

**Project: “Enhancing Synergies in  
Commonwealth of Independent States (CIS)  
National Programmes on Energy Efficiency  
and Energy Saving for Greater Energy  
Security”**

**Regional study “Analysis of policies of CIS  
countries on improving energy efficiency and  
potential for developing cooperation and  
enhancing synergies in the CIS region”**

## List of abbreviations:

|          |  |
|----------|--|
| AC       | Agricultural complex   |
| GDP      | Gross Domestic Product   |
| CES      | The Common Economic Space  |
| CHP      | Central Heat and Power/Thermal Power Station                               |
| CIS      | Commonwealth of Independent States   |
| CIS UEM  | CIS Unified Electricity Market   |
| COP      | Coefficient of Performance   |
| EU       | European Union   |
| EE       | Energy Efficiency  |
| EM       | Energy Mix   |
| ES       | Energy Saving  |
| ESCO     | Energy Service Company   |
| FERs     | Fuel and Energy Resources  |
| HCS      | Housing and Community Services   |
| LTF      | Local types of fuel (non-imported)   |
| MW       | Megawatt   |
| PES      | Primary Energy Sources   |
| PPP      | Purchasing Power Parity  |
| R&D      | Research and Development   |
| RES      | Renewable Energy Sources   |
| SCO      | The Shanghai Cooperation Organization                                      |
| t.o.e.   | tons of oil equivalent   |
| t.f.e.   | tons of fuel equivalent  |
| TWh      | Terawatt-hour  |
| IMF      | International Monetary Fund  |
| JSC      | Joint Stock Company  |
| kWh      | kilowatt-hour  |
| UN       | United Nations Organization  |
| UNDP     | United Nations Development Programme                                       |
| UN ECE   | United Nations Economic Commission for Europe                              |
| UN ESCAP | The United Nations Economic and Social Commission for Asia and the Pacific |



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## Introduction

The present study analyses and summarizes the information stated in the reports by the national experts regarding goals and objectives, approaches, priorities and mechanisms of increasing the energy efficiency in the CIS member-states.

Nowadays, most CIS countries have been concerned over high energy intensity of GDP, which exceeds 2-3 times the GDP energy intensity of the advanced countries. Presently, almost all Commonwealth countries recognize the capacities of energy saving and design therefore national policies to improve the energy efficiency in a way that the realization of energy efficiency potential promotes the priority tasks solution of national economic and social development. The national programs became an efficient instrument for implementation of the national policy in energy efficiency.

First chapter of the survey briefly describes the status of economy and of energy market in the CIS countries, provides an assessment of energy saving potential and an in-depth analysis of the national policies on energy efficiency improvement in the CIS countries. It also examines main objectives that are being solved in the framework of policy implementation on energy efficiency improvement. Furthermore, it outlines the existing political, legal, institutional and financial factors that lead to the improvement in energy efficiency and energy saving.

Second chapter examines the potential of improved energy efficiency and energy saving in the field of energy production and consumption, including industry sector, transport, housing and community services, and agriculture.

Given that CIS countries differ substantially in terms of the national economies' structure and availability of energy resources, their policy priorities on improvement of energy efficiency and use of renewable energy sources, as well as the approaches to the implementation of policies are also different.

Upon the results of the analysis there had been revealed the common factors affecting the effectiveness of the current policy, there had been identified effective approaches for the policy design on legislative, institutional, application (program) and management levels.

Third chapter is dedicated to the generalization and comprehension of the accumulated experience of international cooperation in energy efficiency improvement. It analysis the national programs on energy efficiency and energy saving in terms of the expansion of international cooperation, as well as it gives the recommendations on various forms and methods of its realization.

## **Chapter I. Comparative analysis of the national programs and measures undertaken to improve energy efficiency and energy saving in CIS countries.**

Current CIS member states are: Republic of Azerbaijan, Republic of Armenia, Republic of Belarus, Republic of Kazakhstan, Kyrgyz Republic, Republic of Moldova, Russian Federation, Republic of Tajikistan, Turkmenistan, Republic of Uzbekistan, and Ukraine.

### **1.1. Economic situation**

The Commonwealth of Independent States holds a substantial resource potential. It occupies 16.4% of world's territory on which approximately lives 4.4% of world's population. The CIS share of global conventional oil accounts for 20%, gas reserves – 40%, coal – 25%, power generation – 10%. Given its geographical position the CIS region has an important transit potential. Its transport and communication systems` role in the global transport system is becoming increasingly important.

At the same time, the standard of living of population in the CIS member states is very dissimilar and generally falls behind of that one in the advanced countries. Politically and economically, the region in general is estimated as heterogeneous and unstable.

Over a period of 20 years of economic development of the CIS countries one can distinguish several periods:

1991-1999 – the period of a deep economic decrease due to disintegration of the former USSR,

2000 – 2007 – the period of dynamic economic boost,

2008 – 2011 – the period of global financial crisis and first post-crisis years, characterized by serious changes in dynamics of global economic activity.

In the 90s of the previous century all the CIS countries faced a deep (up to 40% in 1998) adaptive decrease related to the collapse of the USSR, after which

followed the period of restorative economic growth. The scale of decrease in the years of 1990 reflected in fact how tight were the inter-republican ties within the framework of the USSR's common national economic complex. The level of decrease reflected the negative synergy of geopolitical and transformational shocks, as well as unfavorable foreign trade conditions and ethnic tensions in a range of post-soviet countries.

In the period 2001-2007 the favorable economic conditions in most CIS countries allowed to ensure high level of macroeconomic indicators' growth.

The total GDP of CIS countries according to IMF evaluations on the PPP amounted in 2008 around 2.9 trillion US\$ or 4.5% of the World GDP. By the same token in the pre-crisis 2007 the CIS was one of the most dynamically developing regions in the world. The average rate of economic growth in the CIS member states comprised 9%. On average, the GDP growth in the CIS countries in 2008 compared to the previous year comprised 5.5%, which is substantially higher than in other countries on average (3.2%). The CIS share in the global export counted for 3.5%, in the global trade, in services for 2.5%. In 2008 the total CIS countries' export volume almost reached US\$ 700 billion, import – US\$ 460 billion.

The global financial crisis in the end of 2008-2009 demonstrated a great vulnerability of CIS countries' economies to the external shocks. The CIS countries export more than 1/5 of their products to the Commonwealth's member states, more than a half – to the European countries and roughly 1/10 – to the Asian countries.

In 2009 the economy of most CIS countries was in a state of recession. On average in the CIS countries the GDP in January-July 2009 compared to the same period in the previous year decreased by 9% while in January-July 2008 increased by 7%. The crisis's effect differed in the given countries. Ukraine, Armenia, Russia faced a quite severe decline, whereas the economy of Azerbaijan, Turkmenistan and Uzbekistan retained quite high growth rates. Differentiated reaction to the crisis reflects the level of dissimilation in countries' economy structures and national management systems.

In January-July 2009 almost all CIS countries faced the decrease in the volume of industrial production. On average, the CIS countries compared to the same period of the previous year the volume of industrial production declined by 15%. At the same time, almost in every country the most rapid rates of decline were recorded in the manufacturing industry sector. The volume of transported goods fell by 20%, fixed capital investments by 16%, retail turnover by 5%. All countries witnessed a strong decrease in the monetary volume of foreign trade.

Among the consequences of the crisis there should be first of all identified the exacerbation of economic contradictions between the CIS countries and simultaneously activation of works upon creation of the Customs Union consisted of Belarus, Kazakhstan, and Russia. The Customs Union came into force in January 2010.

Globalization strongly impedes the alignment of diversification of the economy in the post-Soviet states what in its turn requires substantial financial resources, new types of technology, qualified and skilled workers, effective institutions, and certainly fresh ideas for development. So far the growth has been influenced by global demand which generally promotes the growth of the primary industry sector.

Thereupon, there is great importance of orientation of integration projects, primarily of the CES for a qualitative growth of the national economies.

At the stage of the gradual overcoming of the global financial crisis` consequences (and probably on the brink of its second wave) the economic growth in the CIS countries relies on the former model of development while adjusting for some more limited investment flows comparing to pre-crisis periods and increased level of the national debt in a range of states in the region. At the same time, by some other indicators of vulnerability to external shocks, the CIS countries are in a more favorable condition if compare to the year 2008.

Countries importing energy sources (excluding Armenia and Belarus) saw a significant decrease of the current account deficit compared to the indicators of the

pre-crisis period, thank to what they need less external borrowings and they are to a lesser extent exposed to the risk of changeable dynamics of capital inflow.

The problems in the global economy, however, are still present, and lately the risks of slow-down and probability of the second wave of the crisis become more likely. As a result the growth rates of the global economy were revised downwards (towards decline scenario). In this regard, the issue of economic development of the CIS countries in the mid-term perspective remains open. Nowadays, most indicators show global economic slowdown. Obviously, it will result in the economic slowdown in the CIS countries.

In the mid-term perspective, the most serious risks for the states exporting energy sources present the price fluctuations on hydrocarbons.

The IMF in its January report “World Economic Outlook” deteriorated its forecasts by the rates of economic growth in the CIS countries for 2013-2014. In 2012 the economic growth in the CIS counted for 3.6% and growth of the global GDP for 3.2%.

According to the IMF evaluations GDP growth in the CIS in 2013 counts for 3.8% (October forecast – 4.1%), in 2014 - 4.1% (October forecast – 4.2%). On the whole in 2013 the global GDP growth is anticipated (IMF estimates) at the level of 3.5% (October forecast – 3.6%), for 2014 – 4.1% (October forecast – 4.2%).

Accordingly, it is supposed that the CIS countries in general will demonstrate more rapid rates of economic growth unlike world average.

## **1.2. Energy market, balance of energy consumption**

The CIS possesses substantial capacities to develop the fuel and energy sector. To date, the collective energy potential of the CIS member states counts for 10% of global oil reserves, more than 31% of global gas reserves and 27% of coal reserves. Herewith the CIS member states consume about 80% of the extracted natural gas and coal, less than 50% of oil. Consequently, the export potential of the CIS countries is quite substantial.

The CIS member-states have a great potential of energy saving, which according to experts' estimations amounts from 420 up to 450 million tons of oil equivalent. Currently, energy intensity of some CIS countries exceeds 3 or 3.5 times the level of industrially developed countries. The highest levels of GDP energy intensity are recorded in Kazakhstan, Turkmenistan, Uzbekistan, and Ukraine.

On the whole, in 2010 CIS have produced 645 billion tons of oil (up by 2.2% as compare with 2009). Major countries oil-producers in the CIS are Russia (78% of total production in the CIS), Kazakhstan (12%) and Azerbaijan (about 8%).

Oil production increased up by 9.2% as compared with 2009 and amounted 784 billion cubic meters of gas. Russia ranks first in production of natural gas (82.8% of production in the CIS) simultaneously being the largest exporter of it. The second largest gas producing country in the CIS is Turkmenistan. Uzbekistan produces more moderate volumes of gas.

Coal production in the CIS in 2010 counted for 510 million tons, what is 6.9% more as compared with the previous year. Main producers and consumers of coal in the CIS are Russia, Kazakhstan, and Ukraine.

The share of atomic power stations (APS) in the total power generation in the recent years counted for more than 40% in Armenia, about 16% in Russia and approximately 48% in Ukraine. On the whole, the share of nuclear power used in the power generation in the CIS is approaching to 18%.

Analysis of changes in the production and consumption of primary energy sources (PES) in the period from 1990 to 2012 showed that generally the CIS member states by collective production of energy sources in 2012 exceeded the level of the year 1990. At the same time, in the CIS generally the need for primary energy sources 1990 – 2012 decreased by almost 23%.

The Institute of Strategic Studies of the Russian Academy of Sciences jointly with the CIS Executive Committee in 2009 elaborated the forecast of energy production and consumption by the CIS member-states for the period up to

2020. It is coordinated with the forecasts for development of World's energy sector and with integration programs in the CIS (EurAsEC, SCO).

The Baseline Scenario is designed on the basis of national forecasts for economic development and energy sector of the CIS Member States (table 1).

In general, the Baseline Scenario of energy production and consumption by the CIS Member States is characterized by rapid growth rates of production of primary energy sources(1.39 times), including production of natural and associated gas (1.38 times), coal (1.36 times), oil (1.27). According to the Baseline Scenario the power generation in the CIS countries will increase 1.49 times (figures 1 and 2). The most rapid growth rates in the CIS are anticipated in gas production industry which is mainly determined by increase of export. For the given period a leading role in this branch will be played by Kazakhstan, Russian Federation, Turkmenistan, and Uzbekistan and later by Azerbaijan. By the end of the given period the share of Russia in the production structure of oil and natural gas will be decreasing mainly due to the increasing share of Central Asian countries. Over the given period the CIS member states will be increasing their potential of oil and gas export, while the capacities for coal export will decline because of increased demand for internal consumption in the CIS member states, primarily for power generation. Export potential of electric power industry in the CIS member states will increase due to growing demand for electric power mainly in the Asian markets.

Table 1. *The balance of production and consumption of the primary energy resources of the Member States of the CIS within the Baseline scenario.*

| Member States of the CIS                      | Primary Energy Resources Tons of oil equivalent |       |      |       |       |
|---|---|-------|------|-------|-------|
|   | 2008  | 2009  | 2010 | 2015  | 2020  |
| <b>Production of primary energy resources</b> |   |       |      |       |       |
| Azerbaijan                                    | 59.5  | 78.4  | 90.5 | 104.6 | 95.4  |
| Armenia                                       | 1   | 1.1   | 1.2  | 1.5   | 2     |
| Belarus                                       | 3.8   | 3.9   | 3.9  | 5     | 6.6   |
| Kazakhstan                                    | 151.8   | 148.6 | 161  | 226.1 | 268.5 |
| Kyrgyzstan                                    | 1.4   | 1.7   | 1.9  | 2.9   | 3.6   |
| Moldova                                       | 0.1   | 0     | 0    | 0     | 0     |

| Member States of the CIS                       | Primary Energy Resources Tons of oil equivalent |        |        |        |        |
|--|---|--------|--------|--------|--------|
|  | 2008  | 2009   | 2010   | 2015   | 2020   |
| Russian Federation                             | 1289.11   | 1284.3 | 1295.8 | 1361.3 | 1460.5 |
| Tajikistan                                     | 1.5   | 1.9    | 2      | 3.6    | 4.7    |
| Turkmenistan                                   | 70.2  | 82.8   | 95.4   | 136.2  | 168.8  |
| Uzbekistan                                     | 61  | 62.4   | 64.9   | 68.7   | 72.4   |
| Ukraine  | 78.2  | 75.8   | 75     | 114.5  | 124.6  |
| <b>Consumption of primary energy resources</b> |   |        |        |        |        |
| Azerbaijan                                     | 14.6  | 15.58  | 16.3   | 18.62  | 20.61  |
| Armenia  | 3   | 2.94   | 3.01   | 3.33   | 3.86   |
| Belarus  | 27.4  | 27.9   | 28.3   | 30     | 32.1   |
| Kazakhstan                                     | 59.3  | 60.67  | 64.42  | 75.77  | 79.95  |
| Kyrgyzstan                                     | 2.7   | 3.14   | 3.2    | 4.09   | 4.6    |
| Moldova  | 3.3   | 3.92   | 3.98   | 4.75   | 6.44   |
| Russian Federation                             | 715.7   | 677.58 | 681.88 | 726.56 | 768.66 |
| Tajikistan                                     | 3.2   | 3.82   | 3.88   | 4.28   | 5.52   |
| Turkmenistan                                   | 22.3  | 19.89  | 20.66  | 21.76  | 23.83  |
| Uzbekistan                                     | 46.1  | 44.66  | 43.63  | 43.97  | 43.01  |
| Ukraine  | 134.1   | 147.66 | 153    | 163.84 | 175.66 |

Figure 1. Dynamics of energy resources production in CIS. Baseline Scenario.

