronezhskaya nuclear power plants, and the creation of the Common integrated energy system. However, the most significant document in strategic planning was the Energy programme of the USSR for 20 years, developed in 1983 in cooperation with Gosplan (the main soviet planning department) and the Academy of Science.

Summarising the Soviet period in the energy sector and energy planning:

1. The trend of simple increase of power generation was consolidated. On its base the biggest energy system was created – the common integrated energy system. However, with all its technical successes for that time, the system faced several obstacles: huge volume of high quality fuel demand, extreme capital intensity of the expansion and modernisation, and very long distances of fuel supply due to remoteness of extraction sites from the energy generation facilities – average distance for resources transportation is 4000 kilometres (Remizov *et al.* 2008). Meanwhile, the programme of redistribution of the power plants in order to balance the system was not fulfilled due to the enormous investments needed.
2. Technological transformation of the industry occurred in the 1970's when the production of gas and oil became higher than the production of coal, *ipso facto* the process of the rotation of the basic energy sources had finished.
3. Till the end of the 1960's the deficit of energy resources (mainly gas and oil) existed due to the unequal distribution of resources over huge areas. The consequences of this deficit passed through time till nowadays (Nekrasov 2007).
4. Starting mainly from the world oil crisis during 1973-1974 the USSR developed an export oriented energy strategy. Since the USSR was desperately trying to keep the export level of oil, main investments in the energy sector were directed to oil extraction and transportation: 64% of all investments in 1971-1975's, while 77% in 1976-1980 (Arbatov et al. 2005). Besides, such an exponential growth of investments did not even significantly increase the export, but kept it at the same level. Hence, the energy strategy of the USSR was extremely focused on the export of fossil fuels, mainly oil and gas. However, the decline in oil prices on the world market starting from 1984 and followed by budget deficit showed the absolute economic failure of that strategy.

2.2.2. Development of the Russian strategy making during 1991-2003

Being a successor of the USSR the Russian Federation possesses huge potential of natural resources and unique geographical location. However, in order to manage these giant possessions and to provide energy security and base for sustainable development one must have long-term scientifically approved energy strategy.

However, it is reasonable to outline certain specific features of Russia in terms of energy system planning: huge territory: hence, long and limited energy transportation links with high disproportions of distribution; relatively severe climatic conditions; obsolete energy infrastructure that requires maintaining and investments; huge deficit of foreign investments along with the relatively small capacity of the national ones; inadequate energy pricing on the inner market due to social and some economic reasons, which leads to the significant limitation of the energy efficiency prospects; the whole technological infrastructure do not fully address economic feasibility since it was formed in non-market environment (Nekrasov and Sinyak 2001). Therefore, the successful strategy should adequately address and consider these factors.

Starting from economic reforms in 1992 “The Conception of Russian energy policy in new economic conditions” was being developed (Bashmakov 1992). It was a *sui generis* successor of the soviet energy programme with several common features: the same developers, methodological approaches and models, and certainly prevailing directive nature. Besides, it had some obvious gaps:

- The decrease in production of resources instead of extraction and overall availability was discussed
- Only one scenario of the energy sector development for the period of 1993-2010 was suggested, while the whole economy was undergoing the period of uncertainty
- The consequences of the proposed mechanisms were not discussed
- The increase in the national consumption of the main resources was overstated (Mastepanov 2005)

Some of the critical comments on that conception were taken into consideration and the strategy was adopted in 1995. In the last edition the scale of electricity consumption was downgraded and several scenarios of the energy sector development were made (IEA 2002). However, the narrow range of these scenarios did not reflect the real situation in some important sectors like oil, gas, and electricity production, as you can see in Figures 2, 3 and 4.

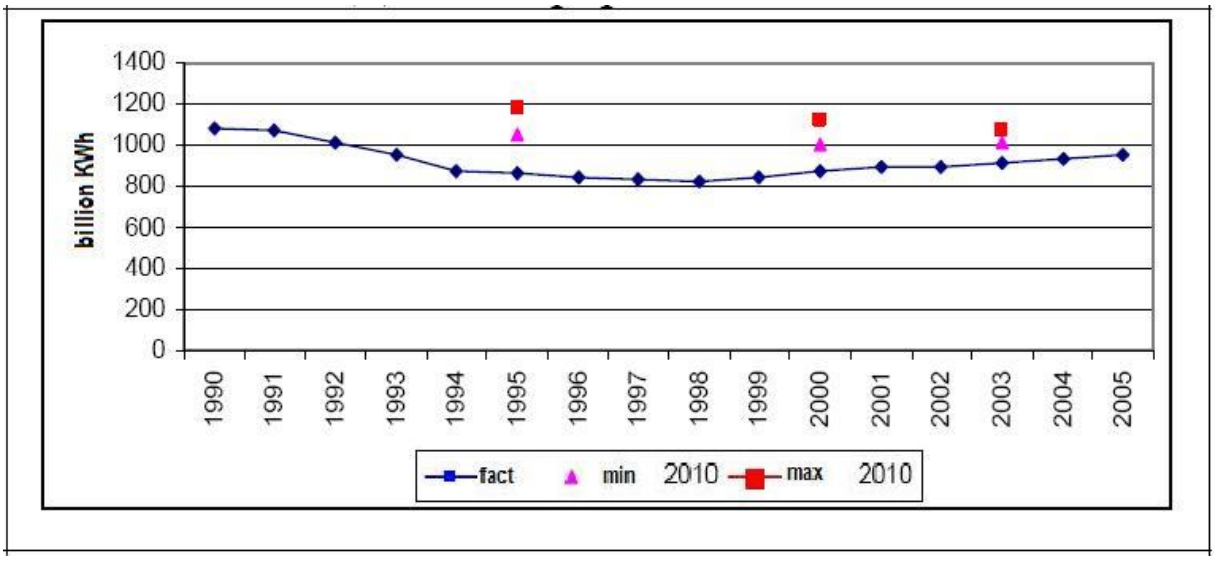

Fig. 2. Prognoses for electricity production for 2010 from different strategies (1995, 2000, 2003) and the real data
Source: Bashmakov 2005 (with amendments)

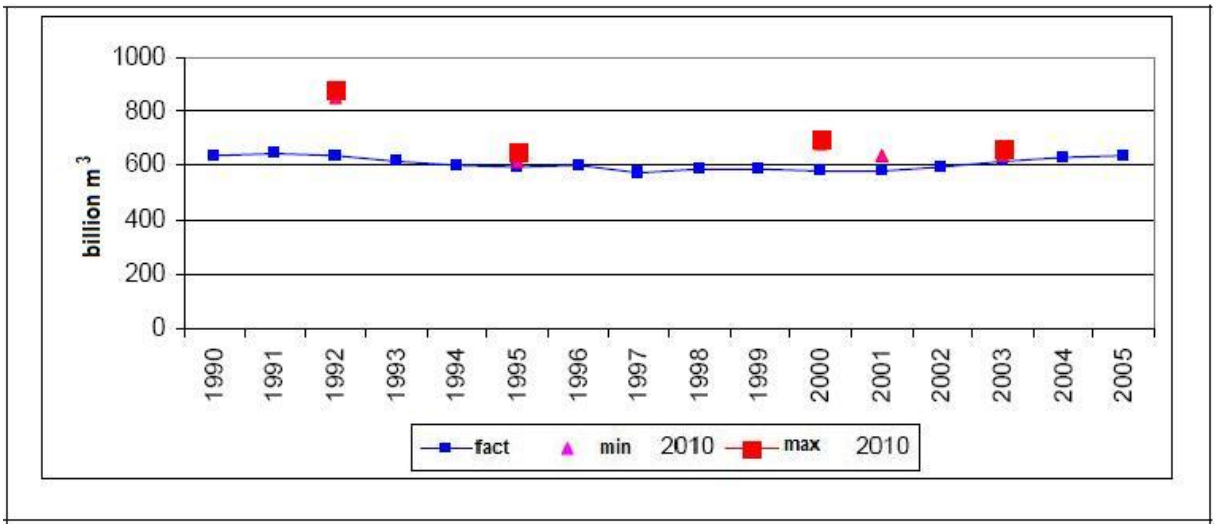

Fig. 3. Prognoses for gas production for 2010 from different strategies (1995, 2000, 2003) and the real data
Source: Bashmakov 2005 (with amendments)

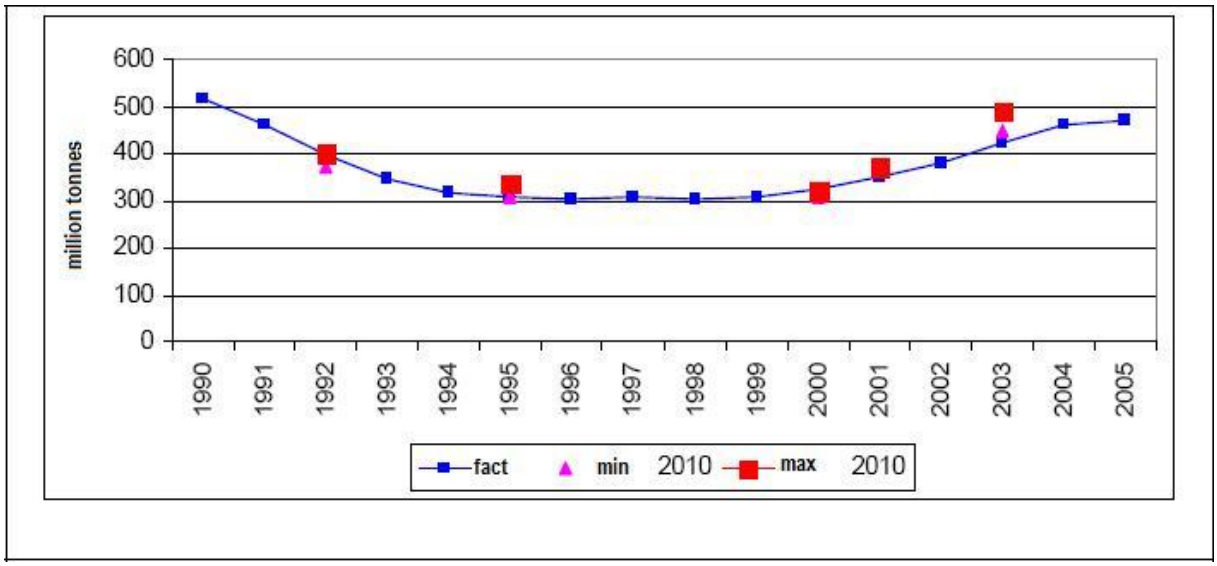

Fig. 4. Prognoses for oil production for 2010 from different strategies (1995, 2000, 2003) and the real data
Source: Bashmakov 2005 (with amendments)

In 1998 Ministry of Fuel and Energy of Russia made a decision to create a new research institution, the governmental body "Institute of Energy Strategy" as a coordinating structure for the analysis and prognosis for the Russian energy sector. And the next issue of energy strategy till 2010 developed by the Institute of Energy Strategy was adopted by the government in 2000. However, in spite of the more detailed prognosis for the sector

development, the range of scenarios did not reflect the real situation (Figures 2, 3 and 4). For instance, the scenario of oil production for 2010 suggested by that strategy was already reached in 2001 and the ratio of increase surpassed the optimistic expectations (Figure 4).

One of the main reasons for these discrepancies was the mistaken understanding of the energy structure at that time. The strategies of 1995 and 2000 were as directive as soviet ones, but the situation in the energy sector settled in the way that the most part of the growth for instance in the oil sector was made by private companies (ECS 2004). However, further state invasion into the oil and gas sector weakened the influence of this previously neglected factor (Bashmakov 2005).

Summing up the main features of energy strategies 1995 and 2000:

- Wide use of soviet methods of energy strategy planning: solely directive and learning school
- Wrong prognoses and scenarios for the energy sector development overall and resources production in particular
- Absence of knowledge accumulation (design school of strategy making): the energy strategy of 2000 did not take into consideration the mistakes of its predecessor, mainly due to the change of developing team, absence of clear mechanisms of strategy goals realization
- Export orientation with main investments deployed in the development of the resource base like in previous soviet energy programme
- Lack or neglect of environmental issues that are connected to the energy sector development

- The mechanisms or models for export price prognosis on major energy resources were not implemented.

2.3. Analysis of Russian energy strategy till 2020: benefits and shortcomings

2.3.1. General description of the existing Russian energy strategy

The need for long-term and medium-term development program and the identification of the national energy policy were imposed by the highly important role of the fuel and energy complex (FEC) in the Russian economy. In 2003 "Energy strategy of the Russian Federation till 2020" was adopted by the government and remains in force up to our days. Comparing to the previous strategy of 2000 some of the long-term targets and key features became more ambitious and detailed. Additionally, the energy sector's priorities of the development for external markets were also made. The main priorities of that strategy are (IES 2003):

- Energy security: providing population, industry and economy with stable and affordable energy
- Energy efficiency improving: energy saving, consumption rationalization, technology advancing
- Environmental concerns: minimization of the impact through using economic incentives, production and distribution improvements

The general scheme can be seen in Figure 5.The main way for achieving these priorities and goals is the foundation of a "civilized" energy market and maintaining regulatory role of state. Also, a few measures are supposed to assist: improved management of state property, creation

of the rational market environment, introduction of technical standards system, support of initiatives in innovation, energy saving and investment sector.

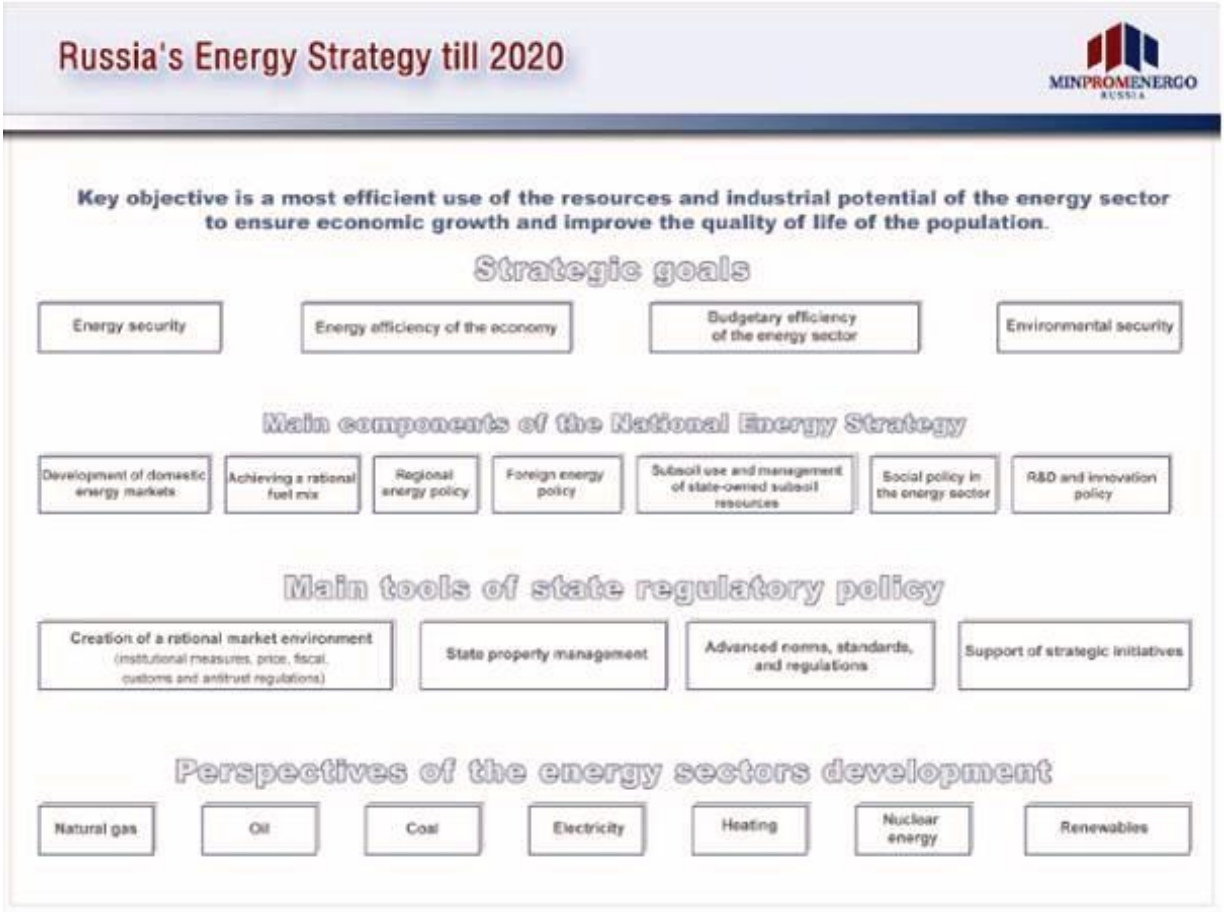

Fig. 5. The Russian Energy Strategy till 2020
Source: Minpromenergo 2005

Generally, the main task of the strategy was to find ways to create a completely new structure of FEC, increase the competitiveness of its services and products in the international markets, via priorities setting in the development of FEC and the its potential realization, development of the tools and mechanisms of the national energy policy considering the probable outcomes of its implementation (IES 2003).

2.3.2. Problems revealed under the Strategy and methods of overcoming them

The mains ways of achieving the tasks and objectives were considered to be the regular energy markets' development and creation of the interaction field between the state and enterprises as well between enterprises themselves. However, the state was supposed to scale down its role as an economic agent, while enhancing its participation in the market infrastructure development through market regulation. Besides, there is a distinction set between national companies and external or foreign ones (Tambovstev and Shastitko 2005). Hence, even in this statement of "sector liberalization", the state still keep the possibility to exert an o influence on the energy market.

Finally, the main strategy objective was to attain maximum efficiency in the use of the FEC potential for the economic growth acceleration with improvement of the living standards and in the use of energy resources and fossil fuels.

The strategy identifies the main problem of the Russian energy sector as follows (IES 2003):

1. Gas sector's production base suffering from the lack of development.
2. Obsolete capital assets: 80% in oil production while 50% in total in 2004. During 1990 the commissioning of the new production capacity decreased by 200-600%.
3. Environmental issues, rising from the energy sector development and fossil fuel use.
4. Shortages of investment. External investments constituted less than 13% of total. In particular, in the electricity and gas production spheres an appropriate "investment climate" was not created. Therefore, the underinvestment of these two vital sectors could possibly stall economic growth.

5. Absence of stable and comprehensive legislation that completely addresses the nature and features of FEC entities.
6. Deficiency in competition between different energy sources as a result of inadequate structure of demand and energy pricing that brings undue attention to gas while reducing the share of coal.
7. Lagging of Russian FEC in technological methods and science from the international level. The development of advanced oil reprocessing is low, while the production of oil has unjustifiably complicated reservoir methods.
8. High share of gas and oil export in overall picture of state revenues, thus, high dependence of the latter the world's oil and gas markets. That resulted from the high degree of export orientation of the previous energy strategies and programmes.
9. Defective structure of the market along with disorganized energy market.

Necessary investment flows to the FEC till 2020 were also estimated and amounted to a total 170-200$ billion in the gas industry, 230-240$ billion in the oil complex, 120-170$ billion in the electricity sector, 20$ billion in the coal industry, 70$ billion in heating facilities, 50-70$ billion in energy efficiency (IES 2003). Therefore, according to the Strategy of 2020 the total investment needs to the FEC are 660-770$ billion, or approximately 33-38$ billion a year for the period 2003-2020. However, according to the Energy Charter Secretariat data (2004) during 2002 total investments to the FEC were around 12$ billion. Hence, under the Strategy the FEC was supposed to experience a three-fold increase of investments. Besides, the growth was to be reinforced mainly by foreign investments and loans. However, the realization of this ambitious plan will be discussed in the second chapter.

The comparison of the investment direction between the current energy strategy of Russia and previous energy strategies starting from the Soviet ones shows minor differences. The main focus of the investments of these strategies is on expanding and maintaining the production and export of oil and gas. Indeed, more than 80% of total investments are concentrated in the oil and gas sector. Hence, the current strategy has remained export oriented.

2.3.3. Environmental concerns of the Strategy

The Strategy till 2020, as its predecessors, also pays considerable attention to the environmental side of the energy policy. The FEC is traditionally considered to be one of the main sources of pollution in Russia. In 2003 it was responsible for 22% of total waste from industry, 70% of greenhouse gas emissions, 23% of water pollution, and 48% of toxic air emissions (IES 2003). In particular, the power generation sector is responsible for 25% of total pollution from the FEC. Therefore, one of the main objectives, stated in The Energy Strategy till 2020 is to reduce the environmental impact of the FEC and follow the compliance with the Kyoto Protocol of the UN Convention on Climate Change, which determines the emissions level of Russia for the period 2008-2012 below the level of 1990. Additionally, the Energy strategy forecast the level of greenhouse gas emissions to be 75-80% of the level 1990 and even the level of 2020 to be under the obligations.

However, the main reasons of meeting the requirements of the Kyoto Protocol is not the successful environmental policy of Russia, but the significant economic decline and therefore the FEC's decline during the 1990's (Chouprov pers.comm.). The fall in production of oil, electricity and gas can be seen in Figures 2, 3 and 4. However, the real improvement of the energy sector performance is the subject of discussions. For instance, the problems of

associated gas flaring and gas leakage highlighted by International Energy Agency (2006) show the extremely ineffective way of natural gas treatment: in 2004 the total emissions of associated gas in the distribution and transport system including associated gas flaring in torches constituted the equivalent of 298 million tonnes of CO_2. Besides, total losses of natural gas due to the above-mentioned reasons accounted for 70 billion m^3, which is around 30% of total Russian natural gas export (IEA 2006). Therefore issues of energy efficiency are tightly connected to the environmental aspects of the Strategy.

At the same time many experts (Chouprov pers.comm.; Kokorin pers.comm.) admit that the potential of environmental impact reduction from the FEC is mainly situated in the decreasing of energy intensity and increasing the energy efficiency of the latter. Thereby, the necessity to construct new power generations along with the increase in extraction, production and consumption of fossil fuels can be prevented by proper development of the energy efficiency and the energy savings policy. The performance of the Energy Strategy till 2020 in this field will be discussed further in section 3.2.

2.3.4. Shortcomings of the Strategy

Unfortunately, expectations of the Energy strategy will 2020 appeared to be inaccurate. In particular, domestic consumption was overestimated – for the period 2000 -2005 6.2% growth occurred, as opposed to the predicted 8.2% (IES 2003). One of the main reasons was that the overall energy intensity decrease was 6% higher than planned. At the same time such important factors as export of primary energy resources and therefore their production, along with GDP growth rate were underestimated and also needed significant correction. Besides, the amount of investment into the FEC, diversification of domestic energy supply from

natural gas to coal (as expected according to the strategy) stayed out of even the pessimistic scenario. The roots of these flaws are the wrong understanding of the trends in the both national and international energy sector and the obsolete estimation model used, which is typically based on the indicators of the five year period.

In spite of the fact that the Energy Strategy till 2020 was analysed by a number of independent experts, all their works can be categorised as critique of the prognosis. Bashmakov (2007) makes a typical critique of the Strategy, mentioning like many other authors (Ivanov 2004; Remizov *et al*. 2008) mainly the inaccuracy of prognosis. However, the comprehensive review of the sector by sector performance and the roots of inaccuracy are not clearly analysed. Besides, the upcoming Energy Strategy till 2030, which is to be adopted at the end of 2009, lacks its comparison to the current Strategy till 2020, since no comparative analysis was made. The current thesis will also try to cover these gaps.