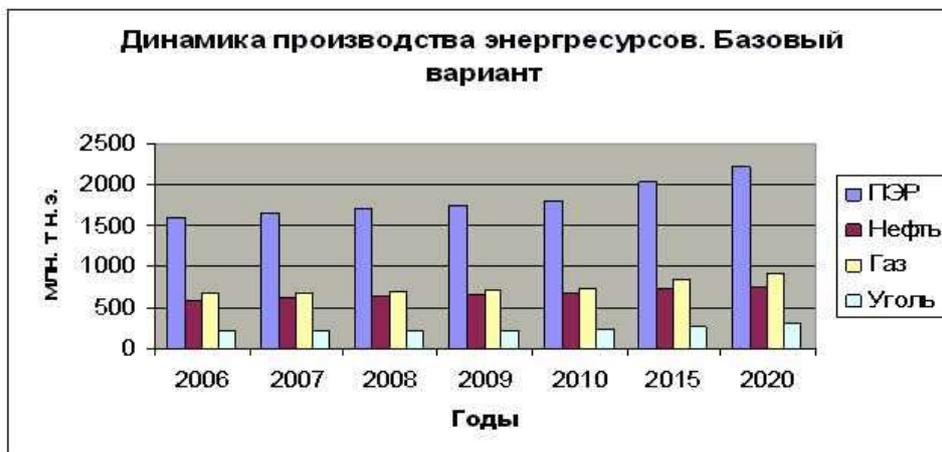
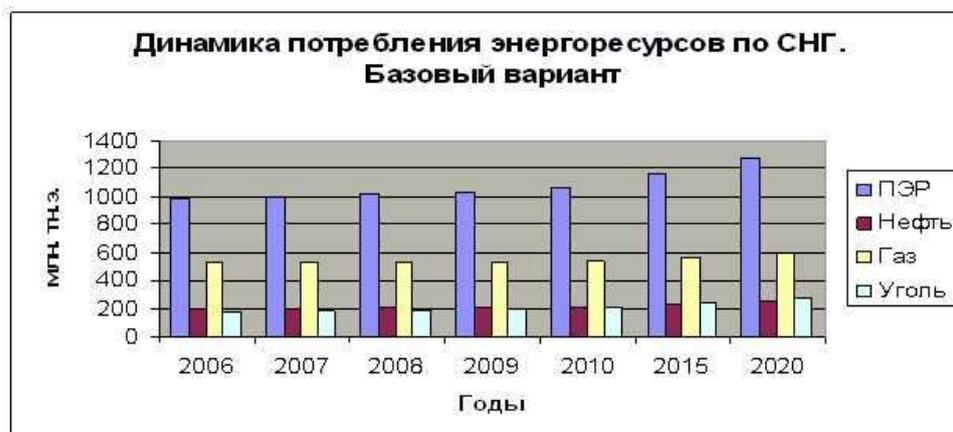


Figure 2. Dynamics of energy resources consumption in CIS. Baseline Scenario.



The Baseline Scenario retains the tendency of economic development of the CIS countries by means of considerable increase of consumption volumes of fuel and energy resources, a low level of usage of alternative energy, high level of GDP energy intensity in comparison with industrialized countries.

Summing up the forecasts of energy source production and consumption balances of the CIS member states in accordance with the Baseline Scenario one may say that it retains the tendency of economic development of the CIS countries by means of considerable increase of consumption of fuel and energy resources and underuse of alternative energy.

The Baseline Scenario assumes the tendency established in the 2000 – 2008 of direct dependence of the economic growth (with the growth of the population prosperity) and energy consumption levels in the CIS member states. In the majority of the CIS countries this will be happening due to electric-power industry (increase of electric power consumption demands extra fuel consumption for power generation) and domestic sector.

The change in the structure of the energy balances of the CIS countries in the given scenario goes on moderately which slightly modifies the structure by the end of the period under review.

The feasibility of the objectives set in such Scenario is confirmed by the levels of development of fuel and energy sectors, covered by national programs, by

the forecasted balance sheets of mutual trade between of the CIS member states and prospects for energy resources export.

The Energy Efficient Scenario is viewed as an alternative one.

The Energy Efficient Scenario is based on the forecast of decrease, in comparison with the Baseline scenario, in domestic demand for energy resources in the CIS member states due to intensive energy saving policy. Environmental issues were also taken into account and viewed as the highest priority. The supposition was made that levels of extraction and production of energy resources in the CIS member states remain equal to the Baseline Scenario (table2). Thus, there were considered the possibilities of the export potential growth of the CIS member states through the increase of the energy saving and improved energy efficiency. In the present scenario one may observe the 6-7% decrease in organic energy consumption if compared to the Baseline Scenario.

Intensive energy saving policy based on the experience of advanced industrial countries provides the opportunities for the CIS member states of more effective utilization of fuel and energy resources through priority investments into research-and-development and design-and-engineering projects as well as into implementation of new technologies. The scenario involves is the secured provision of innovation-based development in all sectors of economy of the CIS countries and their competitiveness on the market.

*Table2. The balance of production and consumption of the primary energy resources of the CIS countries within the Energy Efficient Scenario.*

| Member States of the CIS                      | Primary Energy Resources, tons of oil equivalent |        |        |        |        |
|---|--|--------|--------|--------|--------|
|   | 2008   | 2009   | 2010   | 2015   | 2020   |
| <b>Production of primary energy resources</b> |  |        |        |        |        |
| Azerbaijan                                    | 59.5   | 78.4   | 90.5   | 104.6  | 95.4   |
| Armenia                                       | 1  | 1.1    | 1.2    | 1.5    | 2      |
| Belarus                                       | 3.8  | 3.9    | 3.9    | 5      | 6.6    |
| Kazakhstan                                    | 151.8  | 148.6  | 161    | 226.1  | 268.5  |
| Kyrgyzstan                                    | 1.4  | 1.7    | 1.9    | 2.9    | 3.6    |
| Moldova                                       | 0.1  | 0      | 0      | 0      | 0      |
| Russian Federation                            | 1289.11  | 1284.3 | 1295.8 | 1361.3 | 1460.5 |

| Member States of the CIS                       | Primary Energy Resources, tons of oil equivalent |        |        |        |        |
|--|--|--------|--------|--------|--------|
|  | 2008   | 2009   | 2010   | 2015   | 2020   |
| Tajikistan                                     | 1.5  | 1.9    | 2      | 3.6    | 4.7    |
| Turkmenistan                                   | 70.2   | 82.8   | 95.4   | 136.2  | 168.8  |
| Uzbekistan                                     | 61   | 62.4   | 64.9   | 68.7   | 72.4   |
| Ukraine  | 78.2   | 75.8   | 75     | 114.5  | 124.6  |
| <b>Consumption of primary energy resources</b> |  |        |        |        |        |
| Azerbaijan                                     | 14.6   | 15.58  | 16.3   | 18.62  | 20.61  |
| Armenia  | 3  | 2.94   | 3.01   | 3.33   | 3.86   |
| Belarus  | 27.4   | 27.9   | 28.3   | 30     | 32.1   |
| Kazakhstan                                     | 59.3   | 60.67  | 64.42  | 75.77  | 79.95  |
| Kyrgyzstan                                     | 2.7  | 3.14   | 3.2    | 4.09   | 4.6    |
| Moldova  | 3.3  | 3.92   | 3.98   | 4.75   | 6.44   |
| Russian Federation                             | 715.7  | 677.58 | 681.88 | 726.56 | 768.66 |
| Tajikistan                                     | 3.2  | 3.82   | 3.88   | 4.28   | 5.52   |
| Turkmenistan                                   | 22.3   | 19.89  | 20.66  | 21.76  | 23.83  |
| Uzbekistan                                     | 46.1   | 44.66  | 43.63  | 43.97  | 43.01  |
| Ukraine  | 134.1  | 147.66 | 153    | 163.84 | 175.66 |

The combination of social, economic and technological factors (the growth of GDP, the population living standards, unrealizable potential of energy saving) predetermines the increase of demand for energy resources in almost all CIS countries while the change in the pricing environment in the energy resources trading has not yet allowed to change the present tendency towards the expansion due to the demand lag.

The diversity in the energy resources production and consumption structures is the objective basis for the expansion of energy resources trading and mutual integration of the CIS countries in the energy sector.

The energy resources export capacity (first of all in terms of natural gas) of the CIS countries calculated until 2020 is fairly high with due account for the intra-regional trading and it can still be expanded through the realization of the increasing energy efficiency programs in all CIS member states.

Natural gas ranks high in the energy balances of almost all CIS member states. In the majority of the CIS countries (experiencing power shortage or excess) the programs, which aim to reduce the share of gas in the energy mix not only by

means of energy savings, but also by its replacement with other types of energy sources, appear.

Current inefficient use of energy resources predetermines the decrease of the energy intensity levels of all CIS countries which makes it possible to bring the mentioned indicators closer to the standards of the developed countries. More vividly it can be traced in Energy Efficient Scenario (by means of intensification of energy saving programs) and “Excessive” Scenario of development (by means of acceleration of economic growth and structural energy saving).

### **1.3 Analysis of the CIS countries policy in the energy saving area**

As a whole by now many CIS countries are concerned about the high rate of GDP energy intensity which exceeds approximately 2-3 times the indicators of the GDP energy intensity in the developed countries. The governments became aware of the importance of formation and realization of national policy in the energy saving area and improving the energy efficiency.

Considering the significant diversities in the structure of national economies and resource endowment, the policy priorities in the area of improving the energy efficiency and use of renewable sources of energy and approaches to its realization differ.

It is important to note that up to present the national energy markets in the CIS countries have not been completely formed. There is governmental regulation of prices on energy sources and tariffs on the services of natural monopolies. In this context, energy efficiency is of great importance from the point of view of the population and economy energy supply with reasonable tariffs as well as from the point of view of market reforms to reduce the amount of cross-subsidization.

All the CIS countries can be divided into two groups: countries mainly importing the hydrocarbons and countries exporting these types of hydrocarbons. To the first group Armenia, Belarus, Kyrgyzstan, Republic of Moldova, Tajikistan, and Ukraine could be ascribed, to the second one –Azerbaijan, Kazakhstan, Russian Federation, Turkmenistan, and Uzbekistan.

Countries, depending on oil and gas imports generally need pay much more attention to the measures aiming to improve the energy efficiency and promote rational use of energy sources since they buy them on foreign markets at the world prices or close to them. Exporting countries to a lesser extent suffer from high energy intensity of the economy as they can allow themselves to determine the prices in the domestic market, considerably lower than world prices and thereby increasing competitiveness of the products and reaching the objectives of the social and economic development.

Countries, relying on energy resources import mainly earlier designed an appropriate legal and institutional framework necessary to reach the objectives in the sphere of improving energy efficiency and energy saving. The main goal of such policy in this group of countries is lowering of GDP energy intensity with the purpose of ensuring the energy security and improving the structure of the fuel and energy mix, reduction of dependence on imported energy sources, increase of use of available in the country fossil fuels and renewable energy sources.

Generally in all CIS countries, excluding Turkmenistan and Azerbaijan, there are laws on energy saving in force, the legal framework of energy saving is formed or is in the process of formation and aimed to ensure the basis for implementing the policy of effective use of energy sources: there are laws coming into force on improving energy efficiency and energy saving, there are adopted strategic documents on development of the national economies which reflect the goals and objectives in the area of improving the energy efficiency. There were also designed the national programs and action plans, formed particular sectoral and specialized programs in accordance with the national priorities.

By the same token, in some states the legal base can be defined as just “declarative”. In the majority of countries the laws on energy saving do not propose the mechanisms of direct action and are loosely connected with other legislative acts regulating various energy issues and ecology. The norms of the energy legislation often are not coordinated between each other; there are gaps and unresolved issues. Moreover, almost all countries actively study international

experience and there are efforts being done to adjust it to the national conditions and priorities. In particular, noteworthy are the tendencies in harmonization of the legislation in the sphere of energy efficiency with the EU legislation.

In the majority of states under review there is lack of a complex and consistent approach to realization of the policy on improving energy efficiency. As a rule, a mechanism of monitoring and assessment is absent or underdeveloped. There is no fully organized system of collecting statistical data, no mechanisms of correction of the mid-term objectives and mechanisms of their achievement, there is no fully developed system of subordinate normative legal acts and standards, as well as no mechanisms of economic stimulation of investments into energy efficiency worked out in practice.

Major impediments to introduction of energy saving enterprises are the imperfection of the tariff policy and the practice of cross-subsidies, underdevelopment of ESCO and energy saving technologies, uncertainty regarding the budgetary support of energy efficiency in the perspective, high investment risks, low level of qualification of the local management, insufficient level of culture in rational use of energy sources, insufficiently developed system of market relations, absence of efficient economic incentives for drawing investments into main productive assets and for the implementation of energy saving projects, imperfection of governmental regulation in the area of energy saving, particularly on the regional and local levels.

Indeed, very often there is lack of real policy regarding the population, which could further the energy saving and use of alternative sources of energy in the housing sector. Existing mechanisms of state policy do not always suffice for overcoming aversion by the economic agents of innovative technologies in general and of energy efficient technologies in particular. There is no appropriate infrastructure of energy market and energy efficient technologies, no formed sources or not fully practiced in action the mechanisms of financing the energy efficient projects. The cornerstone in implementation of investment projects

remains unpreparedness of the population and of authorities to wait for a couple of years the return of investments.

The common weak point is uncertainty in the regulatory environment in the sphere of heat supply and other infrastructural spheres of housing and utilities services, directly related to the service of population, functioning in the conditions of merely absolute absence of good coordination of rules and price setting which have to a considerable extent a subjective non-economic nature and oriented mainly to the preservation of social stability and not to economic results. Actual absence of the long-term tariffs virtually excludes any long term and serious activities on energy saving and even more on energy efficiency.

The most successful countries, in which along with the thoroughly designed legal base and necessary institutional framework (extremely important is the presence of an independent body of state regulation in charge for energy saving). Another necessary prerequisite is the clear goal setting and planning (with defining of key indicators that are planned to achieve until specified time), as well as creation of the system of monitoring of results in the implementation of national policy in energy efficiency. Besides, even in the presence of the system of economic incentives, at the first stage of energy efficiency policy implementation the leading role plays the budgetary funding of energy efficient projects.

It could be noted that best results in energy saving were achieved by Belarus, that has been undertaking a more complex and consistent approach in energy efficiency since 1995 and the key principle of which is ensuring energy security through improvements of the fuel mix while using energy resources rationally and integrating local types of fuel (non-imported) and RES as well as of energy and eco-efficient technologies in all in sectors of economy.

Apart from GDP growth and reduction of energy intensity of the economy (more than two times as compared to the level of 1997 – a year of stabilization and economic recovery) the level of total energy consumption did not considerably change. This is the case for almost all sectors of the economy. Currently, energy intensity of economy is 1.4-1.8 times lower than in the Russian Federation,

Ukraine, Kazakhstan and other countries of the former Soviet Union, but is still 1.5-1.8 times higher than in average in the European countries.

The implementation of programs and activities to realize the state policy allowed to raise the share of domestic energy sources in the mix of heat and electricity production from 2.8 % in 1990 up to 25% in 2012.

Ukraine also achieved a substantial progress in energy efficiency. It designed multi-tier legal framework and worked out long-term and mid-term plans and the system of target and intermediate indicators, established an institutional framework and a system of monitoring and assessment of realization of complex and specific sector programs.

The Russian Federation in the recent 6 years established an integrated system of energy efficiency improvement and now the main task of the state policy in the field of energy saving, among others, is practicing in action of all mechanisms of the system.

The policy of other states in the sphere of energy efficiency improvement is less complex and consistent and focuses mainly on their top priorities.

CIS countries also pay much attention to use of renewable energy sources (RES).

### *1.3.1 Main goals and objectives*

The concept of energy security in the Republic of Belarus assumes 12 indicators among which the GDP energy intensity by PPP is one of the most important.

Currently Belarus works to achieve the following objectives:

- reduce GDP energy intensity as compared with the level of 2005 no less than 50% in 2015 and no less than 60% in 2020;
- reach the total level of saving of FERs with comparable GDP over the period 2011 - 2015 by no less than 7.1 – 8.9 million tons of fuel equivalent and by no less than 5.2 million tons of fuel equivalent over the years 2016 – 2020;

- ensure the share of domestic energy sources in the mix of the boiler and furnace fuel – 30% by 2015 and 32% by 2020.

These targets are planned to achieve through realization of activities on energy saving, aimed at improvement of the economy structure, introduction of modern energy-efficient technologies and equipment, development of economic and organizational mechanisms of stimulation of energy saving measures, system of metering and control of energy consumption, energy audit of organizations and branches of industry, raising the energy efficiency by means of standardization, broadening of the spectrum of research studies.

Belarus faces the rise of demand and supply on the market of energy efficient technologies and equipment. There is need for the services on project management and implementation of turnkey construction projects, conduct of energy examinations on the enterprises.

By now, in accordance with the action plan, defined by the Strategy of development of the energy potential in Belarus, the Government actively undertakes measures to improve the tariff policy by means of step by step optimization of the tariff system on energy, creation of economic incentives to promote the use of energy saving technologies in action and stimulate the consumers to save energy; stage-by-stage removal of cross-subsidies from the tariffs on energy, including tariffs for the population.

The strategy on energy potential development of the Republic of Belarus determines a complete stage-by-stage removal of cross-subsidies in the tariffs on energy in Belarus by 2014-2015.

The main goals of Ukraine at the current stage are:

1. Reducing the level of GDP energy intensity by 2015 by 20% as compared with 2008 (annually by 3.3%), improving efficiency of the use of FERs and improving the competitiveness of the national economy;
2. Optimization of the energy mix structure of the country in which the share of energy from renewable and alternative types of fuel must count

for no less than 10% by 2015 through reducing the share of imported fossil minerals, particularly natural gas, by its substitutes from alternative energy sources, including secondary sources.

In the frames of reaching the given tasks Ukraine aims to achieve:

- substitution of the natural gas in the energy mix, from 2016 by no less than 15 billion of cubic meters, oil products – 1 million tons;
- raising the level of heat supply of the population and reducing the use of the natural gas to produce the heat for housing sector by 60%, budget-financed organizations – 35%;
- reducing by 50% of the state budget expenditures for financing of the public utilities and energy supply of the budget-financed organizations;
- reducing by 25% the consumption of the imported natural gas;
- reducing by 20% the level of energy intensity of the works on transportation, storage and distribution of the gas as compared with 2008, raising the reliability and energy efficiency while transiting the natural gas through the mainline gas pipelines;
- reducing by 15-20% the volumes of use of the natural resources by means of decrease of the volumes of FERs consumption;

A turning point in the sphere of energy efficiency improvement is expected to be the adoption of the National action plan on energy efficiency until 2020 by the State Agency of Energy Efficiency and Energy Saving. Design and approval of the National plan is one of the commitments by Ukraine to the European Energy Community. The main goal of the Action plan is increasing the energy efficiency by 20% until 2020 and the use of renewables up to 11%. The general task of the Plan is reducing the use of energy at the national level to 9% from the average volume of final consumption, or 6.23 million tons of oil equivalent.