Since the objective of this thesis is to analyse the transformation of the energy sector for the period 2003-2008, it is reasonable to analyse the performance of the current Energy Strategy for the respective period. For instance, Table 2 shows the comparison between the strategy prognosis and factual data for the major issues of the FEC for the year 2005. Though only two years have passed after the adoption of the Strategy, the failure of predictions can be easily seen. Hence, the prognosis for a longer period will have much greater deviation. The analysis of the mismatch provided by the sector is done in the next Chapter.

Table 2. Strategy prognosis and factual data for 2005
Data source: FSSS 2008

	Strategy-2003 (both scenarios)	In fact
Oil price (Urals)	18.5-22.5	More than 50
GDP growth to 2000 (%)	125-127	135
National consumption of primary energy resources (million tonnes)	945-975	1000
Oil production (million tonnes)	420-445	468
Gas production (billion m^3)	610-615	629
Coal production (million tonnes)	270-280	298
Electricity production (billion KWh)	930-935	952

2.4. Strategy making theory and Russian experience in energy sector: outcomes

The theory of energy strategy making is not well development as a separate part of strategy making *en masse*. However, the similarities in complex structure of the strategic object allow implementing major definitions and categories from different strategy making fields, mainly the business and socio-economic terms. Still, the specific features of the energy sector, including the energy system definition, must be considered.

The Russian energy strategy making has an obvious correlation with the Soviet strategies and programmes. They all can be referred as exclusively directive, export-oriented, fitting in the learning school (if using the business theory). Besides, the evident absence of evolutionary nature, poor learning from the results, experience accumulation, indicative measures is of the particular peculiarity of all Soviet and then Russian energy policy. All these features were mainly transferred from one strategy to another due to the preservation of the developing team, and in particular its non-transparency and closed type.

3. ANALYSIS OF THE MAIN SECTORS OF THE ENERGY STRATEGY TILL 2020 AND THEIR PERFORMANCE DURING 2003-2008

Three main aspects of the Russian energy policy require special attention: oil and gas complex, energy efficiency, and nuclear energy. The importance of these sectors was discussed in the methodology section. Their development clearly illustrates the fails and successes of the Russian energy policy in general and Energy Strategy till 2020 in particular during 2003-2008. This period was the time of extremely high gains from the oil and gas export, new Russian nuclear program, the economy growth and the improvements in "statistical" energy efficiency. However, not all the above mentioned events were positive - some brought additional pressure for the energy sector. The analysis of the Strategy performance in these challenging conditions is provided.

In this chapter I will analyse the Energy Strategy performance till 2020 during the period of 2003-2008 by focusing separately on its sectors. The sectors that I will grasp at this chapter are oil and gas, energy efficiency and nuclear energy. In the framework of my examination of the oil and gas sector I will primarily focus my attention on such issues as oil and gas production. Additionally I will scrutinize oil peak theory and lay it over the current developments in Russia. Then, I will analyse energy efficiency sector. Finally, the sector of nuclear energy will be analysed in this chapter from the several perspectives. First, I will look at present nuclear capacities of Russia and possibilities of these capacities' increase. Second, I will look at floating nuclear power plants. Finally, I will examine reactor technology and features.

3.1. Oil and gas extraction and production

High GDP growth of the Russian economy during 2000-2008 occurred mainly due to the gains from export of oil and gas and their high prices. Indeed, the Bank of Finland calculated that 10% of stable increase in oil prices on the international markets is directly correlated to 2.2% increase in GDP of the Russian Federation (Rautava 2004). In addition, a group of experts from the Brookings Institution investigated this correlation for the period 1997-2005 which can be seen in Figure 6. Besides, in 2005 oil and gas accounted for 37% of the revenues of the national budget and 63% of total exports in total. Therefore, the importance of these sectors for the Russian economy and FEC can hardly be underestimated. Hence, the Energy Strategy was supposed to treat these spheres with certain accuracy.

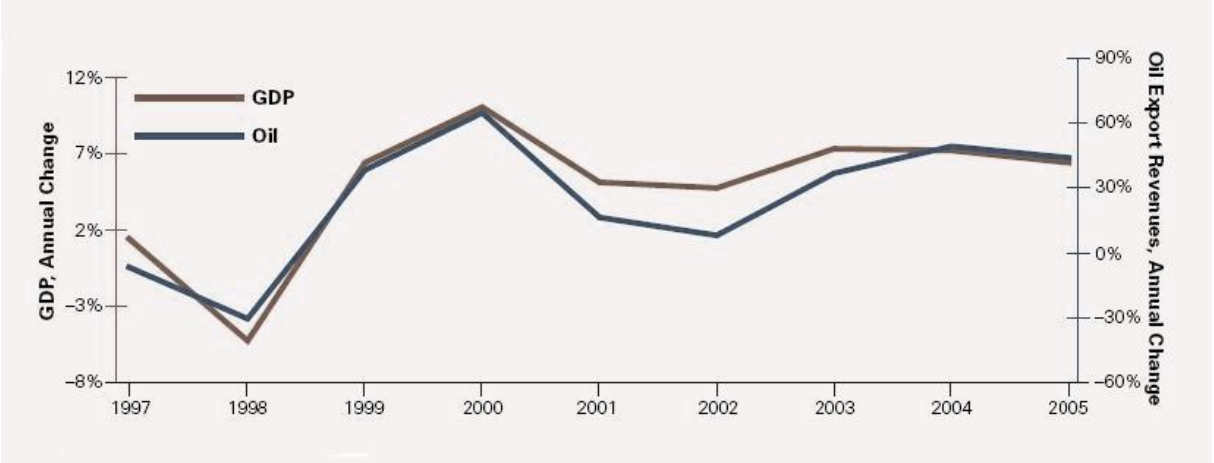

Fig. 6. Crude oil export revenue and Russian GDP
Source: Gaddy *et al.* 2006

However, the Strategy prognosis for export oil and gas prices for the period of 2003-2008 was not analyzed. The main reason for this is the above mentioned absence of price prediction mechanism, an intrinsic peculiarity of Russian and Soviet energy strategies (Kopylov pers.comm.). While the complexity of such a prediction is doubtless, the necessity to increase the limits of prediction were not realized by strategy makers. That is why saying that the

Energy Strategy did not reflect the extreme rise in energy (oil in particular) prices during the period under study (Bashmakov 2005) is not quite correct, since the mechanism was not in place and the entire strategic prognosis was based on the short-term retrospective analysis.

3.1.1. Oil production

The survey of the Federal State Statistic Service (2008) shows that Russia possesses proven 60 billion barrels of oil reserves situated mainly in Western Siberia. In comparison, the Eastern Siberia had 4.7 billion barrels of proved and probable oil reserves. According to the FSSS (2008) Russia produces around 9.4 million barrels of crude oil per day. Moreover, 70% of this amount is exported while only 30% is refined countrywide. The Russian state also possesses natural monopoly on oil pipeline infrastructure. The growth rate of Russian oil production constituted 700,000 barrels per day annually for the period 2002-2004, while around 200,000 barrels per day for the period 2005-2007 (EIA 2008).

The development transition and distribution system is under special attention of the Energy Strategy, which seeks for development of the existing directions and creation of the new routes. For instance, the Strategy states that till the 2020 oil and gas exports in Asian direction will constitute 33% and 17% respectively of the total export. Pipeline system, controlled by state-owned Transneft, was supposed to significantly expand into five directions: from Eastern Siberia to Asia-Pacific region, from West Siberia to the Barents Sea, Baltic pipeline extension to the Finland and Primorsk, reverse of the Adria line of Druzhba pipeline to Croatia, capacity expansion of the Novorossiysk and Tuapse ports along with Atyrau-Samara Pipeline (Ivanov 2004).

These plans experienced several changes from the original version. For instance, the start of the oil export from Primorsk was delayed from 2007 to 2008. Another project - Eastern Siberia-Pacific Ocean pipeline had a lot of environmental obstacles including the danger for Baikal Lake and marine national park in Perevoznaya bay, which made the project much more expensive than initially planned and therefore led to the delay (OECD 2008). Environmental issues also stopped the Adria pipeline reversal in 2005, when Croatia considered the environmental impact assessment of the project to be incomplete and insufficient (EIA 2008). A new "Master Plan for the Development of Oil Pipeline Transport for the Period till 2020" which is aimed to solve all that problems is currently in the elaboration process. However, this plan seems to be implemented after the exception of the new Energy Strategy till 2030.

Besides the shortages on the environmental side, these strategic projects like the FEC *en masse* are suffering significantly from underinvestment. Figure 7 compares the necessary investment and the actual level. It can be easily seen that the overall underinvestment is approximately 50%, which means that the strategic plan of investment attraction did not work. Indeed the data is the direct evidence of the absence of effective investment attraction mechanism in the Energy Strategy till 2020.

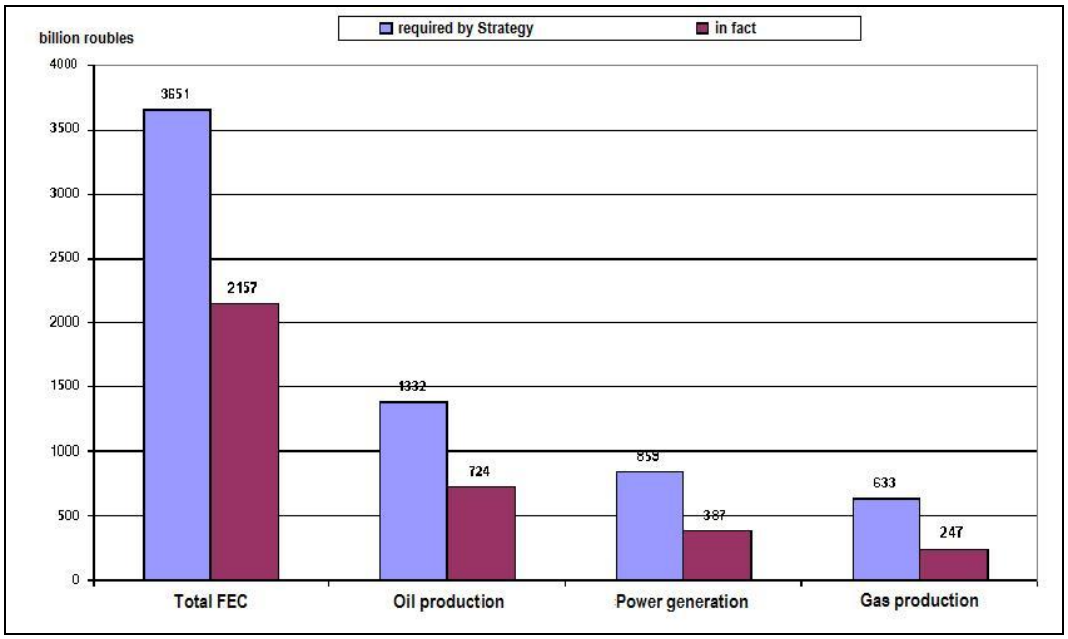

Fig. 7. Investments to the FEC during 2003-2007
Source: IES 2009

This peculiarity of the Russian Strategy till 2020 is an intrinsic feature of all Russian energy Strategies – they all are based on the directive planning exclusively, while indicative part remains rudimentary. The oil sector in particular is a good illustration for that, since the oil production was privatized by private business during 1990's. The state strategy-making bodies do not have necessary experience in creating incentives for the private investments. As a result all of the projects in the FEC are backed mainly by the state, lacking in private funding. Besides, it is also one of the main reasons of the inaccuracy of the Strategy prognosis for oil production (Table 2).