Moldova also pays great attention to energy saving: effective use of FERs is one of the most important points in strategic programs related to energy, transport, and economic development in general.

There had been worked out long-term and mid-term plans, established the priorities, tasks in main sectors, and formed the system of target indicators of energy saving:

1. in the electric power sector – stimulation of investments into power generation, including from RES, and encouragement of the use of energy products and household appliances conforming to the EU standards; reducing the losses in the grids of power distribution from 13% in 2011 to 7-10% in 2020, what requires an annual loss reduction in the amount of 0.52 – 0.82%;
3. in the heat and power sector – reducing the losses in the transport and grids of power distribution and promotion of new energy efficient technologies, appliances, and equipment for heat supply;
4. in the natural gas sector: work out of the National program of gasification through the prism of capacities of the renewable energy sources and the potential and capacity of the use of biogas in public buildings;
5. in industrial sector – stimulation if investments in industry of re-equipment of technological appliances with a low coefficient of efficiency and the use of energy efficient appliances, utilities and technologies;
6. in the building sector – development of the administrative, legal and financial capacities for the complex measures on raising the energy efficiency in the housing sector and encouragement of investments by the government and private sector in the area of energy efficient buildings;
7. in the transport sector – spurring the use of biofuels as a component for the conventional types of fuel and encouragement of effective of tires regarding the fuel consumption; reducing of the fuel consumption by electric and railway transport by substituting old transport units with more energy efficient ones;
8. in the public sector – introduction of the programs on improving street lightning, construction of the buildings with low and close to zero level of consumption, use of RES for heating the socially important objects;

Armenia`s goal is to reduce annual electricity and natural gas consumption to 1 TWh and 600 million cubic meters respectively. The plan focuses on increasing

the energy efficiency in the municipal, commercial, and housing sectors, as well as in industry and transport, and what worth noting is that it assumes finding form the state budget.

Armenia also managed generally to overcome such barriers of increasing energy efficiency as subsidizing of the energy tariffs and the absence of metering of energy and gas consumption.

The most important policy priority of Tajikistan in the sphere of energy efficiency is the use of renewable energy sources and reducing the use of non-renewables (fossil fuels), improving the investment climate in energy sector by means of increasing energy tariff payments to the level, ensuring reimbursement of expenses related to the energy production and supply, as well as investments into energy sector.

A greater attention is also paid to the issues of reliability and sustainability of energy supply to the population of isolated and remote regions of the republic, as well as of small and medium-sized businesses.

The lack of generating capacities and the need for the solution of social problems prompted the Government of the Republic of Tajikistan to transfer from 1 October 2009 all the budget-financed organizations, industrial enterprises, commercial organizations and the population to the use of energy saving light bulbs. 241,000 of low-income households were provided with energy saving light bulbs subsidized from the national budget. The result of this action was a reduction of daily consumption of electricity in the country by 78 million kWh.

It is also noteworthy that the reforms assume the financial rehabilitation of the branch by means of introduction of payments discipline and raising the tariffs on energy. The most important activity at this stage is the need for changes in the existing legislation to create an independent regulation body in the electric power sector and reforming the tariff policy to allow private sector to participate in the further stages of the restructuring process.

Kyrgyzstan in general is preoccupied with the similar tasks to achieve by 2014-2015 the financial and economic recovery of energy sector, to introduce new

generating and transmitting capacities, to increase the renewable energy share in the structure of power generation, to improve the energy efficiency by means of energy saving, to ensure the energy supply of the users and to conduct socially acceptable tariff policy.

The main objectives of energy saving policy in the republic are: rational use of energy while it is being produced and consumed through the active introduction of energy saving and innovative technologies, as well as the use of renewable energy sources.

The structure of consumption of FERs in the recent 20 years has seen a considerable increase of housing sector share and the decrease of the industrial and agricultural sectors' shares. Currently the population consumes about 60.5% of all electricity in the domestic market; public sector – 10.5%; industry, agriculture and the private sector – 29%.

The structure of the fuel and energy mix also witnesses considerable changes: sharp decline of coal consumption and herewith heating, hot-water supply, cooking are provided now by electricity use. Whereas the population in 1990 consumed 1 billion kWh, the year 2010 recorded 3.64 billion kWh of electricity with regard to seasonal fluctuations: consumption volumes in winter period are 3.5 times higher than in the summer period.

Tariffs that are currently in force in the Republic of Kyrgyzstan do not stimulate the producers and consumers of energy to reduce energy expenses. In this regard, there is need for amendments to the existing tariff policy in energy sector.

It is necessary to note that due to a range of political and economic reasons Moldova, Kyrgyzstan, Tajikistan, Armenia later than Belarus and Ukraine managed to start the policy implementation to improve energy efficiency.

A group of countries-exporters of oil and gas started to design the policy in the sphere of energy efficiency later than other countries which do not possess own great hydrocarbons` resources. Moreover, at the current stage the governments of these countries realize that along with other positive results, improvement of the energy efficiency makes it possible to reveal an additional volume of resources for

the export, to optimize the generating capacities and to reduce the environmental burden.

Russia recently started to work out and implement the policy in the area of energy efficiency – main part of the legal base was worked out during last 6 years. But energy saving became one of the most important priorities in economic development and international experience has been examined and taken into account in national policy shaping.

Presently, Russian GDP energy intensity is approximately 7 times higher than in Japan and 4.5 times higher than in the United States. In the housing sector the Russian standards of heat and water consumption are 3 times (sometimes 4-5 times) higher than in Finland and Norway.

Russia`s energy saving policy is consistent and systemic and is ensured apart non-budgetary sources also through the budgetary finding. It is noteworthy that annual expenditures of the federal budget for implementation of the State Program of the Russian Federation “Energy Saving and Improvement of Energy Efficiency until 2020” are 7 billion Russian rubles (for the period 2011 -2013).

The main goal of Russia in the sphere of energy saving is the reduction until 2020 of GDP`s energy intensity of the Russian Federation for no less than 40% as compared with 2007. These saved resources are supposed to become the main energy source for economic boost.

At the current stage Russia determined main goals and objectives, the instruments of regulation and stimulation of energy saving. In the process of establishment are the system of state regulation in energy saving and the market of corresponding services and technologies. There has been also assumed the design of the system of indicators to assess the results in the sphere of energy efficiency, as well as the establishment of the system of regular monitoring and assessment.

Analysis of the basic principles of the Russian policy in the sphere of energy efficiency improvement, with regard to the development of the real sector of the economy, shows that the Russian Federation even with a considerable lag, sets for itself the tasks similar to the tasks in other countries-leaders in energy saving.

Federal, regional and municipal budgets of the Russian Federation assume significant allotments for realization of energy saving activities. Significant funding are offered by Russian and international financial organizations. Apart from that, the given funding considerably remains not high-demanded due to the insufficient development of specific mechanisms of financing (for instance the mechanism of providing with the state guarantees). Moreover, the financial risks also have a great affect which are caused by the administrative barriers, instability of economic climate and blurriness of the legal base what does not make it possible to forecast the time frames and feasibility of investments return and respectively to attract private investments.

As a result of absence of clear guarantees of reimbursement of expenses there is no interest in energy saving among the majority of companies and potential investors. Noteworthy, there is no agreed mechanisms allowing to distribute the funding resulted from realization of energy saving projects. At present it is difficult to get profit from energy-saving projects implementation.

There has been established the Federal ESCO (FESCO) as well as more than 100 other ESCOs. Nevertheless, in practice there are no mechanisms of realization of energy performance contracts and the ESCO market develops slowly.

The financial part of energy saving and energy efficiency also remains underdeveloped (in legal aspects). Presently, there is absence of practically efficient methodological and normative documents on defining and fixing the established effect (economic profit). The enterprises are not prepared to invest for the modernization, there are no methodological and normative rules on receiving financial assets as a result from realization of energy saving projects, there is no practice of the monitoring mechanism to prove the economic profits after implementing the projects, there is lack of bookkeeping rules of fixing the saving results on the systematic basis and of its differentiated accounting and accumulation. There is also absence of adopted and legally binding rules to define the period of charging the savings and definition of a comparison base.

The desire of energy suppliers and ESCOs to invest into energy efficiency remains very low at the same reason, particularly when the payment discipline of consumers is low and probability of reimbursement of expenses from energy saving investments through the tariffs is also low.

Another institutional barrier is the imperfect organizational structure of the housing sector and consequently inadequate management, services and maintenance of the housing infrastructure.

Involving the population's finances to improve energy efficiency of the housing sector is impeded by the traditional mentality along with immaturity of mortgage markets that do not make it possible normal functioning of the credit system and loan agreements. The commercial credit institutions usually attribute the borrowers from the housing sector to the high risk group and thus do not give loans to such borrowers, especially to the apartment buildings' residents who mostly need such types of loan.

The situation is exacerbated by the fact that the level of the minimum cost of living increase faster than levels of income and some families cannot pay for the municipal bills and to undertake some primitive measures for energy efficiency. Unreasonably low energy prices also cause very long and unattractive payback periods. Stimulation of resource savings in the public sector is hampered by the existing mechanism of budget planning.

The intermediate results of the State program realization show that in Russia there is lack of sufficient and complex legal base and technical assistance to save energy. In many sectors of the economy the investors cannot receive and make use of savings from investments into energy saving.

Kazakhstan lately has declared that energy saving and improvement of energy efficiency is one of its priority tasks. It has been established, that energy saving and improvement of energy efficiency could allow Kazakhstan to save the FERs in the amount of 20-30 million tons of fuel equivalent over the period 2011 - 2015.

Kazakhstan`s goal in energy saving area is to reduce GDP energy intensity by no less than 10% until 2015 and by 25% until 2020 respectively.

Presently the country is characterized by quite low prices as compared with world`s prices on FERs. Because of the low level of the tariffs during the period 1998-2008 the volumes of reconstruction and modernization of existing power stations were 3-4 times lower than necessary for their maintenance in action, and new generating capacities were nor established or brought into force.

For the purpose of finding the solution in 2009 there has been brought into force the system of the maximum tariffs established by the Government for the electric power stations for the period of no less than 7 years (2009 – 2015) with regard to the volume of investments needed for their reconstruction and modernization. In this regard, the maximum tariffs for various price groups were established within a quite broad spectrum (for instance in 2012 from 3.63 to 7.9 tenge for kWh).

It is planned that the tariffs for electricity after 2015 will be released.

It is assumed that by 2030 the level of electricity consumption in the country with regard to the target indicators on reducing GDP energy intensity will amount in 145 billion kWh per year, and the level of electricity production should reach 150 billion kWh.

To achieve this task until 2030 there is plan for realization of activities on reconstruction, modernization of existing and construction of new generating capacities with total capacity 11,603 MW. These activities will be implemented on the basis of modern and highly effective and eco-friendly technologies with the rise of efficiency coefficient of the electric power stations (modern condensation electric power stations have the coefficient of efficiency up to 45%, gas-fired - up to 65%).

Nevertheless, the base of the country`s energy sector should remain steam power plants working on coal but in the structure of the generating capacities in Kazakhstan by 2030 the share of electricity from RES will be considerably

increased (up to 15%) in accordance with modern trends in the world energy as well as cleared up the feasibility of constructing new atomic power plants.

Electricity consumption and specific fuel consumption for electricity generating and heat supply in the republic exceed on average the level of the advanced countries by 25-30%. Energy saving potential in energy sector is estimated in amount of 16 million tons of fuel equivalent per year.

For the moment there is a great need for the modernization of the equipment almost in all sectors of industry. Deterioration of the capital funds in metallurgy and chemical industry is more than 60%, in the mining industry – 50-55%, in machinery construction – 35-40%.

The energy intensity of industrial sector of Kazakhstan is 5 times higher than the similar indicator in the EU. By various estimations, the energy saving potential in industry amounts 25-39% of total energy consumption and exceeds 10 billion kWh.

Currently the housing sector consumes about 40% of heat energy supplies. According to experts' estimates about 70% of buildings have the heat characteristics which don't conform to the modern requirements (especially this relates to the buildings constructed in 1950 – 1980) because of which they loss through the walling constructions up to 30% of the energy used for heating. The reason of high heat consumption is deterioration of the housing fund.

The considerable share of public organizations (schools, hospitals etc.) and the housing buildings are equipped with ineffective energy systems and require the renovation. The public organizations consume about 5% of electricity and about 15% of heat energy produced in the country. The undertaken studies show that in various budget organizations intensity of use coefficient differs and exceeds the norms even in the organizations of similar structure.

The municipal sector of the country is also characterized by high level of grids deterioration and by considerable extent of energy losses during the transportation and consumption. The majority of buildings and grids in the communal sector were constructed or been modernized more than 20 years ago. In

the whole, with regard to the normatively prescribed time frames of safe exploitation during 25 years, about 63% of the grids require the capital refurbishment or their absolute substitution.

In this regard the most reasonable measures of the national policy on improvement of energy efficiency in Kazakhstan are:

1. stimulation of energy saving and improvement of energy efficiency including the use of energy saving products and technologies;
2. introduction of limits for the circulation and the use of technologies and the products with low energy efficiency as well as the requirements for energy efficient constructions, buildings and housing equipment;
3. obligations of conducting the energy examinations and expertise of energy saving and improvement of energy efficiency for a particular category of sites;
4. organization of metering and control of the produced, distributed and consumed energy sources;
5. conducting measures of state control and monitoring the effective and rational use of energy sources;
6. performance of the balanced tariff policy and price-setting in the sphere of production and consumption of energy sources with regard to state interests in rational use of energy resources;
7. implementing the energy management system.

In Uzbekistan the energy saving should also become one of the most important priorities in the energy sector of the country since it makes it possible to reduce the needs of substantial investments into energy sector. Unlike the previous orientation to the building up of the large scale energy production, the most important priority of the branch is raising the efficiency of energy use of the current equipment.

In this regard the priority directions of energy sector development are defined as follows:

- technical re-equipment, reconstruction and modernization of energy appliances aimed at preservation of the installed capacity of power stations, improvement of their technical and economic indices;

Introduction of modern and highly efficient technologies and electronic appliances allowing to save fuel and energy resources and to reduce the environmental and ecological burden.

The main goals of the country in the area of energy efficiency are:

- reduction of the final energy consumption for satisfying a particular volume of the demand;
- improvement of the efficiency of using the energy sources and improvement of the system “extraction-transformation-distribution-consumption” at each of these stages;
- substitution of expensive and limited energy sources with the cheaper and renewable ones;
- applying the advanced technologies that promote energy efficiency while satisfying ecological requirements;

The main tasks of the system of state regulation in implementing energy saving at the current stage are:

- creation of the respective legislative and methodological base that will stimulate the realization of the energy saving measures;
- providing conditions for the legal and economic interest;
- defining the level of enterprise`s efficiency in using the energy sources and revealing the energy saving potential.

Taking into consideration the importance of the electric power industry in the economy of the country there is growing interest from the President`s side and from the Government to the branch. Particularly, in accordance with the Decree of the President of the Republic of Kazakhstan dated 15 December 2010 № III-1442 “On Priorities of Development of the Industry of the Republic of Kazakhstan for the period 2011-2015” the development priorities are:

1. framing the concrete, deep and comprehensive long-term perspective of economic development in general and of energy sector in particular;
2. ensuring the stability of normative indices and tariffs with the purpose of raising the competitiveness of the national industrial products and decrease of dependence of industrial development in general on the world`s markets` fluctuations;
3. further deep changes in the structural transformations of the economy aimed at the leading development of the priority branches such as energy, oil and gas industry, chemical, textile, light industry, nonferrous metallurgy, mechanical engineering and automotive industry, pharmaceuticals, high-quality and profound processing of agricultural production, production of the construction materials providing increase of role and place of the republic in world division of labor, production of competitive goods with the high value added, using steady demand in the world market;
4. implementation of large-scale modernization, technical and technological updating of industrial productions, equipment by the most modern hi-tech appliances, the accelerated implementing of modern scientific achievements and progressive innovative technologies, expansion of preparation of highly qualified personnel for the industry;
5. steady increase of the efficiency of industrial production at the expense of increase of labor productivity, consecutive decrease in production expenses and product cost, introduction of modern energy saving and resource-saving technologies, improvement of the organization of production, elimination of losses and unproductive expenses;
6. systemic implementation of the international quality standards and technical regulations in the production of an industrial output.

In Azerbaijan and Turkmenistan energy efficiency policy as the separate direction of a state policy doesn't actually exist. The legal and institutional bases in fact aren't created. At the same time, in these countries particular steps are taken for optimization of the fuel and energy mix, for optimization of generating

capacities and development of renewable energy within the realization of the energy policy.

In Azerbaijan particular attention is being paid to the issues of increasing energy efficiency in industries and to improving the ecological situation.

Turkmenistan solves the task of increasing energy efficiency within the plans on common modernization of economy and energy sector in particular, as well as of renewable energy development. There are a lot of hard-to-reach areas in the country where the centralized approach to power grids is complicated. The use of RES and development of respective technologies is urged to solve this problem, for example, on the remote distant pastures, oil and gas fields, on the islands of the Caspian Sea.

Presently, Turkmenistan realizes together with the United Nations Development Program and Global Environment Facility the project "Improvement of Energy Efficiency in Residential Buildings of Turkmenistan" (2010 – 2015гг.). The similar project is carried out in Turkmenistan for the first time. The budget of the project makes up 46 million US dollars, the most part of which is provided by national partners, such as the State Concern "Turkmengaz", mayoralty of the city of Ashgabat and the Ministry of Construction of Turkmenistan. The State Concern "Neftegazstroy", the Ministry of Energy and Industry, and the Ministry of Municipal Services, and also the Polytechnic Institute of Turkmenistan are involved into activities for the project.

The project includes two main directions – taking into account of the principles of energy efficiency in the process of design, construction and service of residential buildings, and rational use of energy in houses.

### *1.3.2. Legislative and regulatory base*

Belarus, Russian Federation and Ukraine have a developed legislative and regulatory base in the area of energy saving and energy efficiency improvement.

In the Republic of Belarus more than 30 legislative acts regulating the public relations in the sphere of energy saving are in force, including the international

agreements related to the realization of the energy saving policy in Belarus. At present the concept of a new Law of the Republic of Belarus "On Energy Saving" is being developed.

The main strategic documents which are legally fixing the state policy in the sphere of energy efficiency and energy saving are the following:

- President`s Decree of the Republic of Belarus dated 11.04.2011 №136;
- Directive No 3 of June 14, 2007 “Economy and Thrift are the Main Factors of the Economic Security of the State”;
- The Concept of Energy Security of the Republic of Belarus approved by the President`s Decree of the Republic of Belarus № 433 of 17.09.2007;
- Strategy of Development of Energy Potential of the Republic of Belarus approved by the Decree № 1180 of 09.08.2010;
- The National Program on Energy Saving for the period 2011 – 2015 approved by the Decree № 1882 of 24.12.2010;
- The National Program of Development of Local (domestic) and Renewable Energy Sources for the period 2011-2015 approved by the Decree № 586 of 10.05.2011 and other special programs in the sphere of energy efficiency increase and promotion of use local types of fuel and RES.

In Russia the main legislative acts in the area of energy efficiency and energy saving are the following:

- The Presidential Decree of 04.06.2008 № 889 'Concerning Some Measures for Improving the Energy and Ecological Efficiency of the Russian Economy' established the goal of decreasing by 2020 Russia`s GDP energy intensity no less than by 40% as compared with 2007;
- The Federal Law of 23.11.2009 № 261 "On Energy Conservation and Improving Energy Efficiency, and Introducing Amendments to Certain Legislative Acts of the Russian Federation";
- other acts and the bylaws adopted, as well as the State Program on “Energy Saving and Energy Efficiency Improvement until 2020”, approved by the

Russian Government Decree of 27.12.2010 № 2446 and other respective regional, municipal and corporate programs.

In Ukraine presently the Law on "Energy saving" remains the basic law which regulates the relations in the energy saving area but at the same time there are about 100 normative legal acts in the area of energy saving, and a significant amount of standard and methodical documents. These acts and documents, directly or indirectly having legal influence on the relations in the energy saving sphere, allow to create the structure of public administration and control in the energy saving sphere; to implement the rationing system of fuel and energy resources use, concept of energy audit, the system of state examination of energy saving and national standards of energy saving, to establish sanctions for violations of the law in the energy saving area.

The principal documents in the area of energy efficiency improvement in Kazakhstan, Moldova, Tajikistan and Armenia are national laws on energy saving, in Uzbekistan – the law on rational use of energy.

In Tajikistan there a complex legislative base for development of renewable energy and a small-scale power generation was created according to national priorities of development which includes also norms, standards, and methodological documents.

The approach of Armenia to the provision of the sources of funding the energy saving activities should be noted. The Government of Armenia established in 2006 the Fund of Energy Efficiency and Renewable Energy, which operates as a revolving fund. Fund provides financing for energy saving projects via mechanisms of cooperation with the banks and other credit organizations.

The energy saving policy of Kyrgyz Republic is regulated by laws of the Kyrgyz Republic "On Energy", "On Electric Power Industry", "On Energy Saving" and "On Energy Efficiency in Buildings".

Azerbaijan pays special attention to the development of alternative energy and sets the task of harmonization of the national legislation in this sphere with the legislation of the European Union.

According to the information available in open sources, Turkmenistan doesn't set an objective on development of the standard and legal base in the energy efficiency sphere, however also pays serious attention to the development of renewable energy.

#### **1.4. Main institutions and organizations responsible for policy and programs in the area of energy efficiency and energy saving**

In Belarus the main institute responsible for the development and carrying out the state policy in the sphere of energy efficiency and renewable energy, monitoring policy realization and ensuring the state supervision of rational use of fuel, electric and thermal energy, is the Department on energy efficiency of the State Committee on Standardization of the Republic of Belarus.

In each ministry and in the regions there are administrations and the committees responsible for the implementation of programs on energy saving, achievement of the established indicators. Both state and private enterprises are obliged to include into the business plans the targets and action plans on energy efficiency which will allow to ensure the achievement of the established indicators.

There had been organized the system of monitoring of execution and of reporting to the Department on energy efficiency of the State Committee on Standardization. The Department on energy efficiency exercises control under achievement of the established target indicators and actions for energy saving about which the ministries, departments, executive committees (regional, regional, and city) as well as the enterprises report to the Department. Then the Department prepares the summary report for presenting it to the Council of Ministers.

The similar institutional structure acts in Ukraine. The principal body of executive power in Ukraine on ensuring realization of a state policy in the sphere of effective use of energy resources, energy saving, use of renewables and alternative types of fuel is the State Agency on Energy Efficiency and Energy Saving of Ukraine. Other authorities are responsible within the competence for

development and implementation of sectoral programs of increase of energy efficiency for 2010-2014.

In Russia the Ministry of Energy, the Commission of the President of the Russian Federation concerning the strategy of development of the fuel and energy complex and ecological safety, and the Governmental commission on questions of fuel and energy complex, reproduction of mineral resources and increase of energy efficiency of economy play the key role in policy formation in the area of energy efficiency improvement.

Within the established field of activity of the Ministry of Economic Development of the Russian Federation, the Ministry of Energy of the Russian Federation, Ministry of Industry and Trade and the Federal Agency on Construction, Housing and Communal Services, subordinated to the Ministry of Regional Development of the Russian Federation, also carry out the following functions:

- monitoring and analysis of realization of a state policy and efficiency of legal regulation in the field of energy saving and energy efficiency increase;
- organization and participation in the development and implementation of programs, projects and actions in the field of energy saving and energy efficiency increase;
- development and realization of measures of the state support, and stimulation in the field of energy saving and energy efficiency increase.

The state control (supervision) in the field of energy efficiency is exercised by: Federal Service for Environmental, Technological and Nuclear Supervision, Federal Antimonopoly Service and Federal Tariff Service, Federal Service for the Consumer Protection and Welfare.

Public authorities in the regions of the Russian Federation and local governments are also in charge of energy saving and increase of energy efficiency.

In Armenia the leading role in policy formation in the sphere of improving energy efficiency is also played by the Ministry of Energy, in Azerbaijan and Tajikistan – Ministry of Industry and Energy.

In Kazakhstan the policy in the field of energy efficiency and energy saving is defined by the Ministry of Industry and New Technologies, however, coordination, realization and monitoring of all the listed actions will be assigned to an authorized body in the energy saving sphere, to local executive bodies and Institute of Development of Electric Power Industry and Energy Saving .Committee of the State Energy Supervision and Control of the Ministry of Industry and New Technologies probably will act as an authorized body in the energy saving sphere and also carry out the accreditation of energy audits and keep the State energy register.

It is also necessary to note that there had been specially created the Kazakhstan Institute of Development of Electric Power Industry and Energy Saving. The purpose of the creation of this institute, regarding energy saving is to carry out the analysis of a state of development of energy saving in Kazakhstan, normative and technical provision in the sphere, etc.

In Moldova the Ministry of Economy act as the central administrative governing body responsible for design of state policy in the field of energy efficiency, and the Agency on Energy Efficiency (which is the body subordinated to the Ministry of Economics)is implementing the state policy in the field of energy efficiency.

In Uzbekistan the main regulating body in the field of electric power industry is the State Inspection for Supervision in Power Industry (Uzgosenergonadzor). Besides, the companies like the State joint stock company "Uzbekenergo" and the National holding company "Uzbekneftegaz" are responsible for the implementation of energy effective and energy saving technologies in the relevant branches.

### **1.5. Existing programs in the field of energy efficiency and energy saving. Planned programs in the field of energy efficiency and energy saving.**

Azerbaijan now is working under the program on development of alternative and renewable sources of energy till 2020.

In Armenia the main program document in the field of energy saving and energy efficiency is the National program on energy efficiency and energy saving of the Republic of Armenia.

The basic principles of energy efficiency proposed in the program are the following:

1. identification of energy saving potential in all sectors of economy and its realization;
2. increase in efficiency of using the fuel and energy resources in all sectors of economy;
3. application of advanced technologies and work plans schedules for consumers of fuel and energy resources;
4. ensuring availability of consultations concerning the effective use of resources and products for consumers of fuel energy.

In Belarus the programs (republican, sectoral, regional) became the main instrument for implementing the policy and strategy for energy efficiency. Programs define the complexes of concrete actions, mechanisms of their performance, volumes and financing sources, responsibility and dates of their implementation. The National programs on energy saving in 1996-2000, 2001-2005 both 2006-2010 and a number of target programs, for example, the National program on transformation of boiler houses into mini-CHPs for 2007-2010 are carried out successfully. Among the main programs that are being realized nowadays are

- the National program on energy saving for the period 2011-2015;
- the National program of development of local and renewable energy sources for the period 2011-2015,

- the Program of construction of the power plants working on biogas for 2010-2012,
- the State program of construction of power plants on local types of fuel in 2010-2015,
- the State program of construction in 2011-2015 of hydroelectric power stations in RB,
- the Comprehensive program on design, construction and reconstruction of energy effective houses in RB for the period 2009-2010 and till 2020, etc.

It is also necessary to note that the Program of development of the system of technical rationing, standardization and compliance confirmation in the field of energy saving for the period 2011 - 2015 within which the harmonization of the Belarusian norms with European and international ones is planned to be provided. It includes development of 136 state standards, 123 (88%) from which will be developed on the basis of the European and international norms. It is planned to ensure the development of new and re-examination of existing standards in the field of construction aiming to increase the energy efficiency of the buildings and of heat generating equipment. The standards concerning questions of introducing the RES, local and alternative types of fuel, development of energy management and energy audit of the organizations have been developed.

It is planned to develop the programs on construction of electric power plants for heat and electric power generation with funding of the World Bank that will allow decreasing of specific norms on generation of heat and electricity.

In Ukraine presently the main program document in the field of energy efficiency and energy saving is the State target economic program of energy efficiency and development of production of energy resources from RES and alternative types of fuel for 2010-2015.

It is planned to develop and approve by the State Agency on Energy Efficiency and Energy Saving the National plan of action in energy efficiency till 2020 within performance of commitments of Ukraine to the European Energy

Community. The main objective of the Action Plan is raising the energy efficiency by 20% until 2020 and increase a share of renewables to 11%. General purposes of the Plan are reduction of energy consumption at the national level to 9% from the average volume of final consumption, or 6,23 million tons of oil equivalent.

Besides, in the near future Ukraine is planning to develop and approve the following programs in the field of energy efficiency and energy saving:

- the long-term strategic program on energy saving of Ukraine, providing, first of all, replacements of natural gas with alternative types of fuel, increase in production of own energy resources and reduction of power consumption in housing and communal services;
- the state target program of modernization and development of housing and communal services which is supposed to replace two existing programs and three more programs which are in the process of development and coordination;
- sectorial program on energy efficiency and energy saving of the State committee of television and broadcasting;
- program of energy efficiency and energy saving of the Ministry of Defense;
- communication strategy of an agricultural and food industry complex of Ukraine for the purpose of raising the awareness among the market players about the best efficient practices;
- the program of modernization of systems of heat supply in the Lvov area for the period 2012-2016;
- the regional target economic program of energy efficiency in the Lvov area for 2012-2015.

In Russia the State Program of the Russian Federation "Energy Saving and Increase of Power Efficiency for the period till 2020" (further – the Program) now is realized.

Actions of the Program cover the principal branches of economy and the social sphere of the Russian Federation.

The program included the sectoral subprograms as well as subprogram to encourage energy saving and efficiency in the members of Russian Federation and provides with methodological, information and staffing support of actions of the Program.

The Program includes the activities of two types: universal and widely applicable in each sector, or in several sectors of the Russian economy, and specific, applicable in concrete branches, taking into account their technological features. The Program provides for removal from operation of old inefficient capacities, the equipment, installations, and introduction instead of innovative technologies and the new progressive equipment in the course of new construction and modernization. Thus, the Program has a complex character.

Within two years (2011-2012) the realization of a State Program "Energy Saving and Increase of Power Efficiency for the period till 2020" the energy intensity of the Russian GDP decreased by more than 5,5%.

At the meeting of the Government of the Russian Federation 07.03.2013 the draft of a State Program of the Russian Federation "Energy Efficiency and Development of Electric Power Industry" with subprogram "Energy Saving and Increase of Power Efficiency for the Period till 2020" was approved by the order of the Government of the Russian Federation of 27.12.2010 by No. 2446. The State Program "Energy Efficiency and Power Development" will be accepted after adjustments till 01.09.2013 on the questions defined in the corresponding assignment by results of meeting of the Government of the Russian Federation of 07.03.2013, including additional instruments of stimulation of energy efficiency and energy saving.

Kazakhstan carries out the Comprehensive plan of increase of energy efficiency over the period 2012-2015, the purpose of which is the decrease in energy consumption of GDP of Kazakhstan no less than by 10% by 2015 comparing with 2008. The task of the plan is to develop a complex of the legislative, organizational, scientific, technical, economic and financial measures aimed at the reduction of irrational consumption of fuel and energy resources.

Currently, there is being developed the Concept of development of electric power branch of the Republic of Kazakhstan till 2030 which shape the basis for Sectoral program of development of energy branch until 2030 to be developed. The program will include a part on energy efficiency.

Tajikistan realizes the following programs in the area of development of renewable energy:

- "The target comprehensive program on the large-scale use of RES, such as energy of small rivers, solar, wind, biomass energy and energy of underground sources";
- "The program on effective use of hydro energy resources and on energy saving for the period 2012-2020";
- "The long-term program of construction of small power plants over the period 2009-2020".

It is important to note that the small-scale power generation is a key factor which can reveal the potential of development of mountainous (93% of the territory of the country) rural regions of Tajikistan, and has a high potential for reduction of poverty and achievement of the development objectives. The purpose of the Strategy of development of small hydro energy in Tajikistan is reliable and steady electricity supply of the population in the isolated and remote areas of the republic as well as of small and medium businesses.

Kyrgyzstan carries out the Energy saving program till 2015. Within the program the implementation of energy saving activities and measures to increase the energy efficiency will be carried out soon in the following directions:

- preparation of drafts legal and normative documents for the implementation of requirements of the Law "On Energy Saving" and implementation of measures to increase the energy efficiency;
- reconstruction of the existing power plants and energy-intensive enterprises, modernization of the energy sector, thermo-isolation of buildings, construction of buildings in which energy resources are consumed more effectively;

- usage of local energy sources;
- restructuring of the construction materials industry, start of production of energy saving and thermo insulating materials;
- development, production and installation of the equipment and systems for metering and regulation of volume of expenses of hot water, steam, natural gas, the electric power.

Moldova fulfills the National program on energy efficiency for 2011-2020, the National plan of action on energy efficiency for 2013-2015 (purpose –to increase efficiency of energy consumption and reduction of emissions of greenhouse gases).

It is planned to develop the following documents:

- programs of development of electric transport system and norms on energy efficiency and environmental friendliness of energy devices used by final users;
- harmonization of technical standards with the standards of the European Union and support of use of the advanced technologies providing high efficiency;
- plans of development of the centralized systems of a heat supply;
- energy efficiency programs for the industrial sector;
- the draft Law on energy efficiency of buildings and minimum requirements to energy efficiency of buildings;
- program of gradual increase in number of houses with almost zero consumption of energy in public sector;
- the Action Plan on biomass;
- the rules of importing the tires with the labels C1, C2, C3 on which classes of efficiency of use of fuel are specified;
- own programs on energy efficiency for each three years and the plans of action for every year with definition of priority measures, financing sources, etc., developed by regional and municipal administrative bodies;

- The regulation base necessary for the promotion and stimulation of energy efficiency and the use of renewable;
- the national plan of action on energy efficiency for each 3 years;
- indicators and reference points on energy efficiency coordinated with established ones in the European Union.

Moldova implements an integrated and systemic approach to a problem of energy efficiency increase.

In Uzbekistan the programs of energy sector development and of the industrial development are designed taking into account the need for improving the energy efficiency of national economy.