Another vital issue is that under the Energy Strategy the main objective for the oil industry is the continuation of the exploration of existing reserves along with step-by-step growth of production in order to provide the steady export volumes in perspective. Therefore, the Strategy is focusing on the growth of the oil reserves and exploration intensity. The Russian Energy Strategy expected to maintain the oil output growth by developing Sakhalin projects,

mainly Sakhalin II – 170,000 bbl/day. Other large fields to be planned are: 150,000 bbl/d Yuzhniy Khulchuyu field – 2008; 100,000 bbl/d Prirazlomnoye field – 2010; 300,000 bbl/day Vankorskoye – 2008; Timan-Pechora project (EIA 2008). Another important inflow to sustain the oil export is expected from the Caspian region transit.

Meanwhile, one of the major problems in Russian oil sector is the deterioration of the reserves in both new fields and the developed ones. As can be seen in the Table 3 the main producing oil fields are deteriorated for more than 60% and new fields, except Tyanskoye, are not that significant in volume. This data is also valid for today, since no big oil field was put online till nowadays. However, the problem of oil production decline has arisen in the late 1980's and is tightly connected to the theory of the oil peak.

Table 3. Depletion of the main Russian oil fields (production in thousand barrels per day)
Source: EIA 2008

Field	Production		Online Date	Depletion*
	2005	2006		
Samotlor	868	844	1964	73%
Fedorovo-Surgutskoye	482	433	1973	70%
Priobskoye	466	552	1989	14%
Romashkinskoye (Tatarstan/Samara)	300	301	1949	85%
Tevlinsko-Russkinskoye	247	223	1986	49%
Ust-Balyk-Mamontovskoye	241	242	1964	85%
Tyanskoye	214	246	1995	31%
Pokachevsko-Uryevskoye	190	178	1977	63%
Sugmutskoye	190	186	1995	67%
Vatyeganskoye	164	167	1984	37%
Malo-Balykskoye	156	165	1984	41%
Krasnoleninskoye	123	139	1985	13%
Povkhovskoye	116	122	1978	99%
Pravdinsko-Salymskoye	114	124	1968	29%
* Depletion is defined as Cumulative Production/Recoverable Oil Reserves (P+P)				

As we can see in the Table 3 these strategic plans were not fully realised. The production, indeed, was gradually growing as can be seen in the Figure 8, but the absence of introduction of the new oil fields along with above mentioned deterioration of the major ones put the

sustainability of that growth under big question. In addition, the plans to transit Caspian oil did not take into consideration the unreliable character and unsettled agreements of that source, which in turn are connected to the energy security issues.

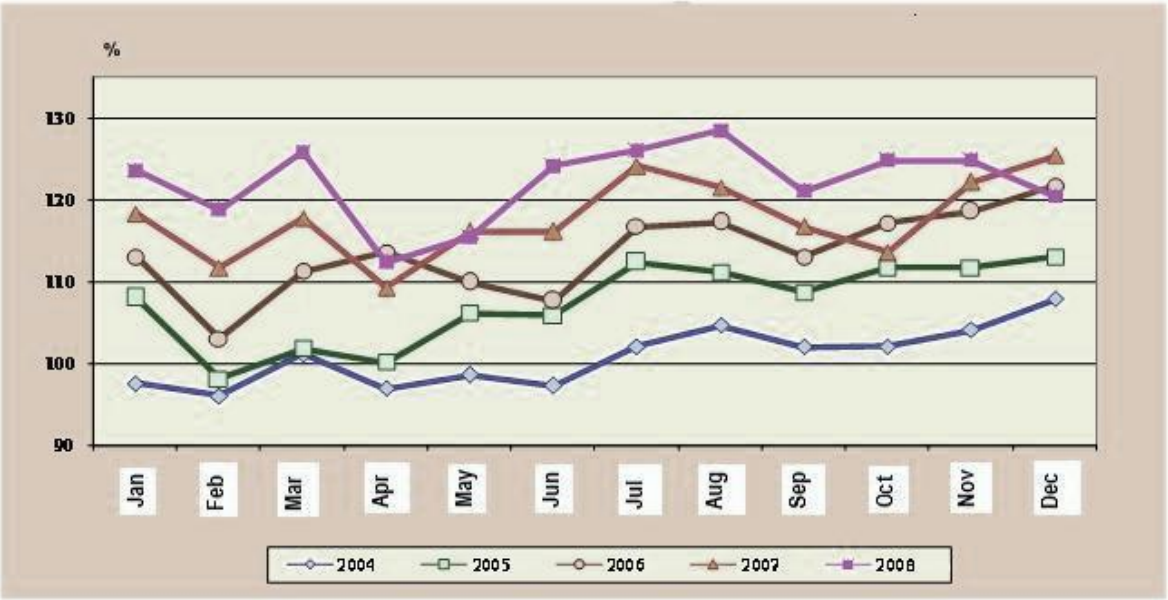

Fig. 8. Growth rate of primary oil production in comparison to 2003 level
Source: IES 2009 (with amendments)

3.1.2. Oil peak theory and Russian reality

As it was mentioned before the Russian FEC faces now the sharp exhaustion of the current oil fields and decline in the development of the new ones. Hence, such an important issue should be included into the top concerns of an energy strategy. From the one hand the widespread theory of the oil peak was not considered in the existing Russian Energy Strategy till 2020. From the other hand in the currently discussed Strategy till 2030 to be adopted in the end of 2009 the theory is mentioned as "the stabilization of the hydrocarbon resources" (IES 2007).

In 1950's Hubbert developed a model which underlay the oil peak theory. According to this model the production of oil in any producing oil field represents a bell-shaped curve, so-

called Hubbert Curve (Deffeyes 2006). The turning point of that curve is the moment when extraction reaches approximately 50% of the recoverable oil. When turning point has been passed the gradual decline of the oil production will occur. Hubbert implemented the same model for the U.S. oil production nationwide and made an accurate prognosis for the oil peak. After that, quite a number of geologists tried to fit the theory to the global oil production but accuracy of oil peak prediction was a challenging question.

The main arguments of the opponents of this theory are that the Hubbert model of oil extraction dynamics does not take into consideration technological development and the impact of the oil price, since the countries of OPEC try to control the production in order to keep oil prices on the high level (Maugeri 2004). Additionally, proved oil reserves have been increased for 55% over the last twenty years and come to around 1.1 trillion barrels (BP 2009).

It is important to note that in case of Russia these counterarguments are not that reasonable. Firstly, Russia is not the OPEC member, although some negotiations between them exist. Secondly, high oil prices have only been encouraging the oil extraction and export orientation of the Energy Strategy. Finally, as it has been already mentioned technological developments are lagging due to significant underinvestment. Summing up, all these factors show that Russia perfectly fit the Hubbert model. In 2009 Russia has cut oil exports with simultaneous delay of the development of the new oil fields (Jahn 2009). However, the true reason for this is not the “price regulation”, but the consequences of the economic crisis and deterioration of the oil fields.

The oil peak in Russia had a "false" turning point at the end of 1980's, when the oil production experienced 40% decline (EWG 2007). Indeed, the major factors of that decline were obsolete production equipment and economic depression. After both FEC and economic transformations during 1990's along with privatisation of the oil extraction and production the foreign investments backed the development of the existing oil fields. Meanwhile, the introduction of the new oil fields with the exception of some isolated cases was not invested into. The changes of Russian oil supply curve can be seen in Figure 9.

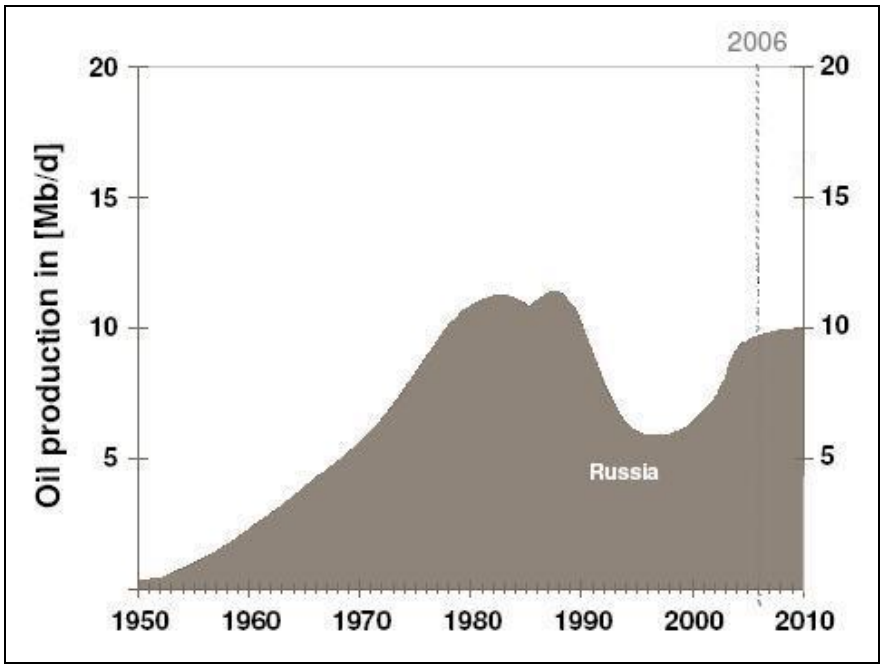

Fig. 9. Oil production in Russia (RSFSR as a part of USSR)
Source: EWG 2007(with amendments)

As illustrated in the Figure 9, the Russian oil production experienced two production (not oil) peaks – one in the end of 1980's, another is going now. Due to the non-gradual development of the oil sector, the oil peak can be hidden by these two production peaks. Indeed, Figure 8 shows that in the end of 2008 the growth rate of oil production was below the level 2007 as well as 2006. The state argument of such a decline is the economic crisis of 2008 (Jahn 2009). In contrast, the severe economic recession of 1998 followed by sharp decline in oil prices

(Campbell 2001) did not influence the Russian oil production at all. Therefore, the real origins of the current production peak is the deterioration of the producing oil fields and the absence of the introduction of the new ones (Mäkivierikko 2006), which can be considered in that particular case as the beginning of the oil peak for Russia.

In summary, the Energy Strategy of Russia till 2020 misses one of the most important trends in oil sector and *ipso facto* inadequately determines its development for the future. However, it is important to admit that the other countries do almost the same, except maybe China which is the only country that considers oil peak theory in its energy strategy comprehensively (Hirsch 2008). After passing the oil peak, Russia will face the necessity for significant corrections of its energy security agenda and opportunities of oil export. In these terms, almost all existing attempts of pipeline distribution system development lack a sense of purpose. Besides, oil peak will also somehow influence the strategy for gas sector, which plays a constantly increasing role in Russian FEC as well in the Russian economy overall.

3.1.3. Gas production

The Russian Federation possesses huge amount of natural gas – around 47 trillion m^3 of proved resources or 23 % of world total (IEA 2006). While Russia is the world largest producer and exporter of natural gas, 85% of the production and more than 90% of the export is controlled by state-owned company (FSSS 2008). All that means the Energy Strategy should mainly focus on Gazprom or in other words in sector, or in that particular case company, which is almost absolutely controlled by the state the energy strategy of the latter is supposed to be more precise in projections for development and somehow correlate with the

company's strategy (Fedorov pers.comm.). In the reality prognosis for the gas sector suffer de facto from the same gaps as the oil one.

The company's revenues mainly go to the foreign investment and the development of export pipeline infrastructure. Being a natural monopoly, Gazprom simply does not have direct incentives to develop intensively, updating the equipment and improving the technology. During the period 2003-2008 the investments has grown from 7 billion dollars to 20.4 billion dollars per year (EIA 2008). However, the IEA (2006) estimated the required investments for the Russian gas sector to sustain the production growth as 11 billion dollars per year. According to the Figure 7 the Strategy also sets far greater investment level than exist. Hence, taking into consideration that few investments go directly to the development, we can see that current level of them is significantly insufficient (Litvak pers.comm.). Therefore, the underinvestment as in oil sector takes place. However, main reason for it is not only the lack of foreign capital but the bad management of the existing financial resources.