In particular, for the implementation of the Law of the Republic of Uzbekistan "On Rational Use of Energy" there has been developed and is in the process of realization the "Energy Saving Program of Uzbekenergo for the period till 2020", providing the system of measures for realization of energy saving potential of the branch which is estimated about 3-5 million tons of fuel equivalent".

The program is balanced with expected indicators of production and consumption of electricity for this period and is aimed at the realization of energy saving potential in the branches at the expense of system`s performance of measures for efficient use of fuel, reduction of losses of electricity in all chains of its production, transfer and distribution. Achievement of this purpose is provided at the expense of performance of measures for increase of energy performance of the existing equipment with high degree of wear through its modernization, high-quality repair and preventive actions, reconstruction of the part of power plants and energy supply grids with the implementation and use of the equipment; installations and the technologies satisfying the requirements of the current level of development of energy generation, transfer and distribution; improvement of energy resources metering systems and devices, and also on management of energy consumption.

## Chapter II. Potential and feasibility for energy saving and energy efficiency in CIS countries.

Currently CIS countries have considerable energy saving potential. According to experts and national energy efficiency programs data untapped energy efficiency potential of CIS countries is roughly estimated at 450 million TOE (tons of oil equivalent), including:

|              |                 |
|--------------|-----------------|
| Azerbaijan   | 10 million TOE  |
| Armenia      | 1 million TOE   |
| Belarus      | 5 million TOE   |
| Kazakhstan   | 30 million TOE  |
| Kyrgyzstan   | 1 million TOE   |
| Moldova      | 1 million TOE   |
| Russia       | 300 million TOE |
| Tajikistan   | 1 million TOE   |
| Turkmenistan | 15 million TOE  |
| Uzbekistan   | 25 million TOE  |
| Ukraine      | 70 million TOE  |

It is important to note that so far all states except Belarus and Ukraine have not unlocked the potential of low-cost energy efficiency measures. In Belarus the potential of low-cost measures is almost exhausted at this point.

According to experts the highest technological potential of increasing energy efficiency is showed in such sectors as housing (apartment buildings), power generation and industry.

### 2.1 Energy supply saving potential

Energy sector in all CIS countries was formed in the former Soviet Union on a common technological base and it has number of common features and problems.

Deterioration of a large part of the generating facilities and power grids as well as persistent underinvestment in the industry is the common problem for CIS countries. To maintain energy system reliability, large-scale modernization program of generating capacities and grids is required.

In Ukraine for example about 80% of the thermal power plants units require modernization or replacement. About 35% of overhead power transmission lines

(220-330 kV) operate for more than 40 years, 55% of transformer substations prime equipment has exhausted its estimated service life. In the energy distribution sector a significant part of power facilities have worked out their resources: 31% of power grids and 32% of transformation substations are subject for reconstruction and replacement. Equipment deterioration leads to excessive fuel consumption, reduction of working capacitance and growing negative environmental impact.

In Kazakhstan real losses are unknown as proper district heating supply metering is not provided. About 60% of total heating mains length is more than 25 years old. The average age of heating mains as of 2002 is 18 years. The actual heat loss in the transmission system in the cities according to experts' estimates is two and more times more than that of the standard.

Unfortunately in other CIS countries the situation is quite similar. Therefore, it is possible to assert with confidence, that the power plants fuel consumption can be reduced by about a third. However it is a conservative estimate because it does not take into account energy savings that can be achieved in consequence of increased use of CHP, production decentralization and optimization of power distribution system.

Significant energy savings potential is concentrated in energy transmission sector. Potential for transmission losses reduction is about one third of actual losses. In the municipal heating network losses reach 20-25% of a total heat production.

The main causes of losses:

- poor condition of heating systems;
- lack of metering and control systems of thermal energy;
- inefficient use of heat exchangers;
- inflated installed capacity of heat sources, etc.

As a result of introduction of energy saving measures in Belarus, the country managed to reduce heat losses from 26% in 2001 to 17% in 2012.

Reduction of losses is achieved through:

- replacement of heating systems using pre-insulated pipes;
- installation of high-efficiency heat transfer equipment;
- analysis and evaluation of heat loss;
- measures to optimize the heating schemes with the installation of lower capacity heat sources;
- transfer of boilers in the mini-CHP plants using natural gas, local and renewable energy sources.

## 2.2 Energy consumption saving potential

The potential of energy efficiency increase in end-use sectors is significantly higher than in energy generation. In particular, financial potential in end-use sectors is estimated 4 times higher than in electricity production and heating together. Furthermore, energy saving for end-users is accompanied by further reduction in primary energy consumption, in total energy production and transmission system. So reducing energy consumption by 1 kWh, end-user saves about 5 kWh of primary energy resources.

### 2.2.1. Industry

Up to 70% of energy saving potential in industrial sector is concentrated in several most energy-intensive industries:

- 1) industries with the highest absolute rates of fuel and energy resources consumption: iron and steel industry (cast iron and steel production, non-ferrous metals), chemical and petrochemical industries;
- 2) industries with high cost proportion of fuel and energy in production costs: construction materials (especially cement, brick, glass), pulp and paper industry (production of pulp, paper and cardboard), textiles (weaving) and mechanical engineering etc.

For example in Russia, three most energy-intensive industries (iron and steel, pulp and paper and cement industries) possess 53% of the energy saving potential; energy saving potential of steel industry accounts for 39%.

Despite the importance of the industrial sector in terms of achieving performance targets in the sphere of energy savings and energy efficiency of the economy in general, the industry is a sector of the economy where energy efficiency state policies are extremely limited. In fact, they are related to mandatory energy audit, establishment of energy efficiency monitoring and introduction of government support measures.

It is important to note that the outdated technological base of the industrial sector is a common problem to all CIS countries.

Realization of structural changes in a production sector is an extremely complicated part of national policy, as this particular sector of economy is described in terms of higher (about 70%) amortization.

At the industrial complex enterprises energy saving measures are advisable to plan as a part of complex measures aimed at re-equipment and modernization of producing units. A good example of this approach is a set of activities implemented on the largest petrochemical plant in Belarus called «Polimir» JS «Naftan» (optimization schemes of internal and external power supply, construction of 7.6 MW cogeneration plant etc.).

At the enterprises a good account was given for installing trigeneration plants (combined cooling, heating and power plants; JS «Grodnokhimvolokno»). This is especially important at the factories with large consumption of an appropriate energy (greenhouse plants, glass plants, etc.).

In general, investments into energy efficiency enhancements in industry are economically and financially viable: in Russia 97% of technical potential could be realized through cost effective investments, 80% of the technical potential could be realized through a financially attractive investments.

Due to the implementation of energy saving policy in Ukraine during 2007-2010, energy efficiency of the mining industry has increased by 10% in four years – from 25.8% to 35.4% of the EU level. The mining and smelting complex is the largest consumer of raw materials, equipment and energy resources and consequently the largest producer in industrial sector. Energy consumption in

mining and metallurgical complex accounts for 65% of total energy consumption in industrial sector.

### *2.2.2. Agriculture*

The main types of energy consumed by agricultural sector, are petroleum products (fuels and lubricants), heat, electricity, gas. Priority to different types of energy is given depending on the agricultural subsectors. So animal farming consumes mostly petroleum products and electricity, crop farming consumes mostly petroleum products, and greenhouse needs heat and electricity.

In order to improve the competitiveness of the products, agricultural sector faces the necessity of modernization, a key objective of which is to increase productivity and reduce energy consumption. The main direction of energy saving is to consume it efficiently by matching capacity of equipment with specific needs, schedule compliance of electrical equipment, which prevents idle running and part - load operation, maintenance of electrical equipment in good technical condition, which means elimination of deviations from the standard state.

Reduction of electricity consumption for lighting is achieved by replacement of incandescent lamps, which convert to light only 5-8 % of consumed energy, with fluorescent lamps, net output of which is 20-30%.

It is estimated that about half of energy savings can be achieved by installation of energy saving machinery, technological processes and equipment, including industrial- mastered and new, that are subject to development , and about a tenth - by raising the level of utilization of secondary energy resources.

Large livestock complexes, that remained part of agriculture sector of Belarus, allow for introduction of biogas complexes for production of heat and electricity. For this purpose a special program for construction of such complexes until 2015 has been worked out. Important areas for agriculture is the replacement of imported energy sources with local energy sources, introduction of heat recovery systems, optimization of heating schemes, use of energy-efficient

technologies in vegetable and greenhouse plants. According to estimates consumption of FERs may be reduced by 30%.

A common problem of agricultural development in the CIS countries is low value added. Improvement of energy efficiency of agricultural sector of Ukraine to the EU level would save 1,390 kt.o.e. or 66.7 % of final energy consumption in 2008, which is about 600 million euros in 2010 prices. However, this amounts to about a one third of the value added of the sector. This example illustrates well the importance of energy efficiency in agriculture.

The potential of energy saving and increased energy efficiency in agriculture can be achieved by:

- introduction of contour farming and drainage system (decommissioning of low productive eroded land and creation of pastures, hayfields, etc.);
- replacement of the spring plowing surface with soil treatment;
- introduction of energy saving technologies for growing crops;
- process optimization for drying of grain;
- introduction of modern less energy-intensive technologies for production of compound feed;
- energy-efficient modern agricultural machinery;
- modern equipment in the power supply system to reduce energy consumption and automated process control;
- increase volume of crops that can be used to produce bio-diesel and biogas;
- improvement of the system of collection of agricultural wastes, to be used for production of biogas;
- production and increased use of biofuels.

### *2.2.3 . Transport sector*

Energy consumption in transport sector in 2000-2010 provided the main growth of primary energy consumption in Russia. In 2000-2008, it grew by 45.6 million t.f.e., including the railway transport 1.3 million t.f.e., pipeline transport – 10.7 million t.f.e., automobile transport – 27.3 million t.f.e. and other types of

transport – 6.3 t.f.e. That is, the share of automobile transport accounted for 60% of the increase. In 2000-2010, this share was 66%, or up to two-thirds, because road transport was less vulnerable to crisis reduction of turnover in 2009-2010. The increase in fuel consumption of private vehicles was 18.8 million t.f.e. in 2000-2010, or 50% of the total increase in energy consumption in transport. This increase in energy consumption is significantly bigger than that of power plants or residential and public buildings combined. In general, a similar pattern is common for all countries of the CIS.

As for the energy saving potential transport sector usually follows such sectors as housing, industry, production of heat and electricity.

As transport sector is closely linked with almost all industrial and social spheres, its development trends are highly correlated with general economic trends. With all variety of conditions and specifics of the various sub-sectors of transport sector, FERs are used quite inefficiently.

The following measures are seen to be rational to improve the efficiency of energy resources use in transport sector. In rail transport it is necessary: to expand electrification and to transfer to electric individual sections of the railway; upgrade the road system by building non-abutting railway; gradually introduce modern rolling stock, including locomotives; optimize freight train formation plan and the direction of traffic volumes; to reconstruct boiler and heat engineering services; introduce automated commercial electricity metering; put in place an automated system for the outdoor lighting.

In road transport, it is necessary: to improve the structure of the vehicle by means of technical regulation and the introduction of differentiated stimulating economic mechanisms, expand the use of alternative fuels, including compressed natural gas and biofuels, and fuel additives; introduce energy saving technology maintenance and repair of vehicles.

In the area of the main highways energy saving measures should be directed to: optimize the development of road infrastructure with priority for public roads, expanding the use of new technologies and materials in the construction, repair and

maintenance of roads, reduction of energy consumption in industrial processes for the production of crushed stone, asphalt and ferroconcrete.

On sea and river fleet it is necessary to: expand the use of best practice speed vessels; improve utilization of thermal energy for heating and electricity supply vessels; use alternative sources of energy supply of passenger tourist boats while parked at the expense of their connection to the shore electrical grid; create a series of automated monitoring systems and energy management in ports.

With due attention to the issues of energy efficiency in the transport sector, it is possible to achieve significant results. For example, through the introduction of energy saving and energy-efficient technologies at the Ministry of Transport and Communications of the Republic of Belarus in 2006-2010 the amount of total consumption of fuel and energy resources in the sector fell by 6% ; the generalized energy costs - by 11%, energy intensity of production output, works performed and services rendered - by 47 %.

#### *2.2.4. Housing and communal services*

The CIS countries have huge potential for energy saving in housing sector (about one third of the total energy saving potential, or 70% of total energy consumption in this sector).

Generally about 10% of the housing stock is in need of urgent repair in the CIS countries. From year to year, the share of dilapidated and emergency housing with wear and tear for more than 60% increased and became a subject to the demolition. Housing made of precast ferroconcrete is the most energy-intensive in the world but forms a significant part of the housing stock in the cities.

The actual heat loss from buildings is much higher than standard because of poor quality of construction and operation. The share of physical deterioration of supply networks is very high: more than 50% in water supply networks, more than 50% in heat supply facilities, more than 65% in electric power grids and more than 60% in general engineering services).

The main directions of energy savings in the residential sector are:

- optimization of district heating schemes, modernization of power plants and decommissioning of inefficient boilers;
- use energy-efficient constructive and engineering systems;
- organization of good governance in servicing residential buildings;
- implementation of residential energy-efficient buildings projects with controlled ventilation, a single inlet of heat carrier into a separate apartment for the organization of heat metering and heat control in every apartment, with utilization of ventilation emissions;
- design and construction of buildings with energy-efficient technologies;
- thermal rehabilitation of buildings and thermo modernization of houses ;
- implementation of energy efficient lighting systems;
- creation of a complex technological equipment and the development of solutions for using heat pumps in heating systems;
- creation of the combined technologies of low-temperature heat from the quantitative and qualitative-quantitative regulation of the heat load, the decentralization of heat generating capacities;
- involvement of the population into the process of energy conservation and improving efficiency of use of FER in buildings.

The largest part of the potential energy savings can be achieved as a result of measures to improve energy efficiency in heating and hot water supply.

The complexity of the reforms that encourage energy saving, which stimulate introduction of energy efficient technologies and equipment, installation of heat meters, the use of two-level tariffs (for both electricity and natural gas) and encourage the population to economical consumption of thermal energy.

The complexity of reforms that encourage energy saving starting from the implementation of energy efficient technologies and equipment, installation of heat meters, using two-level tariffs (for both electricity and natural gas) and ending with the encouragement of the population to rational consumption of heat is the key to improving energy efficiency in the sector.

## **2.3. The most effective approaches, tools and incentives for energy efficiency in the CIS countries**

### *2.3.1. Legislation and regulation*

It should be noted the positive experience of the formation of legislative and regulatory base in the Republic of Belarus.

Energy conservation and energy efficiency are stated as the key areas in the state energy policy. Primary and secondary legislation, institutional structure, mechanisms of the governmental support are created and constantly improved.

The system of legal regulations which includes regulations, standards, and specifications has been constantly developed. Methodological instructions for its use have been also created.

Nevertheless, development of legislation in terms of introduction of market mechanisms and improving the tariffs, creating conditions for cooperation between government and business remains relevant.

Ukraine and the Russian Federation develop to a large extent similar system.

Establishing of special government body which is responsible for development and implementation of energy efficiency policies is also very important. Such government body gets a special importance in the countries exporting energy resources.

Authorizing Ministries of Energy to implement energy saving policy creates an internal conflict of interests linked with the implementation of mutually exclusive functions of the Ministry – on the one hand, to ensure increased production and sales of energy resources, heat and electricity, and on the another hand, to solve the opposite task - to reduce the energy consumption. It has a negative impact on the formation and implementation of energy efficiency policy and leads to the fact that energy efficiency improvement becomes a secondary task.

The above mentioned body should be authorized to carry out the following functions:

- regulation of the activities of businesses and individuals for the effective use of FER and energy saving;
- organization of the development and implementation of concepts and national energy saving programs;
- development of criteria for evaluating the effectiveness of energy resources use on regional and sectoral levels;
- creation of economic conditions to stimulate the interest of legal entities and individuals in energy savings;
- participation in the development of national, sectoral and local energy balances;
- formation of state order for scientific researches and development works in energy saving area.

### *2.3.2. Management of energy saving and energy efficiency programs*

Energy saving and energy efficiency programs should be formed on the basis of a system of long-, medium- and short-term objectives and should contain:

- clear priorities,
- a comprehensive system of indicators to evaluate achievements of the declared objectives,
- built-in system of regular monitoring of results and adjusting tasks.

It is important that programs contain a specific list of activities which are supported by an adequate amount of financial resources.

Formation of multi-level system, where national programs are supported by relevant regional and sectoral energy saving programs allows achieving good results.

Governments may be advised to conduct an audit of short-term objectives and parameters of actions (priority, time, funding, etc.) by taking into account changes in the external and internal circumstances.

It is reasonable to carry out regular analysis of the barriers to implement state energy efficiency policy and promptly develop and introduce measures to

overcome them; to analyze effectiveness of individual incentives and mechanisms; to continue working on improving the regulations, and study international energy efficiency and RES experience.

### *2.3.3. Regulation of energy prices and tariffs*

Almost all CIS countries are striving to achieve the elimination of cross-subsidies in the energy sector, which is a big problem and causes a significant distortions on the market. Energy subsidies remain a traditional measure of performing a social policy. As a result, low energy prices do not provide sufficient motivation for energy saving consumption and investments into energy-efficient equipment.

Taking into account the necessity to ensure socially acceptable level of payment for the consumed energy it might be recommended a gradual optimization of tariffs for energy, including:

- implementing a system of differentiated electricity tariffs for consumers based on times of the day,
- creation of economic incentives for using of energy-saving technologies in production processes and energy savings by consumers;
- formation and establishment of electricity tariff rates based on type of activity (generation, transmission, distribution, sales);
- gradual elimination of cross-subsidies of energy tariffs, including those for population.

The practice of granting preferential tariffs and cross-subsidizing large energy-intensive industries leads to the further use of non-competitive production technologies. Lack of motivation for rational use of energy and investment in energy efficiency increases social costs.

One of the main incentives for improving the energy efficiency of natural monopolies and municipal organizations is the use of long-term tariff regulation methods, including the method of profit return on invested capital with simultaneous consolidating of a companies' commitment to quality, reliability, and

development of provided services. Based on this regulation, companies have an incentive to cut costs that include costs of energy resources and to improve the efficiency of resources' use since savings from these actions retain to companies and can be used for any companies' purposes.

#### *2.3.4. Stimulating processes of energy consumption and energy saving*

It is advisable to consider the following practices:

- experience of two-levels energy tariffs system, when higher tariffs for energy are set for legal entities and individuals for energy consumption above the established standards;
- introduction of preferential taxation for enterprises that have implemented energy saving programs and have achieved results above the established limit;
- introduction of a bonus system for managers of government enterprises and public sector organizations for achievement of significant energy saving results.

Incentives for owners of individual houses and apartments, implemented energy efficiency measures at their own expenses, play an important role in engaging population to increase energy efficiency activities. The first experience of work with individuals was obtained during campaign for ensuring all households with meters of hot and cold water.

#### *2.3.5. Financing energy saving and energy efficiency measures*

Lack of financial resources for the implementation of energy efficiency activities is a significant factor that prevents improving energy efficiency and energy saving.

In the initial stage, an important role in promoting energy efficiency plays budget subsidies provided for the implementation of priority activities on a

competitive basis. They can cover either 100% of implementing energy-saving activities' costs or some part of them. In particular, the structure of funding sources in the Republic of Belarus has been changing. In 1996-2005 almost half of the investment was carried out by government funds and 40% by the companies' own funds. The investment structure of 2006-2010 was different - own funds of enterprisers became the main source and about one-third was financed by the Government, ratio of loaned funds had increased to 10% of the total funding. The volume of investments into energy efficiency has constantly grown. US\$ 1,172.3 million was invested into energy savings activities in 2010, which is 24.6 times more than in 1996. In 2010, loans and borrowings formed almost a third of the total financing with 25% of government sources participation. It is envisaged the increase of volumes of credits, loans and other funds up to 20% in the structure of energy efficiency funding for 2011-2015.

Financing of government programs for the periods of 2006-2010 and 2011-2020 years should be implemented with the use of government and private support and public-private partnerships, including the means of foreign borrowing by international financial organizations and national banks' structures.

It might be recommended to create the special mechanisms for financing energy-saving activities, such as a revolving fund, budgetary allocations on terms of repayment and maturity, mechanism of providing government guarantees and repayment parts of loans interest rate to commercial banks for the loans used for implementation of energy-saving projects.

It is important to promote developing of energy services market to encourage establishment and operation of ESCOs and other market-based mechanisms for energy efficiency investments.

It is important to ensure a stable macroeconomic environment and clear rules on investment's return for implementation of energy efficiency and energy saving activities for all sectors of the economy as on the basis of long-term tariff regulation and participation of government if needed, which allow to establish

clear criteria for private investments and to eliminate investments' risks in energy efficiency projects.

#### *2.3.6. Raising public awareness and training of staff for implementation of programs of energy saving and energy efficiency activities*

It should be noted a low level of information about scientific, technical, organizational, economic and other energy saving and RES opportunities in information and education area.

However, targeted and systematic work to promote economic, environmental and social benefits of energy efficiency gives practical results. Information support of energy saving activities should include:

- conducting energy efficiency workshops, seminars at the sectoral, regional, national and international levels, as well as international exhibitions of energy-efficient technologies, equipment, instruments, materials, and scientific and technical conferences, forums and symposiums;
- organization of large-scale actions, such as "Energy efficiency - in action", "Minus 60 watts in each apartment," "Time to change habits" with wide use of media resources aimed to shape public opinion regarding energy saving both in national economy and in everyday life;
- publication of specialized magazines;
- formation of relevant web-resources;
- organization of advertising campaigns on television, etc.

At the same time it should be organized the systematic work on training and improving qualifications of managers and professionals including the following:

- creating an educational system in the area of energy saving;
- organizing training on energy management in the leading universities of the country;
- implementing the course "Fundamentals of energy saving" in all higher and secondary specialized educational institutions and as optional - in secondary schools;

- introduction of the courses on energy efficiency into the training and retraining programs.

It is also important to pay attention to the training of pupils in schools. Belarusian experience of conducting competitions of children's drawings is interesting. To stimulate participants, winning drawings were published in the form of leaflets and distributed as social advertising in public transport, public places, educational institutions, etc.

## **Chapter III. International cooperation of CIS members in the area of energy efficiency and energy saving**

### **3.1. Analysis of the current status of international cooperation of CIS members in the field of energy efficiency and energy saving**

All CIS members have been developing international cooperation in the area of energy saving, energy efficiency improvement and use of renewable energy for a long time.

CIS members foster cooperation in the framework of the Community of Independent States in order to maintain and develop traditional ties. By the present moment the following major documents have been adopted and the following decisions have been made:

- Agreement on cooperation between the CIS members in the field of energy efficiency and energy saving, adopted by the CIS Executive Committee in Kishinev on October 7, 2002;
- Main directions and principles of interaction between the CIS members in the field of energy efficiency and energy saving, approved by the decision of the CIS Economic Council on March 11, 2005;
- Strategy of interaction and cooperation between the CIS members in the field of electric power for the period up to 2020, approved by the decision of the CIS Electric Power Council on May 26, 2005;
- Agreements on cooperation between the CIS members in the field of energy efficiency and energy saving.

The Strategy (Main directions) of interaction and cooperation between the CIS members in the field of electric power for the period up to 2020 as well as the Main directions and principles of interaction between the CIS members in the field of energy efficiency and energy saving, worked out by the Energy Policy Center of the Russian Federation in cooperation with the CIS Executive Committee and with the financial support of the UNECE Committee on sustainable energy will serve as a basis for the CIS members' activities in the field of electrical energy.

These documents contain detailed information on the objectives and possible directions of cooperation between the CIS countries in the field of energy efficiency and energy saving.

In order to give further impetus to the economic cooperation between the CIS countries, to ensure sustainable development and economic security, to ensure welfare and to improve quality of life of the population basing on the synergetic effect and economy of scale, to enhance competitiveness of national economies of the CIS countries and to strengthen their positions in the global economic system in 2008 the CIS Council of Heads of Governments made the decision to approve the Strategy of economic development of the Community of Independent States for the period up to 2020.

The Strategy provides, in particular, that the CIS members will interact in the field of fuel and energy complex in the following directions:

- development and strengthening of technological basis of electric power sector based on parallel functioning of energy systems of the CIS member countries;
- forming of the common CIS electricity market;
- development of transnational transport energy networks;
- development of small hydropower with due regard to international experience;
- coordination of actions of exporters, transit countries and importers of fuel and energy resources;
- advancing technological capabilities of the use of unconventional and renewable energy sources, creating conditions for production of respective equipment at the CIS countries' factories;
- development of industrial base of fuel and energy complex, creation of new energy capacities.

The Strategy also sets a task to identify new approaches to interaction in the area of improvement of fuel and energy resources use efficiency with due regard to international experience. National energy programs of the CIS member states were

supposed to be updated in the meaning of increased focus on energy efficiency policy and energy saving, use of alternative types of fuel and tackling environmental problems.

The CIS member states took the decision to carry out additional measures in the field of energy efficiency and energy supply, development of standardization, certification and metrology systems, working out of international standards that determine and set requirements for equipment and household appliances, pursuing of a corresponding pricing policy, creation of a unified information base on high efficient energy equipment, use of renewable energy sources. Besides, all CIS countries emphasized the urgency of dedicating of a separate document to energy cooperation issues; for these purposes the respective concept of cooperation in this area was supposed to be worked out.

Members of the CIS Electric Power Council hold the activities on ensuring of sustainable energy supply of the CIS member states through the use of the advantages of the unified electric power technological base and ensuring of a stable parallel functioning of national electric power systems:

- pursuing a coordinated policy in the electric power area in order to ensure sustainable and stable energy supply of economy and population basing on the efficient functioning of CIS countries' energy systems;
- elaboration of CIS countries' electric power systems functioning and development strategy as a part of fuel and energy complex and coordination of CIS countries' energy systems prospective development programs;
- identifying of common principles and norms of joint functioning of CIS member states' energy systems;
- coordination of technological aspects of joint functioning of CIS member states' energy systems;
- shaping of an interstate market of electric power and capacity, equipment, funding and innovations;
- shaping of a CIS member states' integrated information space in the area of electrical energy with regard to international standards;

- elaboration and implementation of joint environmental programs in the field of electrical energy;
- cooperation with international organizations dealing with electric power sector issues, production, transmission and distribution firms and companies, energy and power engineering equipment suppliers, investors.

Alongside with that national reports note that many decisions taken in the framework of the CIS are not implemented in the proper way and are of a declarative character that provides for a coherent harmonization of the legal and regulatory framework and forming of a unified system of technical norms and regulations. Practical steps of such cooperation are, in general, of an informational character and consist in holding workshops, conferences and other kinds of information interaction.

The prospects of implementation of experimental and demonstration projects with account for drastic differences between the CIS countries in terms of fuel and energy balances structure, economic conditions as well as in terms of technical norms and regulations, in opinion of national experts, are quite uncertain.

Such a situation has a negative influence on both striving of the CIS members to strengthen integration processes and mid- and long-term prospects of development of economic relations between the CIS countries in the energy field. Cooperation and initiatives within the Eurasian Economic Community (EEC) and Eurasian Economic Commission is an important step towards shaping joint positions and areas of activities for Russia, Belarus and Kazakhstan. So, in accordance with the decision of the Interstate Council of the Eurasian Economic Commission No. 401 of December 12, 2008, forming of the EEC joint energy market information support system is to be continued.

International financial support of energy efficiency and energy saving policy in the CIS member states is provided by the UN, its bodies and programs (UNDP, UN Regional Commissions – UNECE, UN ESCAP and others), by the Global Environment Facility, the World Bank Group, the European Union, US Agency for

International Development (USAID) and other donors. Bilateral cooperation in the area of energy efficiency with non-CIS countries is in progress as well.

Main directions of cooperation:

- working out of a legal and regulatory framework;
- estimation of energy saving potential in different sectors;
- strengthening of human capacity;
- development of energy service market;
- estimation of renewable energy use potential and recommendations;
- awareness rising in the field of energy efficiency;
- implementing of new technologies and best practices;
- implementation of demonstrational projects.

Numerous projects, including pilot projects on building and modernization of energy efficient objects in industry and housing and utility sector, projects on elaboration of technical norms and regulations to stimulate investments into projects on energy efficiency in electric power sector, heat supply system, public service, construction and industry have been implemented and are being implemented with the support of international organizations and grants in the CIS countries.

As Ukraine and Moldova are contracting parties to the Energy Community Treaty, the European Union provides considerable assistance to these countries in order to bring national legislation systems into conformity with the EU one.

CIS countries also develop cooperation with International Renewable Energy Agency (IRENA), International Partnership for Energy Efficiency Cooperation (IPEEC) and Global Partnership for Energy Efficiency in Buildings (GREEB).

Generally, it is important to emphasize a considerable positive role of regional and country technological assistance projects implementation in the CIS countries. International support to the CIS countries contributed to creation of energy efficiency improvement centers, implementation of pilot projects and creation of demonstrational areas, preparation of recommendations on the use of

international experience with due consideration of national specific features. In the framework of such projects the countries get necessary consultative, methodological, organizational and other kinds of assistance in implementation of national policies in the field of energy efficiency improvement and use of renewable energy sources.

Herewith international cooperation is most profitable for those states which managed to shape comprehensive national energy efficiency strategies and create necessary conditions for their implementation. In this case international assistance acts only as a supplementary factor to the efforts made at the national level and is incorporated into national strategies. In the countries, where national energy saving policies are not fully shaped (for instance, Turkmenistan and Azerbaijan), international assistance helps to attract attention of societies and governments to prospects and opportunities of energy saving.

### **3.2. Analysis of national energy saving and energy efficiency programs in the context of opportunities of deepening cooperation between the CIS countries**

CIS countries' national energy saving and energy efficiency programs enable these countries to develop international cooperation within the Commonwealth almost without any restrictions.

Differences in approaches to energy saving does not impede international cooperation development. Instead, taking into account common features of technological frameworks of these countries, the results achieved and lessons learned in follow-up of such cooperation would be of great interest for all countries.

Orientation on the EU energy saving legislation and standards does not create any obstacles for cooperation within the CIS as well; it is an attempt to adjust best international experience to the CIS countries' conditions.

It is necessary to mention that despite the differences in structure of fuel and energy balances, in economic situation and state energy efficiency policies the

countries come across similar difficulties in implementation of national energy efficiency programs.

At present unsolved issue of financing is one of the main obstacles on the way of energy saving policy implementation in almost all the CIS countries. At the same time the countries have so far accumulated a certain experience of attracting investments into energy saving projects. The forms of these investments are as follows:

- direct financing from the state and/or local budgets;
- financing including attraction of financial resources from state and regional budgets;
- extra-budgetary energy saving funds;
- private investments of companies and organizations;
- financing including attraction of financial resources of energy saving associations, companies, groups of companies, financial-industrial groups etc.; financial resources of private individuals; foreign loans and investments;
- leasing of energy saving equipment supposing that afforded finances will be paid back at the cost of the income got in the course of the project implementation;
- performance contract supposing that the cost of afforded energy saving equipment and services will be paid back at the expense of the cost of energy that will be produced and saved after a project is started up.

Key challenges to efficient energy use still are:

- low rate of modernization of economy in general and production capacities in particular;
- biased energy resources pricing system as a result of administrative influence and cross-subsidization;
- lack of competition on the market, predominance of vertically integrated monopolies, inefficient management of state factories;
- lack of a stable legal and regulatory framework;
- difficulties of implementation of economic mechanism of energy saving stimulation in public sector;

- lack of measures stimulating efficient use of energy;
- high investment risks.

Generally, in the financial and economic sphere there are such sharp problems as price instability and imperfect system of price formation for energy resources which does not allow accumulating investments at factories, high banking and interest rates and difficult procedure of getting mid- and long-term loans for technological renovation and buying of high-efficiency equipment.

The problem of insufficient financing of research and development, modernization and promotion of energy machine and instrument engineering is sharp as well.

The Commonwealth of Independent States has in its disposal all opportunities both in terms of resources' reserves and in terms of productive capacity of fuel and energy complexes, to reach the necessary level of energy security for its members altogether and for every member in particular on conditions of development of mutually beneficial economic, scientific and technological cooperation and use of developed countries' experience in the field of energy and energy saving.

Proven reserves of organic fuel, hydro energy potential, fissionable (radioactive) materials deposits, unconventional and renewable energy sources potential as well as energy infrastructure of the CIS countries create necessary conditions for ensuring sustainable fuel and energy supply of economies and population and retaining a position of a region which is one of the main world market energy suppliers in the foreseeable future.

For CIS member states with high level of energy intensity of economy and, as a result, with high energy saving potential it is very important to base their economic policies on planned in advance economic growth rates that would get ahead of primary energy demand growth rates.

Pursuing of an assertive state energy saving policy is one of the main aspects of energy security ensuring for all the CIS countries, in the first line for those which satisfy a certain part of their energy needs by means of imports of energy

carriers. For energy exporting countries lower energy intensity of economy might contribute to higher level of both energy and national security.

Energy efficiency issues have not reached necessary positions at the economic level; they have not become a basis of a new life pattern and attitude to energy resources among population.

Decisions adopted within the CIS and CIS Electric Power Council demonstrate readiness to develop cooperation in the area of energy efficiency improvement, but political will which is not underpinned by sufficient financial resources turns into a diffuse declaration of intent.

### **3.3. Implications of cooperation between the CIS member states**

All CIS countries make it their mission to modernize their economies and, in particular, energy sectors that would require considerable long-term investments to ensure their modernization, sustainable development, safety, self-sufficiency and competitiveness.

Electric power infrastructure is deteriorating and getting outdated; technological lifespan of numerous power plants has been considerably exceeded, as a result, they operate with a low level of efficiency.

Special importance is being attached to shaping a unified CIS electric power market on the basis of parallel operating CIS electric power systems in order to:

- enhance safety of electricity supply and consumer experience in the CIS countries;
- enhance efficiency of the CIS Unified Electricity Market (CIS UEM) functioning;
- optimize use of fuel and energy resources, hydro energy resources and other renewable energy sources in electric power sector and improve environmental conditions in the CIS UEM countries;
- pull together electric power branch reforming processes in the CIS countries;

- create economic, legal and technological basis for further integration of electricity markets of CIS states and other European and Asian countries.