According to the IEA (2006), due to the poor maintenance, the current transmission system of Gazprom, including compressor stations and pipelines, was responsible for 23-55 million tonnes of CO2 equivalent. While according to Vasiliev (2005), the percentage of underground pipelines which have passed their designed lifespan is doubling every 5 years. Considering all these, Gazprom substantially increased its investments for 2002-2006 reconstruction programs up to 2 billion dollars (Kirillov 2005). However, the efficiency of that programme for emission reduction is still questionable since the data was still not provided.

Even if Gazprom will allocate enough funds for the pipeline construction (the major are –

South stream (crossing Bulgaria, Serbia, Hungary, Greece, Albania and Italia), Nord Stream (Germany, Finland, and the UK), Blue Stream (Turkey), Kovykta – China, and Yamal – Europe II), the current decline of production, shown in Figure 10, will undermine the Gazprom capability to fill these pipes with gas (Kokorin pers.comm). Institute of Energy Strategy (2009) also notes the considerable deficiency even in geological exploration, not only in the introduction of the new fields. For instance, in 2008 the extraction exceeded exploration for 10%. The Energy Strategy admits it along with the increasing role of independent producers. However, the mechanism for the access simplification for them to the export pipelines was not provided and is currently under the development. Therefore, oil companies and independent producers do not have the possibility to export gas. They only sell gas on much more disadvantageous national market (IEA 2006). This fact also has substantial implications on associated gas flaring.

The associated gas flaring is growing: in 2005 it amounted for 27%, whereas in 1999 it was 20% of associated gas production (IEA 2006). According to the IEA the main roots of this problem are: the absence of incentives for oil companies for gas usage, hampered access to Gazprom transport and distribution network, Gazprom reluctance to buy this gas. Therefore, eliminating these barriers will make positive results (Litvak pers.comm.). However, the results for this period shows that the Energy Strategy, having energy efficiency in major priorities though, did not provided effective ways in solving the problem of associated gas.

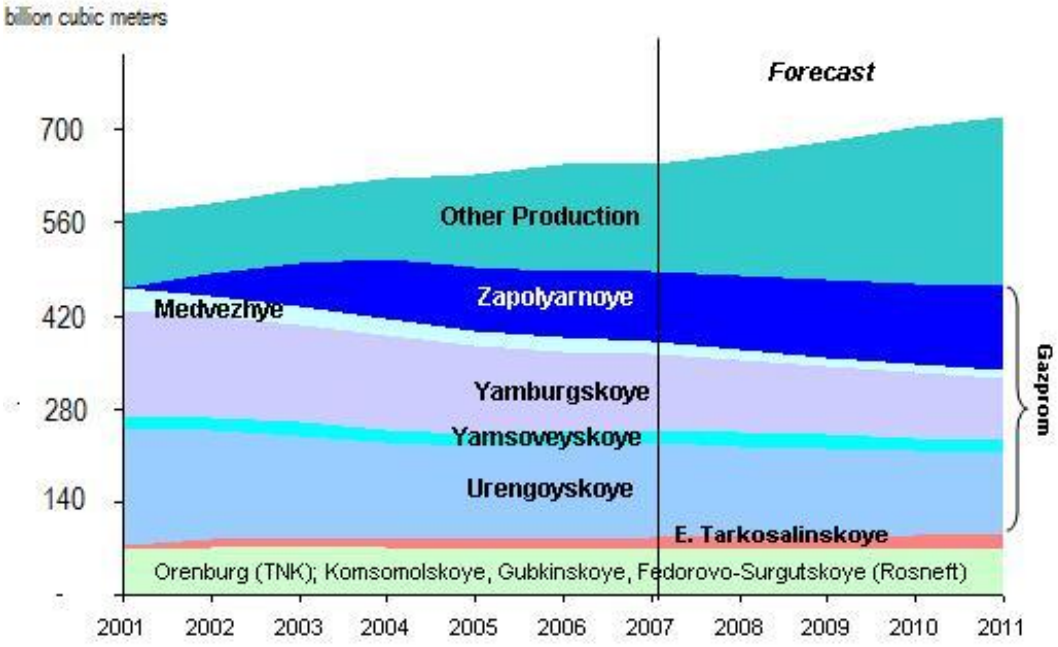

Fig. 10. Production of natural gas in Russia in major producing fields
Source: EIA 2007 (with amendments)

The Energy Strategy till 2020, as it was mentioned before, has underestimated the export prices dynamics for oil and gas and following gas production development (Table 2). In contrast, the Development Strategy of Russia's Gas Industry issued by Gazprom (2002) with assistance of Russian Academy of Science, neglecting price fluctuations, proved to be accurate in gas production prognosis. Baseline scenario of this strategy is the increase in gas production to 650-690 billion cubic meters (bcm) till 2010 and 750-800 bcm till 2020. Optimistic scenario: 745-765 and 880-920 bcm for the respective period. Level of 2008 - 664 bcm (FSSS 2008) perfectly fit the current range of prognosis. However, the state Strategy did not consider the estimation of the company's one. That also brings into a question the value of the state Strategy (in particular, the lack of it) for Gazprom (Litvak pers.comm.).

Since the national gas consumption in Russia constituted significant 63 – 66% (FSSS 2008) of the gas production, the export oriented Energy Strategy till 2020 was aimed to the reduction

of the national consumption in order to increase export volumes. In Russian energy balance of 2000 the total share of natural gas constituted 51%, whereas for coal – 16.8% (IES 2003). Figure 11 clearly shows that major usage purposes of gas – power, heating and industry – can be substituted by coal. Besides, the gradual growth of coal production during last decades with the necessary reserves and existing infrastructure are in place. Moreover, the major Russian coal company Siberian Coal Energy Company started to develop advanced technologies and updating its equipment in order to mitigate carbon dioxide emissions from the coal burning (Litvak pers.comm.)

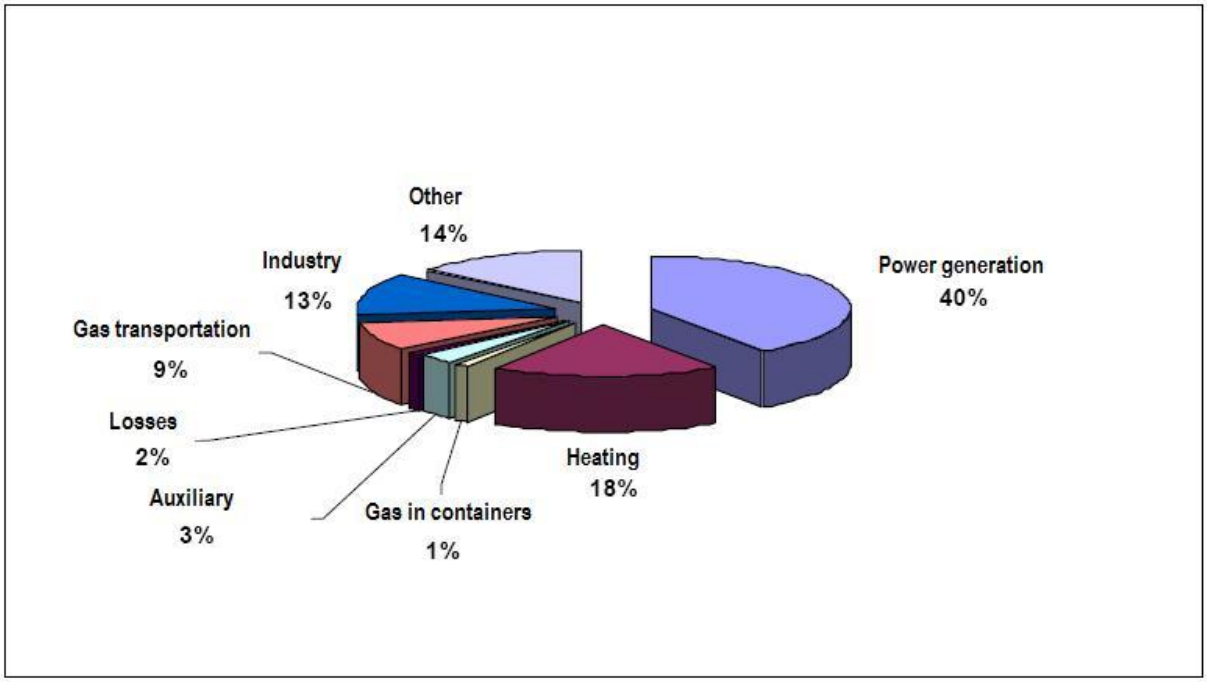

Fig. 11. Structure of natural gas consumption in Russia in 2006
Source: Karaganov *et al.* 2006 (with amendments)

However, the strategic goal was not realised: in 2008 the share of gas in national consumption increased up to 54%, while the share of coal decreased to 15.8% (IES 2009). One of the main reasons for that is the absence of price regulation mechanism along with financial incentives for the consumers to prefer coal. Gas prices over the past decade, regulated by state, increased

gradually, however, almost as much as coal prices (FSSS 2008). Therefore, as in the oil sector, the Strategy lacks indicative-type measures.

Since the export of Russian gas is based on the long-term contracts and has limited routes (pipelines) the political aspect of the price is very significant. Gazprom orientation to the Central Asia resources proved to be unreliable, since the political and, thus, unstable nature of those contracts. This also brings energy security questions to agenda, since the revenues from gas export constitutes a huge part of Russian GDP.

The performance of the Energy Strategy till 2020 in oil and gas sector during the period under study shows that the inaccuracy of prognosis and the entire direction of the sector development. Summarizing the main shortcomings:

- Growing underinvestment, as the result of the absence of incentives and the mechanisms of their attraction
- The forthcoming oil peak and its significant consequences, neglected by the Strategy
- The considerable decrease in introduction of the new oil and gas fields as the result of the points mentioned above
- The increasing share of the natural gas in the primary energy supply, which is result of the Strategy inability to increase the competitiveness of coal on the national energy market
- The remaining losses of the associated gas, since the Strategy did not put necessary attention and provided base for the mechanism of their elimination.

3.2. Energy efficiency

The significance of energy efficiency potential for the Russian FEC was proved by a number of experts (Bashmakov 2005; Opitz 2007; World Bank 2008) and constituted by different estimations about 278 million tonnes of oil equivalent or even more, which is enough to sustain the growth of the energy need of Russian economy for the next decade without increasing the use of other energy sources and building new power capacity. The true potential for energy savings is not available since all the existing data on the issue came from 1988-1990 (Bashmakov and Beschinskiy 1989), whereas the economic and industrial structure of Russia has significantly changed.

However, the realisation of this potential has a complicated nature. On the one hand the Energy Strategy till 2020, assuming the tripling of the GDP backed with 40% energy consumption increase or 43% decrease of energy consumption of 2004 (IES 2003), even underestimated the statistical data for the period 2003-2008. For instance, in 2006 GDP growth exceeded the expectations: 43.9 instead of predicted 33.9 comparing to the 2000 (FSSS 2008), while the energy consumption was on the forecasted level. Hence, the overall energy intensity level exceeded the predicted 17.7% decrease, and amounted to 23.3%. That is why this progress is justified by energy strategy developers as an evidence of huge success of their Strategy (IES 2009).

On the other hand, if a detailed analysis of energy sectors development is undertaken, some contradictory facts will be revealed. It is important initially to look what sectors maintained the GDP growth. Figure 12 shows that the GDP growth in 2003-2008 was provided by non-energy intensive sectors, while energy intensive heavy industry, manufacturing industry,

residential sector did not experience such a boost, they were developing not more than 4.2% excluding fiscal expenses (FSSS 2008).