Parallel functioning of electric power systems ensures satisfaction of electricity and capacity demand in each country at any time in a 24-hour period at the cost of their own power plants and electricity supplies from electric power systems of other countries on a contractual basis. Under these circumstances, as total amount of energy producers and consumers grows, the process of maintenance of standard frequency within the stipulated limits and ensuring of interstate electricity flows gets simplified. Parallel functioning of energy systems contributes to enhanced safety of energy supply and lower total power capacity reserves that ensures continuous electric power supply.

To ensure CIS UEM successful functioning it is necessary to harmonize national legislation, legal and economic conditions of economic entities' functioning, establish a system of state support of priority directions of international cooperation for the purposes of CIS UEM development; solve nonpayment issue and the issue of balancing of trade and financial relations between the CIS member states.

Development of cooperation within the CIS makes it possible to lower total energy costs, enhance CIS economies' competitiveness and stability of energy supply.

Moreover, besides modernization of generating capacities and networks, there is a need to increase new capacities launching rates with joint increase in efficiency of their use.

In fact, development of cooperation within the CIS in the field of energy efficiency implies concentration of resources in the priority area of development and makes it possible to get a synergetic effect from invested resources through replication of results and economy of scale.

Moreover, most CIS countries do not dispose financial opportunities to implement big projects. Big projects and programs implementation is possible within the CIS. Besides, it is possible to implement within the CIS a complex

approach to energy efficiency improvement, on the one hand, and quickest possible development of national industrial, scientific and technological base of CIS member states – on the other one.

In the meantime, the present CIS countries' energy systems status-quo proves the necessity to advance principles of cooperation with regard to ensuring of a balanced approach to electricity exports and imports within the Commonwealth, to harmonize legal and regulatory framework of electricity transit, to form a common CIS electricity market that would regulate cross-border and regional electricity trade, to solve a problem of unplanned electricity flows between the CIS countries' energy systems, to coordinate activities on construction of energy and network objects, network topology change.

Principles of CIS countries' interaction in emergency cases at fuel and energy complex facilities are being elaborated at several levels of both bilateral and multilateral relations in electric power and oil and gas branches. This will make it possible to improve coordination of activities of national ministries, sectoral interstate cooperation bodies, as well as to unify principles and mechanisms of cooperation in this area.

Almost all CIS member states make efforts to enhance energy efficiency, in particular, for the purposes of environmental protection. Environmental protection was defined to be a priority objective of the CIS members' energy policy. Working out of mechanisms of energy saving programs implementation at the interstate level is getting especially up-to-date.

Elaboration of energy saving and energy efficiency programs implementation mechanisms at the interstate level is becoming an energy policy priority of the CIS countries.

Gradual change of CIS countries' fuel and energy balance structure is an up-to-date task as well. Increase in the share of atomic energy (Armenia, Belarus) and renewable energy sources – solar, wind, biomass and small rivers (Azerbaijan, Armenia, Kazakhstan, Turkmenistan, Uzbekistan) – is considered as an alternative to hydrocarbon resources.

### **3.4. Prospective directions of cooperation within the CIS. The most efficient approaches to developing cooperation between the CIS countries in the area of energy saving.**

At present the CIS countries continue to pursue a course on deepening cooperation in the field of energy efficiency in order to:

- enhance safety of energy supply and fuel and energy resources use optimization;
- find ways to harmonize legal and regulatory framework and to form a unified norms and technological basis in energy and energy saving;
- carry out joint researches and development of advanced energy saving technologies;
- coordinate joint activities in the area of environmental protection; monitor and analyze main directions of energy saving development.

The issue of forming a unified normative and regulatory space in the field of energy saving, including forming of common approaches and harmonization of norms, regulatory and technological base of energy saving.

It would be reasonable to work out a framework program of energy saving and energy efficiency on the basis of national programs as the main instrument of integration and interaction in the field of energy saving. Elaboration of a joint complex long-term energy efficiency action plan that would contain benchmarks, concrete measures, funding sources, state support and normative base alteration mechanisms etc. might become an effective instrument of development. To engage into these activities all national bodies responsible for energy efficiency policy implementation it is important to establish close cooperation at the level of sectoral and regional authorized public bodies, development institutions, technological agencies, innovation funds etc.

It would be reasonable for the CIS countries at this stage to consider carefully the Belarusian experience of energy efficiency enhancement and

opportunities of its adaptation to their own conditions. Republic of Belarus has already implemented the whole complex of low-cost measures in the field of energy saving and achieved considerable results.

To achieve positive results in the area of energy saving and energy efficiency it would be reasonable for the CIS countries to consider at the high level the issue of establishing of a concrete body/center on energy saving and an energy saving and energy efficiency foundation that would be funded by joint contributions of member states as well by other sources of financing.

Above mentioned body could be in charge of the following aspects necessary to promote energy efficiency and energy saving:

- strengthening of coordination of national energy saving programs;
- finalizing of forming of the legal and regulatory base necessary for effective pursuing of energy saving policy and promotion of this policy implementation at the municipal and local levels, including elaboration of concrete norms and direct acting standards;
- elaboration of economic mechanisms, financing schemes and energy serving projects management system;
- assistance by establishing of joint ventures, including energy service companies, for implementation of energy service technologies and energy service projects management;
- expert evaluation of projects;
- exchange of scientific, technological and economic information in the area of energy and energy saving;
- organization of trainings and special workshops for specialists;
- working out and support of implementation of joint energy saving and environmental protection programs;
- joint elaboration and implementation of advanced energy efficiency standards in the CIS countries;
- methodological support of energy saving:

- preparation of recommendations on quality improvement of basic energy supplies and energy consumption statistics;
  - elaboration of tools for monitoring state policy influence and for establishing model for energy short-, mid-, and long-term prognoses. These instruments are needed for evaluation of energy policies' strategies and their possible influence on energy resources supplies and consumption;
  - analysis of barriers to energy efficiency and renewable energy state policy implementation and elaboration of recommendations on their overcoming.
- providing of the following measures in the field of energy saving:
    - establishing of an automated data bank on existing in the CIS countries and in the world energy efficient technologies, facilities and devices;
    - establishing of a normative and legal information data bank;
    - organizing of international workshops and conferences on urgent energy efficiency and energy saving issues;
    - exchange of energy efficiency and energy saving teaching programs;
    - establishing of demonstrational objects and high energy efficiency zones, exchange of experience in this area.

The purposes of such a foundation might be:

- strengthening ties with international financial institutions for the purposes of working out of projects financial support and investments attraction schemes;
- carrying out projects on modern energy efficient equipment and RES facilities production;
- ensuring financial guarantees of energy efficiency projects implementation;
- implementation of energy saving projects in the CIS countries on a competitive basis;
- funding research and development.

Major CIS countries' energy companies which are interested in developing business within the CIS could become key partners in developing interstate

cooperation in the field of energy efficiency and energy saving. A prospective direction of cooperation is implementation of joint projects on construction of central heating and power plants (CHPPs) and mini-CHPPs; pilot projects on sharing of energy saving best practices in the CIS countries.

Moreover, a general concept of cooperation within the CIS should provide for a comprehensive scientific and technological energy cooperation development in the following directions:

- enhancing economy and energy efficiency on all stages – from production, transformation, transport, distribution, storage to final use of energy resources;
- elaboration and exploration of qualitatively new technologies and methods of use of unconventional and renewable energy sources;
- environmental and emergency safety of energy sources and stability of energy and fuel supply of consumers.

First and foremost steps to deepen integration processes in fuel and energy complex might be concentrated, first of all, on forming of a common energy saving information space through establishing of experts and consulting network that would dispose a permanently updated knowledge base on the following aspects:

- modern energy saving technologies and equipment;
- normative and legal mechanisms of energy efficiency and energy saving measures implementation;
- successful and unsuccessful implemented pilot projects;
- intellectual projects used in shaping project decisions, optimizing technological decisions in the field of energy efficiency and energy saving;
- normative-technical documentation.

Forming of an expert community and an open network communication, in addition to information experience exchange at modern fora, exhibitions dedicated to energy saving issues, specialized workshops might give an additional impulse to cooperation development, investments attraction, acceleration of integration processes and higher quality of decisions as well as have a positive effect on national programs efficiency.

Establishing of such a network may be realized within the framework of further implementation of corresponding UNECE and UN ESCAP projects that laid the foundation for establishment of the energy efficiency expert community and made a considerable contribution to development of the CIS integration processes. Such a network might be established in the framework of the CIS as well.

### **3.5. Opportunities of deepening cooperation between the CIS countries within the UN, other international organizations and initiatives for the purposes of achievement of priority goals in the field of energy security, energy efficiency and renewable energy**

In 2011 the UN Secretary General put forward the initiative “Sustainable energy for all” (SE4All) which provides that by 2030 the following objectives should be achieved: ensuring of universal access to modern energy sources, doubling of energy efficiency level and doubling of renewable energy share in the world energy balance.

According to the UN data, today 2.6 billion people in the developing countries use traditional types of biomass for cooking and heating and 1.3 billion people lack access to electricity.

Therefore at present approaches to achievement of energy development objectives both in the framework of sustainable development concept in general and in terms of practical steps of arrangement of international energy cooperation are being reshaped.

Sustainable development topics are being actively promoted within the UN in the framework of implementation of Secretary General’s Initiative “Sustainable energy for all” in the context of realization of Rio+20 Global Sustainable Development Conference decisions, “Development agenda” as well as the UN Framework Convention on Climate Change (UN FCCC) and the Kyoto Protocol to the UN FCCC. Practical activities are also held in the framework of the UNDP,

UNIDO and some other UN bodies and entities and other governmental and non-governmental organizations.

Following the results of the Rio+20 Conference on September 24, 2012, the UN Secretary General Ban Ki-moon took the decision to delegate functions of Special Representative of the Secretary General for Initiative “Sustainable energy for all”/Chief Executive of the Initiative to the UNIDO Director General K. Yumkela (headquarters of the Chief Executive will be located in Vienna; a special decision on this was taken by the Austrian government on December 13, 2012); the UN Task Force on shaping post-2015 development agenda was established, as well as the UN Secretary General’s Consultative Council on the Initiative “Sustainable energy for all” (two representatives of the Consultative Council – Ban Ki-moon, UN Secretary General, and Jim Yong Kim, President of World Bank) and the Executive Board (head of the Board – Chad Holliday, President of Bank of America).

The fact that representatives of major banking and financial institutions were engaged in the activities of these bodies and appointed to key positions indicates a qualitative change in sustainable energy development issues perception and increase of attention paid to them at the international level.

As regards the implementation of approaches to international energy cooperation development, the activities held within the UN Task Force on shaping post-2015 development agenda is gaining significance. At present global consultations on energy role in sustainable development of the world and the UN role in this process are being held within the Task Force. The aim of these discussions is to propose a wide range of interested parties to come to a common vision of the future world energy problems and the necessity to incorporate energy issues into the post-2015 Development Agenda that will be implemented under the auspices of the UN. The UN General Assembly adopted the resolution (A/RES/67/215) on declaration of the decade 2014-2024 “The Decade of sustainable energy for all”; in doing so, he emphasized the importance of modern services in the field of environmentally sustainable energy supply pointed at

eradication of poverty and at development in general. Therefore higher UN role in forming of frameworks and approaches to international energy cooperation development can be anticipated.

It seems advisable to develop cooperation between the CIS countries in the framework of implementation of Secretary General's Initiative «Sustainable energy for all» both in the format of exchange of opinions and participation in preparation of program/concept documents and through elaboration of regional technological assistance projects that might be implemented in cooperation with the UNECE, UN ESCAP, UNDP, UN Environment Programme (UNEP), Global Environment Facility.

Active engagement of the World Bank Group and other financial institutions into the implementation of the Initiative «Sustainable energy for all» in real terms means a dramatic change in international energy efficiency cooperation issues, new opportunities for the CIS countries and real opportunity to overcome one of the main obstacles to energy saving projects implementation – lack of efficient financial mechanisms.

In its recent report “Toward a Sustainable Energy Future for All” the World Bank notes country and regional differences and emphasizes the necessity to work out for each country and separate regions of our planet a unique set of mechanisms for achievement of its objectives.

Armenia, Kyrgyzstan, Tajikistan and Moldova were the CIS countries that officially joined the SE4All Initiative. The Russian Federation has supported the Initiative as well.

It seems advisable to consider within the CIS the opportunities of participation in the implementation of the Initiative, in particular, the opportunity to work out a regional plan on SE4All implementation and determine priority goals and directions of cooperation. It is also important to develop cooperation with the World Bank Group and other international funders for the purposes of elaboration of efficient energy saving financing mechanisms with due regard to specific characteristics of regions.

## Conclusions

Distinctions in structure of production and consumption of energy resources are an objective basis for expansion of trade and mutual integration of the CIS Member States in the energy sphere.

Despite distinctions in structure of the fuel and energy balances, of the economic situation and the state policies in the sphere of energy efficiency, the countries meet similar difficulties in the implementation of national programs on energy efficiency.

Practically in all the CIS countries the presence of outstanding financing issues is one of the main obstacles in a way of energy saving policy implementation.

There is a problem of increase in rates of the new capacities input with a simultaneous growth of efficiency of their use present in all the CIS states beside the modernization of generating capacities and the grid management system.

As a whole in all CIS countries, except for Turkmenistan and Azerbaijan, the laws on energy saving do operate, the standard and legal base of the energy saving, urged to provide a basis for policy realization in the sphere of effective use of energy resources, has been already created or is in the process of development; laws on energy saving and energy efficiency improvement have been adopted; strategic documents on development of national economies have been approved. In those the goals and objectives of energy efficiency improvement were set; national programs and the plans of action have been developed, separate industry and specialized programs have been shaped according to the national priorities.

At the same time, in a number of the states the standard and legal base has a rather declarative character. Laws on energy saving do not contain mechanisms of direct action in the majority of the countries, are poorly connected with other acts regulating various issues on energy, ecology, etc. Standards of the legislation often are not coordinated among themselves; there are gaps and outstanding issues. At the same time, practically in all countries the international experience is actively

studied and work on its adaptation to national conditions is carried out. In particular, one may note a tendency of the legislation harmonization with EU legislation in the energy efficiency sphere.

There is no integrated and phased approach to policy realization in the sphere of energy efficiency improvement in the majority of the states in question at present. As a rule, the system of target indicators of energy saving is insufficiently developed, the monitoring and assessment mechanism is absent or is poorly developed, the system of statistical information collecting is inefficiently adjusted, there are no mechanisms of correction of the medium-term objectives and the mechanisms of their achievement, the system of subordinate regulations and standards is insufficiently developed, as well as mechanisms of economic incentives of investments into energy efficiency are not worked out.

One may consider as the main obstacles on the way to the introduction of energy saving actions: imperfection of the tariff policy and practices of cross subsidizing, backwardness of the energy service and energy saving technologies market, uncertainty on the issue of the long-term budgetary support of energy saving, high investment risks, a low skill level of management on sites, insufficient level of practice of economical use of the energy resources, insufficient development of the market relations; absence of effective economic incentives for investment in the fixed capital assets and implementation of energy saving projects, imperfection of public administration and regulation in the energy saving sphere, especially at regional and local levels.

The greatest successes were achieved by the states, in which along with in details developed legislative base and necessary institutional infrastructure (existence of separate body of the state administration responsible for energy saving has the crucial value), clear task setting and planning were carried out (with allocation of key indicators which are planned to be reached by fixed date), as well as the system of the state policy in the energy efficiency sphere results realization monitoring has been created. Besides, the budgetary financing of energy saving projects has the extreme importance, even in the developed system of economic

incentives, at the first stage of realization of the policy in the energy efficiency improvement sphere.

Presently the CIS member states have the considerable potential of energy saving. According to the experts and to data of national programs on energy efficiency improvement, the unused potential of energy saving of the CIS makes approximately 450 million t.o.e.

Such sectors as housing (housing and communal services), production of thermal and electric energy and industrial sectors possess the greatest technical potential for the energy efficiency improvement.

It is thus important to note that in all states except Belarus and Ukraine the potential of low-cost actions for energy saving has not been realized so far. In Belarus such potential is almost exhausted today.

Cooperation development within the CIS will allow to lower cumulative expenses in the energy industry, to increase competitiveness of economy of the Commonwealth States and reliability of energy supply.

Distinction in approaches to energy saving does not interfere with development of the international cooperation. On the contrary, taking into account similar technological base and other general factors of the development, the results reached and the lessons learned are of interest to all states.

Orientation at the EU legislation and standards in the sphere of energy saving does not interfere with cooperation within the CIS, but represents attempt to adapt the best international practices to conditions of the Commonwealth States.

As a whole it should be noted an important positive role of the regional and country projects of the international technical assistance implementation in the CIS States. With the international support in CIS countries the energy efficiency centers were created, pilot projects were realized and demonstration zones were created, recommendations on use of the international experience taking into account national specifics were prepared. Within such projects the countries had received and keep receiving necessary consulting, methodological, organizational and other help and support in realization of the national policy in the energy

efficiency improvement sphere and the use development of their own energy resources (unlike imported) and renewables.

Cooperation development within the CIS in the energy efficiency improvement sphere actually means the concentration of resources on the priority direction of development and allows gaining synergetic effect from the enclosed resources at the expense of replication of results and receiving of an economy of scale.