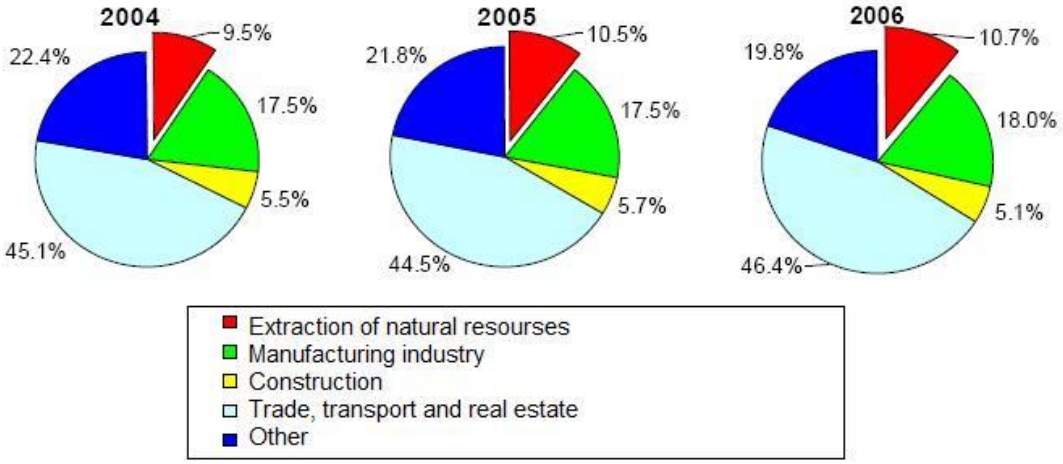

Fig. 12. Russian GDP dynamics by sector 2004-2006
Data source: FSSS 2008

Bashmakov (2009) writes that if the industry energy intensity will be estimated without heat and electricity generation, fuel production and distribution, counting only the end use energy consumption of industry, the energy intensity was developing this way: 2003 – increase 0.8%, 2004 – decrease 15.3%, 2005 – decrease 4.1%, 2006 – decrease 1.9%, 2007 – decrease 1.4%. Therefore, the nature of the officially stated "growth" or "improvement" in energy efficiency is quite questionable, since the target of the Energy Strategy was not reached and the energy efficiency in producing technologies was lagging (Malahov 2006).

Another side of the question is the Federal Targeted Program Energy Efficient Economy of 2001-2005, which was included into the framework of the Energy Strategy. The results of the program were not satisfactory due to the reasons:

1. Priorities of the program did not reflect the real situation in Russian energy efficiency potential. The program addressed mainly the FEC, related industry and atomic energy industry. Therefore, one of the most important residential and major end-user sectors was de facto left out. However, this point can be attributed to almost all Russian energy saving and energy efficiency initiatives (Chandler *et al.* 1996). In its regular review on energy efficiency Energy Charter Secretariat (2007) makes its own estimations, which is shown in the Figure 13. It is clearly seen that not only the FEC but also industry and construction along with residential sector constitute the major opportunities for energy efficiency improvements.

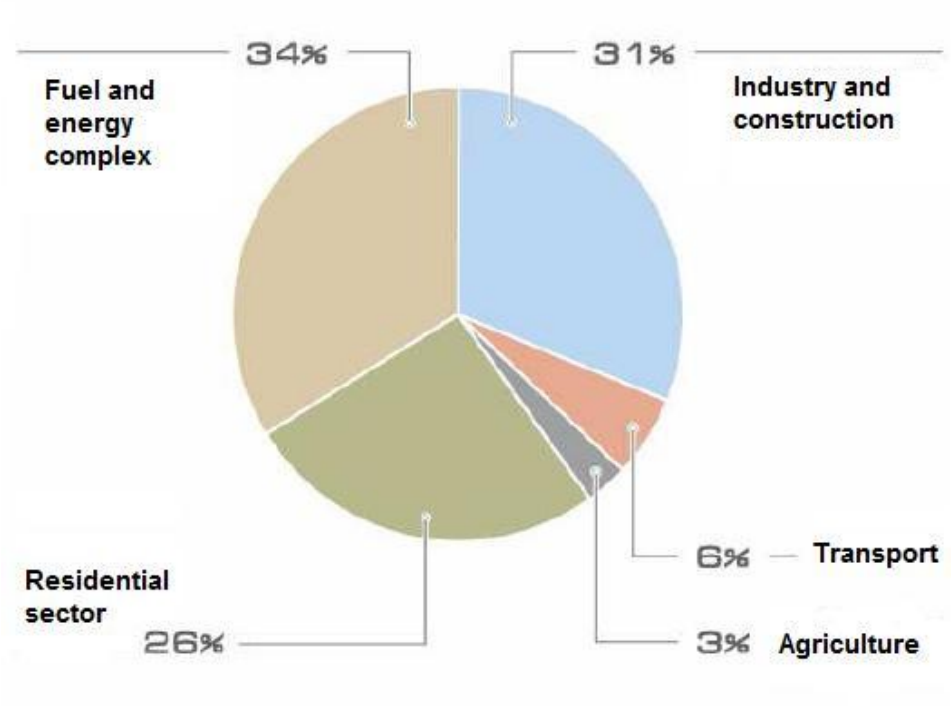

Fig. 13. Energy efficiency potential in Russian economy
Source: ECS 2007 (with amendments)

2. The infrastructure and institution to control and report on the program was not clearly identified. This led to the absence of responsibility for the program fulfilment.
3. The funding from the Federal government was not sufficient while the incentives to attract side investments were not determined and necessary mechanisms lack. The

actual funding from the Federal government was 3.6% of the Program budget (Minpromenergo 2001).

Due to the mentioned gaps the program was stopped in 2005 and since then no comprehensive document exists. However, in President Decree from 2008 “About measures of energy and ecological efficiency in Russian economy” the target for the energy efficiency was made: till 2020 40% of GDP energy intensity reduction comparing to the level of 2007, the electricity reduction of GDP for the same period – 28%. At the same time the bulk of the obstacles for energy efficiency improvements are not still addressed, including:

- Change of behavioristic patterns of the population: in particular creating necessary incentives for energy savings including adequate tariffs (however, not forgetting the social aspect of the price)
- Absence of appropriate statistics (World Bank 2007): prepare a comprehensive study on energy efficiency opportunities in both supply and demand sector
- Absence of incentives for municipalities and all budget-depending structures: the energy savings do not count into the organization budget and therefore lead to the budget curtailment for the next financial period
- Liberalization of the electricity production market: RAO UES has been already divided in 2008, however, a further development needed (Kopylov pers.comm.)
- Taxes and financial barriers: unwillingness of the banks to credit energy efficiency projects and companies.

Therefore, the potential of energy efficiency improvement in Russia should be one of the most important goals for the sector. The Russian Energy Strategy along with the energy

initiatives of the government proved to be inefficient due to the lack of necessary mechanisms and wrong priorities. However, the President Decree and the reform of the electricity production show that the political will to bring attention to these problems is coming to place. Otherwise the intensity reduction of 2003-2008, which occurred owing to the structural changes in energy consumption, will not further slacken the growing energy consumption and, thus, the export possibilities will be endangered.

3.3. Nuclear energy

Russia faces urgent need in substitution of its ageing nuclear power plants in the following decades. Besides, growing demand and above mentioned desire to cease the domestic consumption of natural gas also drives nuclear solutions. Since the federal program till 2015 states the necessity to built 10 nuclear power units, the necessary conditions of such a significant increase (nowadays 31 nuclear power units are utilized) are needed to be analyzed. Besides, the factual possibility to implement this plan is quite questionable due to the existing experience of failures of the similar plans in the near past. Moreover, the subject of investigation includes the overall capacity and capability of Russia to maintain and develop the nuclear energy options, as stated in the targeted program (Government of the Russian Federation 2006).

In the period between Chernobyl accident (1986) and the middle of 1990s, only single nuclear power plant (NPP) was built in Russia – Balakovo with 4 power units, while 3rd unit added to Smolensk. Drastically worsened economic situation, entailed by the Soviet Union collapse logically led to a critical shortage of the funds for further developments of the nuclear industry; hence, number of projects significantly ceased. However, 1990s' export of nuclear

reactors to China, India and Iran was managed and Russian damped domestic program for NPPs construction was recovered (Josephson 1999).

As a result, approximately 2000 nuclear construction projects were resumed. Among them - Rostov-1 (Volgodonsk-1, WWER-1000 V-320 reactor), the first delayed power unit, was revived in 2001, and with a capacity of 1 GW is already in service (Rosenergoatom 2009). The nation-wide “nuclear renaissance” was launched. Subsequently, the third power unit with the same reactor type (WWER-1000) was commissioned in 2004 at Kalinin NPP.

Hereupon, by 2006 the decision to further promote nuclear power had trussed and plans of adding some 2-3 GW per year up to 2030 arose. In addition, exporting projections of nuclear technology to meet 300 GW of new nuclear capacity world demand were made.

In 2001the first government program consolidating the national nuclear sector was signed. Rosenergoatom, in 2008 renamed to Energoatom, received all civil reactors, including related infrastructure and those under construction. Being a government owned company, Energoatom works in the framework of the state energy strategy and federal nuclear program in particular (for the period 2007-2015) and receive state funding for new plants construction. As stated in the strategy policy priority is to double the nuclear power production by 2020 and reduce the natural gas use for electricity generation (IES 2007). The growth is also planned to come from lifetime extension of existing units and their upgrading.

3.3.1. Present nuclear capacity

Table 4 shows the current state of Russian nuclear power which has 31 operating reactors, of total capacity 21.743 GW and Nuclear Power Production 152057.79 GWh as estimated for 2008 (IAEA 2009). In addition to Bilibino, some reactors also provide district heating (cogeneration) - totalling 8 PJ/year.

Table 4. Existing power reactors (in operation)
Source: IAEA PRIS 2009

Reactor name	Type V=PWR	MW net, each	Commercial operation (starting date: mm/yy)	Scheduled close
Balakovo 1-2	V-320	950	5/86, 1/88	2015, 2017
Balakovo 3-4	V-320	950	4/89, 12/93	2018, 2023
Beloyarsk 3	BN600 FBR	560	11/81	2010
Bilibino 1-4	LWGR EGP-6	11	4/74-1/77	2009, 09, 11, 12
Kalinin 1-2	V-338	950	6/85, 3/87	2014, 2016
Kalinin 3	V-320	950	12/04	2034
Kola 1-2	V-230	411	12/73, 2/75	2018, 2019
Kola 3-4	V-213	411	12/82, 12/84	2011, 2014
Kursk 1-2	RBMK	925	10/77, 8/79	2021, 2024
Kursk 3-4	RBMK	925	3/84, 2/86	2013, 2015
Leningrad 1-2	RBMK	925	11/74, 2/76	2019, 2022
Leningrad 3-4	RBMK	925	6/80, 8/81	2009, 2011, +20 yr
Novovoronezh 3-4	V-179	385	6/72, 3/73	2016, 2017
Novovoronezh 5	V-187	950	2/81	2010
Smolensk 1-3	RBMK	925	9/83, 7/85,1/90	2013, 2020
Volgodonsk 1	V-320	950	3/01	2030
Total: 31		21,743 MW		

Typically, reactors have life of 30 years starting from the first power. However, in 2000, lifetime extension plans covered twelve first-generation reactors with total capacity of 5.7 GW. The probable extension period is 15 years (Perera 2003), implying the necessary procedures should have been started by 2006. By 2015-2020 all these 12 units are planned to be replaced.

Nowadays, 8 nuclear power reactors are under construction: Rostov /Volgodonsk 2, Kursk 5, Severodvinsk, Kalinin 4, Beloyarsk 4, Novovoronezh II -1, Leningrad II-1 with total projected 6280 GW capacity.

3.3.2. Nuclear capacity possible increase

According to the Federal targeted program for the nuclear sector development approved in October 2006, 10 new power units will be commissioned till 2015, totalling 33 GW of nuclear power capacity. Initially, the program was estimated for US$ 55 billion, with $26 billion of this sum up to 2015 federal budget inflow (Government of Russian Federation 2006). Moreover, Rosatom funds were supposed to cover the rest and private investments are not involved. After 2015 all financing is planned to be extracted from profits of Rosatom. However, the necessary investments in the nuclear power sector are expected to double up to 960$ million in 2008 due to the financial crisis (EIA 2009).

In 2007 the first version of the program scheme was changed, since from 2012 to 2020 only two 1.2 GW power units/year were available under the federal program financial capacity. Respectively, the units for 2015-2016 were specified as "proposed". In 2008, a new version: one 1.2 GW Tversk power unit was carried forward to 2015 (rescheduled), hence, it is designated now as "planned"(Rosatom 2009). Therefore, federal targeted program is very unlikely to be followed directly, in terms of existing acute financial obstacles. However, the necessity to substitute existing “ageing” power units will be satisfied, since the government supported state investments in Rosatom (2009) after the crisis.

Therefore, the reason for possible underinvestment in the nuclear sector is not the absence of investments attraction mechanisms, but the recent economic recession, since the main sponsor of the program is the federal budget. Therefore, the strategic importance of the nuclear sector, in terms of technological advantage, can be followed. However, in order to sustain its strategic potential Russian government have to make a constantly increasing amount of investments.

Besides, Rosatom and Ministry of Industry and Energy are urgently developing an action plan in order to attract further investments into generation of electricity power. As a result of RAO UES reform it is expected that by 2020 major part of generation will become competitive and privatized, with preserved state natural monopoly over the electric grid. The very positive scenario (major projected NPPs are built) of nuclear development (including some CIS NPPs) is represented in Figure 14.

Figure 14. Planned and existing NPPs in Russia (the high scenario till 2030)
Source: INSC 2009 (with amendments)

3.3.3. Floating nuclear power plants

The importance of the floating nuclear solutions was stated in the Federal program due to the vast Russian experience in building that kind of platforms and convenience of these platforms against the background of the huge electricity distribution losses and distant territories. Therefore the discussion of this extraordinary solution is of particular interest.

The Academic Lomonosov construction - the first floating nuclear power station, was started in 2007 in Severodvinsk. Completion is planned in 2010, when the Lomonosov will provide electricity to both the Sevmash plant and Severodvinsk. The Lomonosov will also serve as a prototype and demonstration model (Resnicoff 2008).The electrical capacity of the Academic Lomonosov will be 70 MW and additional thermal power - 300 MW.

Construction cost are estimated 400$ million (20% funding by Sevmash, 80% by Energoatom), due to newness of the technology. However, later it is to be reduced to $240 million (Rosatom 2009).Since these floating stations are designated mainly for industrial use in the distant regions (Yamal, Kamchatka etc.), electricity cost will be much lower than present alternatives provide.

The potential export opportunities include Indonesia, China, Algeria, Malaysia, and Argentina, who already expressed their interest in technology (Resnicoff 2008). Therefore, the possibility of the floating NPP development is highly probable, since they have some essential advantages: convenience, relatively low cost, and existing technology.

3.3.4. Reactor technology and features

The stress on the nuclear technology development was made in all Russian energy strategies and the Strategy till 2020 is not an exception. Therefore, it is quite important to estimate the current state of technological innovation and advance.

Based on the demand peculiarities and financing capabilities the following bullet points for large scale nuclear plant should be considered:

- Utilization rate at least 90% (Rosenergoatom 2009)
- 3 cents/kWh limit for the power cost (Kurronen 2006)
- 50 years minimum lifetime
- Construction costs not more than 1000 $/kW (Thomas 2005)

The main reactor VVER – 1000 (V-320) has 950-1000 MW net output. Updated types of VVER-1000 have western control systems and apparatuses and are built in China and India - as AES-91, 92 nuclear power reactors. Main components of AES-91, 92 are almost the same except extra seismic protection and slight difference in cooling system (Wenisch 2007).

The creation of the AES-2006 power plant in together with the third-generation VVER-1200 made an evolutionary development of VVER-1000 (in AES-92 plant), with better efficiency (36.56% in contrast to 31.6%), much longer life (50 instead of 30), and greater power. Novovoronezh II (in service in 2012-13) and Leningrad II (operation start 2013-14) will be the first units on this technology (RAO UES 2008).

A typical AES-2006 power plant will have two VVER -1200 reactor units and is expected to run with 90% capacity factor for 50 years. Construction time will last 4.5 years with capital cost about 1200 $/kW, while the first contract is expected to be 2100 $/kW due to technology exploration (Gidropress 2006). Additionally, VVER-1200 provides enhanced safety related to aircraft impact and earthquakes by passive safety tools.

Russia possesses technologically advanced solutions which are utilised in the current NPP construction. However, the capital costs for advanced VVER-1200 exceed the limits of economic feasibility on the international market, while the other features meet contemporary requirements (Thomas 2005). At the same time the new technologies like fast neutron reactor with closed nuclear cycle and nuclear fusion are currently under intensive development. Therefore the future of the Russian nuclear industry is tightly connected with its research and development sector.

Nuclear power technologies remain one of the main advantages of Russian government. The "renaissance" of the recent decade has shown that Russia is ready to develop and invest into its nuclear power sector. The non-stopped funding of the construction of the new power plants and the introduction of new technologies (VVER-1200, floating systems, nuclear cogeneration increase) is strengthening the nuclear share in Russian electricity supply. The government support will prevent the "collapse" of nuclear sector.

However, the full realisation of the ambitious plans stated by the Federal targeted program, to increase share of nuclear energy up to 23% in 2020 seems to be non realistic, since half of the investments should have come from Rosatom revenues, and in current recession conditions Rosatom needs huge government investments itself (Litvak pers.comm.). However, the

substitution of the current capacity will probably occur. At the same time, competitiveness of Rosatom on the international market remains quite strong and is not likely to fall down, since the consequences of financial crisis influenced every participant.

3.4. The analysis of the main energy sectors and Strategy performance: outcomes

During the period of 2003-2009 the main problems and obstacles of the energy efficiency issues, oil and gas complex, and nuclear energy as well as rest unsolved, worsened and became even more urgent. These three sectors serve as a good example of the overall poor performance of Energy Strategy till 2020, the main shortcoming of which was not just in the wrong predictions but in inability to connect the development of the energy sectors together, to address them comprehensively, and to create or promote the creation of essential mechanisms for reaching the strategic goals and following the priorities.

Having accumulated almost all the negative sides, mentioned in the first chapter, the existing Energy Strategy till 2020 expectedly failed in creation of the necessary conditions and mechanisms, which implied the effective indicative type of strategic planning. As a result, the terrible situation in the investment side of the FEC was not improved. Besides, technological energy efficiency was far from estimations, while the official data for decrease of GDP energy intensity was composed owing to the structural changes in Russian economy with the growing number of low and medium energy intensity sectors.

Concerning nuclear energy, it is early to make clear evaluations for the current targeted program, since the period of its implementation has quite recently started. However, both the

past experience of the policy in nuclear sector and started economic recession in 2008 against the background of the current poor state of the sector bring a huge question mark on the probability of the program success.

4. ANALYSIS OF THE CONCEPTION OF THE RUSSIAN ENERGY STRATEGY TILL 2030

Since the Energy Strategy till 2020 even for the short period of 2003-2007 proved to be inadequate, the Government, in particular Ministry of Industry and Energy, gave a task to the Energy Strategy Institute to form a working group in order to re-estimate the current trends in Russian energy production and consumption. In 2007 the basic Conception of the new Energy Strategy till 2030 was published. Since that time the discussion over the Conception formed different scenarios, however, leaving the main features practically untouched (Kopylov pers.comm.). Therefore, analysis of the details of the Conception of Strategy till 2030 is meaningless, since the final text is not determined and some moderate changes are likely to be made (Litvak pers.comm.; Kokorin pers.comm.). At the same time it is reasonable to make an estimation of priorities and basic issues of concern of the new Strategy in comparison to the exiting one in order to figure out if the evolution occurred.

This chapter is divided into three parts: the description of the new energy strategy, in particular its differences comparing to the previous one, the analysis of the major directions of the energy policy, and final outcomes of the comparison of the Conception and its predecessor. The consideration of experience in strategy making, accumulated from the past decade, is of particular interest.

4.1. General description of the new Energy Strategy of Russia till 2030

Since the developing team of the Strategy did not experienced significant change, it was likely to expect the reiteration of the main ideas to the new Strategy, like it was done during

the 1990-2003. However, the Conception does not just follow the structure of its predecessor, but propose a little bit modified approach to the strategy making en masse as well as make consider new issues of the energy policy. The authors define the major differences in the main features and targets of the Conception (IES 2007) from the existing Strategy as follows (with comments):

1. The consideration of the factor of uncertainty. This issue was addressed by including the different scenarios of the development, not just optimistic and pessimistic prognosis like in the Strategy till 2020. However, the prognoses were made only for two scenarios – "innovative" and "conservative", while the "critical" scenario (IES 2007) was just mentioned and left non-considered. Besides, the necessary steps for reaching this or that scenario is not sufficiently described. The annual monitoring of the Strategy with making the required corrections in prognosis cannot be considered sufficient due to the several factors. Firstly, analysis shows the narrow range of the scenarios, which cannot explain the changes of the major indicators. For instance, the economic crisis of 2008-2009 certainly was not expected. However, the "critic" scenario would somehow address the challenges of this recession, but as it was mentioned above, it was not considered as probable by the developers. Secondly, the team that is responsible for the monitoring is the same which made the strategy. Therefore, they are not interested in adequate critic of their piece of work. The past monitoring reports include citations: "strategy is performing quite well: energy consumption exceeded the expected optimistic scenario for 6 %" (IES 2009).
2. "Road map" development. In spite of this statement, the ways of overcoming major obstacles, for instance, in energy efficiency sector was not provided. Besides, the of "road mapping" in the Conception describes only the necessary indicators of reaching

this or that scenario, while the ways of activating these indicators are not explained as well as the models of correlation between indicators. Still, the mechanisms which should be initiated in some particular cases are also not developed. The absence of clear mechanisms or, at least, ways of its creation has successfully migrated from the previous Strategy to the Conception.

3. Main strategic priorities. The list of the priorities was revised: energy security, energy efficiency, economic efficiency of the FEC, and environmental safety. The Concept also assigns especial importance, formulate and define the stages of the development for the regional energy policy, subsoil use, energy balance rationalization, innovative and scientific improvements, social aspects, external energy policy. It should be noticed that so called "new" priorities of this list predictably repeat those from the previous Strategy. However, the major difference in this point is the more detailed nature of some of them. At the same time the so-called innovative improvement is not backed with the description of source of the innovation, i.e. where they would come from (Litvak pers.comm.). The attention to the division of the federal and regional "responsibility" for the energy strategy implementation can be considered as a good step to the overall coordination improvement of the Energy Strategy. In general, the institutional responsibility in the Conception is defined more precisely comparing to its predecessor.
4. Major strategic initiatives. Among them there are: the creation of oil and gas complexes in Eastern regions of the country, exploration of the hydrocarbon potential of the Arctic shelf and Northern regions, development and territorial diversification of the energy infrastructure, improvements of energy efficiency and energy saving, and the development of the non fossil fuel energy. This point attracts particular attention, since the experience of strategic projects and initiatives under the previous Strategy shows

that almost all of them suffered from sharp underinvestment. The new initiatives of the Conception, excluding energy efficiency, also imply a few investment volumes. However, the financial side of the suggested initiatives is not determined in the Conception. Therefore, considering the underinvestment origins of the delay of the same initiatives of the existing Strategy discussed in the previous chapter, the realization dates of those projects as indicated in the Conception are quite doubtful.

5. Perspectives of the of the FEC development. The by-stage characteristics of the development were defined and the estimations of the necessary investment volumes were made including making the indicators for the latter. The problem of underinvestment was placed by the Conception among the major ones and mentioned as a key problem of the national energy security. However in the section of the main energy security the solution of this problem is addressed only as the "creation of the investment climate". However, neither the base for the mechanism creation, nor the delegation of the task to any state institution was made. At the same time the non state investments are considered by the concept as the major resource for the development of the strategic initiatives and projects of the preferred favourable-innovative scenario of the development. Considering such a mismatch of the desired goals and the provided resources (or more exactly their absence) to reach them, one can question the probability of strategy prognosis.

To the mentioned differences of the Conception one should add the more defined energy security issues, particular attention to the renewable energy resources and the consideration of oil peak, at least on the global scale.

Firstly, the energy security definition was broadened and the list of the key threats was revised. The misbalanced structure of the energy consumption in Russia with huge predominance of the natural gas share presents one of the major problems. The decreasing level of the economically feasible reserves of the natural resources, oil and gas in particular, is also addressed.

Secondly, the consideration of the oil peak is included into the main challenges of the energy policy of the Russian Federation. However, the description of the impact and the scale of this issue, as described by the Conception, are quite disputable. The oil peak, predicted to happen in 2012-2015, is addressed mainly as the global problem, not National one. Therefore, the impact for the national FEC was not estimated. The main consequences for Russia, according to the Conception will be the increase of the export prices for oil and gas. However, taking into account Russian interest in such an increase, in this perspective this statement can be considered as an opportunity rather than challenge. At the same time, the oil peak in Russia per se, will definitely make topical the question of the development of alternative energy and fuels, turning down the export orientation of the state energy strategy (Kokorin pers.comm.). This event will probably change the entire perception of the energy policy in Russia. However, oil peak in this context is not described by the Conception.

4.2. Analysis of the major issues of the Energy Strategy till 2030 comparing to the Strategy till 2020

Since the current Energy Strategy till 2020 was analyzed by the three main issues, it is reasonable to make the similar analysis of the latter Strategy while comparing the two Energy Strategies and drawing parallels between them . Still, the nature of the Conception per se, did

not allow making the detailed analysis of these sectors like it the one in the second chapter. Besides, the recently started time period under study of the Conception also limits the evaluation. Therefore, the main attention will be paid to the evaluation of the lessons learned from the previous Strategy performance, the elimination or iteration of the main gaps of the strategic planning for the sectors, revealed in the second chapter.

4.2.1. Oil and gas sector

One should admit that almost all of the major gaps of the previous Strategy, revealed in the section 2.1., are addressed and somehow discussed. Moreover the energy security issues of the Conception are tightly connected to the export volumes and state of the oil and gas complex. Therefore, the analysis of the result of the previous Strategy performance was somehow provided. However, the framework for the creation of the necessary mechanisms and law base, which are essential for the improvements, is not sufficiently developed.

Besides, the origins of the shortcomings is not described and addressed. For instance, the problem of the associated gas flaring is just mentioned in the Conception. However, the importance of this issue against the background of gas fields' depletion is doubtless. Moreover, the required practice and positive examples of effective utilisation of the associated gas exist. For instance, the main Russian oil companies use the associated gas for local co-generation, since they do not have opportunities or incentives to sell it to Gazprom. Another example is Surgutneftegas, which invested in the construction of the contemporary gas turbine power generators and thereby increased its gas utilisation rate to 95% (IAE 2006).

This type of investments is the best option for associated gas utilisation so far. Besides, it is not the only way to combating gas flaring. The increase of the pollution fees will also have significant impact (Senova pers.comm.). However, as mentioned in the second chapter, the absence of access to pipe and Gazprom motivation to buy associated gas are the main obstacles of this problem. Hence, energy industry has the necessary experience, but further incentives needed. Therefore, the Conception should utilise and encourage such developments in this sphere. In addition to that, the strong lobby of the oil companies will also push the access to the Gazprom distribution network (Kopylov pers.comm.).

The oil peak, as was mentioned before, was not addressed properly, since only global scale is discussed in the Conception. However, even on that scale the comprehensive discussion of the consequences and implications for Russia was not provided. At the same time the importance of the oil peak for Russian FEC is described in the second chapter of the current work.

4.2.2. Energy efficiency

Following its predecessor, the Conception puts the problem of energy intensity of Russian economy to the main agenda. The Concept, following the analysis in section 2.2., also confirms that the energy intensity decrease of the Russian GDP in 2003-2007 was achieved mainly by structural changes in the economy and the growing predominance of non-intensive industries and sources, while targeted technological efficiency was significantly lagging. Therefore, one should conclude that the Conception at least admits the fail of the energy efficiency policy under the previous Strategy. Additionally, the Conception puts a particular stress on the necessity of creation of the necessary legislation, concerning energy efficiency, which can be considered as a definite step forward.

As in the oil and gas section the Conception does not address the roots of the energy inefficiency and spheres of its major potential – energy saving on the demand side. Contrarily, it proposes a penalty system for the excessive energy intensity of the services and production. However, the realization of this initiative is quite doubtful, since the measurement of the energy intensity in Russia is another big question (Kosharnaya pers.comm.). Therefore, the Conception does not provide the necessary indicative planning for the demand side energy saving, thereby, fail to cover all the aspects of energy efficiency improvements.

At the same time the Conception determines the market and financial stimulation of the energy efficiency, thereby addressing the experienced tax and financial barriers mentioned in the section 2.2. However, the stimulation of bank loans for the purposes of energy efficiency increase is not discussed.

Finally, the Conception estimations are based on the same obsolete data on energy potential in Russia as the Strategy till 2020. The required contemporary analysis of energy efficiency and energy saving potential of Russian economy is not scheduled.

Summarising, the Conception considered the potential and the importance of energy efficiency and energy saving. However, the determined measures and base for corrections to the existing energy policy are halved and non-comprehensive, since some essential issues like demand side energy saving and incentive mechanisms were not considered.

4.2.3. Nuclear energy

Since the Conception coincides in timing with the current federal targeted nuclear programme, which was analysed in section 2.3., the significant changes in this sector did not occur. The Concept confirms the main objectives of the federal program to sustain and facilitate the construction of the new NPP in the short term and develop the reactors on fast neutrons with closed nuclear cycle along with nuclear fusion technology.

Therefore the outcomes made for the sector in section 2.3 are valid for the Concept also. Since this sector represents the strategic interests of the federal government (Litvak pers.comm.), the decrease of the nuclear power generation will not happen. However, the full realization of the plan seems quite doubtful due to the economic recession and following financial curtailment.

4.3. Analysis of the Conception: outcomes

The Conception of the Energy Strategy till 2030 cannot be equally compared to the existing Energy Strategy till 2020, simply due to its incompleteness and possibility of changing. However, the analysis of the main ideas of the Conception shows that were not made. Still, some evolutionary ones take place. The experience of the Strategy performance in 2003-2007 was taken into account. At the same time the Concept almost exclusively follows the directive planning of its predecessors, thus, lacking indicative mechanisms and tools.

Considering the energy efficiency, oil and gas complex and nuclear power sectors, the Conception addresses some of the problems faced by the previous Strategy, while several

others are not sufficiently discussed. Besides, the Conception mainly addresses the problems per se, not their roots, thus, creating the doubts in the success of the proposed solutions.

Finally, one can say that the Conception seems to be more comprehensive and effective comparing to the previous Strategy. However, some intrinsic features and traditional directions like directive planning and narrow scenarios building are also in place. Considering foresaid, one can say that the energy policy and energy strategy of the Russian Federation are evolving, but evolving slowly. The next challenging 5 years will show if the speed of policy transformation is sufficient to address all the problems and contradictions accumulated in the Russian fuel and energy complex.

5. CONCLUSION

The energy sector of a state experienced significantly challenges and opportunities in 2003-2008, whereas the existing energy strategy, which was designed to foresee and address these issues, did not fulfilled its mission. The forthcoming "change" in the energy policy, presented by development of the new energy strategy, actually, is not the change but the correction. However, the Conception contains many important considerations. After the in-depth research of the two Energy strategies and their analytical comparison, the main findings of the thesis are:

1. The evident absence of evolutionary nature, poor learning from the results, experience accumulation, indicative measures is of the particular peculiarity of all Soviet and then Russian energy policy. All these features were mainly transferred from one strategy to another due to the preservation of the developing team, and in particular its non-transparency and closed type.
2. In 2003-2008 the main obstacles and problems of the energy efficiency improvements, oil and gas complex, and nuclear energy as well as, rest unsolved, worsened and became even more urgent. These three sectors serve as a good example of the overall poor performance of Energy Strategy till 2020 and, thus, Russian energy policy, the main shortcoming of which was not just the wrong predictions but inability to connect the development of the energy sectors together, to address them comprehensively, and to create or promote the creation of essential mechanisms for reaching the strategic goals and following the priorities. The new policy addressed some of the problems faced by the previous Strategy, while several others are not sufficiently discussed. At the same

time, the Conception mainly addresses the problems per se, not their reasons, thus, undermining the effectiveness of the proposed solutions.

3. The existing Energy Strategy till 2020 expectedly failed in creation of the necessary conditions and mechanisms, which request the effective indicative type of strategic planning. As a result, the terrible situation in the investment side of the FEC was not improved. Besides, technological energy efficiency was far from estimations, while the official data for decrease of GDP energy intensity was made mainly due to the structural changes in Russian economy with the growing number of low and medium energy intensity sectors.
4. Concerning nuclear energy sector, the policy remained consistent. The State accurately addresses the necessity of maintaining the present nuclear capacity by prioritising and financing the nuclear program. However, against the background of the economic recession started in 2008 and the current enormous investments needed for the sector, the prospects of the "nuclear renaissance", beyond simple substitution of the existing capacity, is still unclear.

Summarizing, the analysis of the main statements and priorities of the Conception of the Energy Strategy till 2030 shows that no revolutionary transformation was made, tough, some evolutionary ones take place. One can say that some lessons from the experience of the Strategy performance in 2003-2007 were considered: oil peak, underinvestment, failed energy efficiency policy, and infrastructural change. However, the new policy almost exclusively follows the directive planning of its predecessors, thus, lacking important indicative mechanisms and tools. Therefore, the change of development of the new Energy Strategy does not mean the required significant change of the energy policy.

Thus, the analysis of the policy and actual state of the FEC shows that, the latter is developing and changing faster than the policy. It can be considered a huge problem since the strategic policy, first of all, implies strategic vision of the further development. That vision in turn implies not only the addressing of the already faced problems but also the foreseeing of the forthcoming ones. Therefore, failure of the policy to adequately address the emerging challenges reveals the inability for the strategic vision of the policy makers *en masse*.

In the context of energy strategy development, the current policy and strategies partially follow the path of their Soviet predecessors. Keeping in mind the incorrect priorities of the Soviet energy programmes, resulted in the dependence of the whole economy on the oil export and significant energy intensity of industry, the importance of changing this "path" is doubtless.

The limitations of the current research is mainly manifested in the complexity of accessibility of the necessary data and closed process of the Russian energy strategy making in particular and Russian energy policy making in general. The author also experienced great difficulties in the clarification and contacting of the main stakeholders of the strategy making process in energy sector, due to the extreme non-transparency character of the latter. Therefore, the detailed reasons of why the strategy turned this or that way is the issue of further research.

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