Besides, there are objective difficulties for implementation of the large-scale projects in the majority of the CIS states. The implementation of large projects and programs is possible within the CIS. On the one hand the realization of an integrated approach to energy efficiency improvement and on the other the maximum development of national industrial and technological and scientific and technical base of the participating CIS states is moreover possible.

It is expedient to develop a Framework Program of energy saving and energy efficiency on the basis of national programs as the main tool for integration and interaction of energy saving policy of the states. Development of a joint comprehensive plan of actions in the energy efficiency sphere on long-term prospect with target indicators and with the indication of concrete actions and sources of financing, mechanisms of the state support, modification of regulatory base, etc. can become the effective development tool. It is important to adjust close cooperation at the level of branch and regional authorized bodies, development institutions, technological agencies, innovative funds, etc. for involvement in this work of all national authorities responsible for realization of the policy in the field of energy efficiency.

It may be useful for the CIS states to attentively study Belarus experience on the energy efficiency improvement and the possibility of its application and adaptation at this stage to their own conditions. Republic of Belarus has already realized practically the whole complex of rather cheap actions in the sphere of energy saving and reached good results.

In order to achieve the successes in the energy saving and the energy efficiency it may be useful for the CIS countries to consider at high level a question of creation of the specific body/the center for the energy saving management, as well as the energy efficiency and energy saving fund which would be financed by joint contributions of the Member States, as well as at the expense of the other sources of financing.

Creation of the expert community and an open network communication, along with information exchange of experience at the joint forums, the exhibitions devoted to energy saving issues and the specialized seminars could give an additional impulse to the cooperation development, the investment attraction, the acceleration of rates of integration processes and the quality of decisions made, will positively affect the national programs effectiveness.

It appears important to develop the cooperation between the CIS countries within realization of the UN Secretary General Initiative "Sustainable Energy for All" (SE4All) as in a format of an opinion exchange and participation in preparation of the program/conceptual documents, as by development of regional projects of technical assistance which can be realized with assistance of UNECE, UN ESCAP, the UN Development Programme, the UN Environment Programme, and Global Environment Facility.

Active involvement of the World Bank Group and other financial institutions in realization of SE4All initiative in practice means new opportunities for the CIS states and the international support in overcoming of one of the most important obstacles for the energy saving projects implementation – the lack of effective funding mechanisms.

It seems useful within the CIS to consider the possibilities of participation in the initiative realization, in particular - development of the regional plan of action on realization of SE4All initiative, as well as to define the priority objectives and the cooperation directions. Also it is important to develop actively the cooperation with the World Bank Group and other international donors for the development of

effective energy saving projects funding mechanisms taking into account the specifics of the region.

**Brief Overview on the CIS Countries****Annex 1. Republic of Azerbaijan**

According to IMF, in 2011 the GDP of Azerbaijan on PPP made \$93.1 bln. that is 2.2% more in comparison with a similar indicator of previous year. In 2011 growth rate of real GDP in comparison with 2010 made 0.1%.

In structure of Azerbaijan's GDP for 2011 67% - is the share of the industry 27% – services sector, 6% –agriculture. Among industrial production an important role is played by a mining industry (76%). In 2010 in structure of the export the share of income on crude oil was 86.5%, oil products – 6.0%.

According to MEA, in 2010 primary consumption of energy in Azerbaijan made 11.8 million TOE, and production – 65.4 million TOE. Production of energy resources is presented almost exclusively by oil (78.2%) and natural gas (21.3%). Consumption of the PER also consists of natural gas (66.1%) and oil products (31.4%). HPPs have small shares.

Azerbaijan is the large producer of oil and natural gas. According to BP as of 2011, Azerbaijan has 0.6% of the proved reserves of gas in the world and 0.4% of the oil.

In the period of 2000-2011 oil production in Azerbaijan grew by 3.2 times and reached 45.6 million t (in 2009-2010 – over 50 million tons/year). The share of offshore fields in oil production in the country makes 96%. According to the UN, oil export in Azerbaijan in 2011 made 27.8 million t. The country completely provides internal needs for oil products and carries out their export deliveries.

In 2000-2011 gas production in Azerbaijan grew almost by 3 times and reached 14.8 billion cubic meters. The main fields – the shelf Shah-Denise, Bakhar, Azeri-Chirag-Gyuneshli.

According to BP, in 2011 gas export in Azerbaijan made 7.18 billion cubic meters (prior to 2007 the country was a net importer), and all the volume was delivered via the pipelines.

The main legislative acts in the energy efficiency and the RES sphere:

- The Law of 1996 "On Expenditure of Energy Resources";
- The Law of the Azerbaijan Republic of November 24, 1998 No. 541-IQ "On Energy Industry";
- The Law of April 3, 1998 No. 459-IQ "On Electrical Power Industry";
- The Law of December 28, 1999 No. 784-IQ "On Electrical and Heat Power Plants".

The Ministry of Industry and Energy of Azerbaijan is the main body of a state administration in the sphere of the energy efficiency improvement. Presently the Ministry of Industry and Energy of Azerbaijan considers possibility of establishment of the Energy Efficiency Agency.

With assistance of the interstate program of cooperation of the European Union INOGATE ESIB the draft-law on energy saving was developed. Presently the draft passes through a stage of interdepartmental discussion. It is planned that in a package with it about 20 regulations shall be approved, though in the long term their number may be significantly increased.

In 2012 the policy review in the energy efficiency sphere was carried out by the joint group of experts of EU and the Secretariat of the Energy Charter.

By results of research it was noted that, despite attention increase in Azerbaijan to problems of energy saving and RES development, the specified questions are still insufficiently reflected by the policy pursued by Azerbaijan. In particular, development of strategy, the plans of action and the legislation is required. Today the only measures, which are carried out in the field of energy efficiency, are in fact the measures financed at the expense of foreign technical assistance.

Following the results of the review it is recommended to the Government of Azerbaijan to reflect in the Energy Policy a potential contribution of energy

efficiency to increase of fuel export, assistance to economic growth and in environmental protection, as well as to give a high priority to a problem of the energy efficiency improvement and the renewable energy use. It is necessary to carry out the detailed analysis of the energy efficiency economic potential in all sectors of economy and to estimate the obstacles that exist on the way of realization of this potential.

Azerbaijan's GDP energy intensity on PPP in 2010 made 0.130 TOE/thousand dollars. The Government set the goal on energy efficiency improvement to reach 20% by 2020.

In 2000-2009 the efficiency of a power supply system of the Republic increased from 30% to 37.5%, specific fuel consumption reduced from 411 to 327 g/kWh, and losses in an electric network – from 15 to 8.5%.

The State Program on the renewable and alternative energy sources use in the Azerbaijan Republic approved in 2004 is realized.

The main objectives of the State program on the renewable and alternative energy sources use:

- implementation of scientific and technical and organizational measures for the purpose of efficiency increase in the industrial sphere,
- increase in investments into energy industry,
- improvement of an ecological situation in the country.

The State Program provided for the construction of the new heat and hydro power plants in the country, the modernization of the existing generating capacities and the expansion of use of renewable energy sources.

For implementation of the Program the Agency concerning the issues of the alternative and renewable energy sources development under the Ministry of the Industry and Energy (2009) and the State Company on the alternative and renewable energy sources development (2012) were created.

Only the small pilot projects on the RES use were carried out in Azerbaijan. However, the increasing attention has been paid recently to studying of the RES potential.

In 2012 the development of the State strategy on the alternative and renewable energy sources use for 2012-2020 and the preparation of the Program in which pilot areas of development of alternative energy and perspective technologies are defined were complete.

The goal is set on achievement of 20% share of alternative energy in a total amount of energy consumption in Azerbaijan by 2020.

Azerbaijan had been receiving help from EU in total of 13 million Euros in 2010-2012 for reforming of the energy sector during which the plan of action providing specific steps for advance of obtaining energy from RES must be developed. For achievement of the specified goal the preparation of the RES database in Azerbaijan is conducted.

## Annex 2. Republic of Armenia

Armenia depends on import of hydrocarbons and attaches great value to the energy efficiency improvement and decrease in GDP energy intensity.

Standard and legal basis of the policy of energy saving realization is the Law on Energy Efficiency and Renewable Energy of 2006. The Ministry of Energy is the main executive authority responsible for carrying out policy in the energy efficiency field.

The industrial sector consuming 40% of the whole primary energy has the greatest potential for the energy saving, and first of all - power industry, production of construction materials, the mining and chemical industry, then follows the transport sector - 24% of primary energy.

The housing-and-municipal sector consumes about 15% of total amount of energy consumption. Despite the estimated essential potential of this sector in the field of energy efficiency, introduction of energy saving actions is complicated because of the large volume of necessary investments and the average level of the population income.

The agricultural sector also opens opportunities for further energy saving at 4% of the general energy consumption. The task becomes complicated for the low level of financing of rural areas and the lack of highly qualified personnel in the agricultural production processing sector.

The National Program on Energy Efficiency and Energy Saving of the Republic of Armenia (2007) is the main program document in the field of energy saving and energy efficiency.

The National Program is aimed at achievement of the following goals:

1. maintenance of Armenia's economy sustainable development;
2. reduction of dependence of the country from foreign deliveries of energy and avoidance of interruptions in supply of the Armenian fuel, by means of development of energy saving and renewables;

3. the most effective use of sources of fuel energy and renewables, by means of introduction of modern technologies and the practices of control and management.

The main mechanisms of the energy efficiency improvement specified in the Program:

1. Determination of the energy saving potential in all sectors of economy and its realization;
2. Increase in efficiency of fuel and energy resources in all sectors of economy;
3. Application of advanced technologies and work plans/schedules for consumers of fuel and energy resources;
4. Ensuring available consultation concerning effective use of resources and products for consumers of fuel energy.

As a result of the program implementation the following is planned:

- to reach the energy consumption reduction by 15% by means of a gravitational current of waters use and introduction of new technologies at drinking water pump stations;
- to save 475 million kWh for the 10-year period by means of introduction of energy saving lamps in lighting systems;
- to reduce the relative energy consumption by 5% in the mining industry by means of introduction of the energy effective equipment (large flotation machines and stone crushers);
- to increase the energy efficiency in the chemical industry by 23% by means of modernization of technological processes and the equipment;
- to reduce the energy consumption of the food industry by 35-40% at the expense of introduction of modern technologies and the equipment.

The main directions of realization of energy saving actions in the industry:

- elimination of mistakes and improvement of technological processes, realization of organizational measures, reduction of operating time of the equipment at no load;
- introduction of new energy effective technologies and automation of electric drives;

- use of secondary energy resources;
- improvement of thermal isolation of furnaces and heating networks;
- use of energy saving lighting lamps;
- introduction of new energy effective technologies.

The lack of researches in the area of the most effective actions of the fast energy efficiency improvement in two main energy-requiring sectors is felt presently: transport and heating of buildings.

Absence of information on advantages of investments into energy efficiency interferes with realization of the existing economically expedient potential. Consumers don't have information concerning overall performance of the various equipment intended for their enterprises, and many companies need professional development of the personnel and acquaintance with the saved up experience for creation of the investment plan in energy efficiency. Consumers are often inclined to revaluation of expenses of investments in the energy efficiency.

### Annex 3. Republic of Belarus

Since 1995 the Government of Republic of Belarus relied on FER use efficiency increase and thermal and electric energy losses decrease. In Republic of Belarus purposeful work on creation of the state system of the energy efficiency improvement in the economy is carried out: the legislative base, institutional structures, mechanisms of the state support and stimulation, system of target indicators and state programs with monitoring of their performance are created.

Significant GDP growth didn't lead to essential change of levels of primary and final energy consumption. In 20 years (1990-2010) GDP energy consumption of Belarus was reduced by 2.7 times, and gross consumption of FER – by 1.6 times with GDP growth over than by 2.5 times. Presently the energy consumption of economy is 1.4-1.8 times lower, than in the Russian Federation, Ukraine, Kazakhstan and other countries of the former Soviet Union, but still 1.5-1.8 times higher than the average across Europe.

Realization of programs and actions for implementation of a State Policy allowed to increase a share of own energy resources in balance of production of thermal and electric energy from 2.8% in 1990 to 25% in 2012.

Currently the policy in the sphere of energy saving is aimed at the structural changes of national economy and its modernization on the basis of energy effective technologies. The following goals are set:

- to reduce GDP energy consumption in comparison with 2005 level by not less than 50% in 2015 and not less than 60% in 2020;
- to reach the total amount of economy of FER on comparable conditions on GDP for not less than 7.1-8.9 million TFOE in 2011-2015 and not less than 5.2 million TFOE in 2016-2020;
- to provide a share of own energy resources in balance of boiler and furnace fuels of 30% by 2015 and 32% - to the 2020.

These goals are planned to be reached by means of realization of actions for the energy saving, aimed at improvement of the branch structure of economy,

introduction of modern energy effective technologies and the equipment, development of economic and organizational mechanisms of stimulation of energy saving, system of the accounting and control of energy consumption, an energy audit of the organizations and branches, increase of the energy efficiency level by standardization methods, expansion of a range of scientific researches.

The demand and offers increase in the market of energy effective technologies and the equipment is noted in Belarus. There is a demand for services in management of projects and implementation of turnkey construction projects and in carrying out energy inspections of the enterprises.

In accordance with the plan of action determined by Strategy of Development of an energy potential of the Republic of Belarus, at present the Government undertakes active measures for improvement of tariff policy by stage-by-stage optimization of a price level on energy, creation of economic incentives for use of energy saving technologies in productions and economy of energy resources of consumers; stage-by-stage elimination of cross subsidizing in tariffs for energy carriers, including for the population.

Strategy of the energy potential development of the Republic of Belarus defines a stage-by-stage complete elimination of cross subsidizing in tariffs for energy resources in Belarus by 2014-2015.

In Belarus over 30 acts of the legislation operate regulating the public relations in the sphere of energy saving, including the international contracts of the Republic connected with realization in the country of the energy saving policy. Presently the concept of the draft of the new Law "On Energy Saving" is developed.

The main strategic documents which are legislatively fixing a state policy in the sphere of energy efficiency and energy saving are:

- The program of social and economic development of the Republic of Belarus for 2011-2015; approved by the Decree of the President Belarus No. 136 of 11.04.2011;

- The directive of the President Belarus of 14.06.2007 No. 3 "Economy and thrift - the main factors of economic safety of the State";
- The Concept of energy security of the Republic of Belarus; approved by the Decree of the President of Belarus No. 433 of 17.09.2007;
- The Strategy of development of an energy potential of the Republic of Belarus; approved by the resolution of the Republic of Belarus Council of Ministers of 9.08.2010 No. 1180;
- The Republic's Program on energy saving for 2011-2015; approved by the resolution of the Republic of Belarus Council of Ministers of 24.12.2010 No. 1882;
- The National Program of development of local and renewable energy sources for 2011-2015; approved by the resolution of the Republic of Belarus Council of Ministers of 10.05.2011 No. 586 and other specialized programs in the field of the energy efficiency improvement and development of use of local types of fuel and RES.

The main institution responsible for development and carrying out the State Policy in the field of energy efficiency and renewable energy, monitoring of realization of the Policy and ensuring the State supervision of rational use of fuel, electric and thermal energy, is the Energy Efficiency Department of the State Committee on standardization of Republic of Belarus.

In each ministry and the regions there are administrations and the committees responsible for implementation of programs on energy saving, performance of the established indicators. Both state, and private enterprises are obliged to include in the business plans the goals and tasks on energy efficiency which will allow to provide them with the performance of the established indicators.

The system of monitoring of execution and the reporting to the Energy Efficiency Department of the State Committee on Standardization is organized.

The potential of low-cost actions is almost exhausted in Belarus by now.

The important role in energy efficiency stimulation at an initial stage was played by the budgetary subsidies allocated for realization of priority actions. In

1996-2005 nearly a half of investments were carried out from the state sources and about 40% at the expense of own means of the enterprises. Gradually the structure of financing changed and in 2006-2010 own means of the enterprises became the main source, individual share of the state made about a third, the share of the borrowed funds grew to 10% from the whole amount of financing. The volume of investment into energy saving annually grows. In 2010 in energy saving \$1172.3 million were invested that by 24.6 times exceeds the level of 1996. In 2010 loans and the raised funds made already nearly a third of all financing at individual share of the state sources about a quarter. In structure of financing of energy saving for 2011-2015 the increase in a share of the credits, loans and other raised funds to 20% is provided.

## Annex 4. Republic of Kazakhstan

Kazakhstan possesses large supplies of all primary energy resources, at the same time in the country much attention is paid to the issues of energy saving and energy efficiency improvement.

At the current stage the following tasks which can be solved by introducing the energy saving technologies are the most actual for Kazakhstan:

- release of generating capacities in the conditions of possible deficiency at the expense of decrease in energy consumption of primary branches of economy, and
- increase of competitiveness of the Kazakh goods and services at the expense of decrease in their prime cost.

Activity in the energy saving issues demanded development of the legislative standard and legal base.

The beginning to process of formation of a State Policy in the field of energy saving in the Republic was put by the Adopted Law of the Republic of Kazakhstan of December 25, 1997 No. 210-I "On Energy Saving". At the same time many important requirements of legislators from the point of view of energy saving were not supported with concrete norms. In this regard the new law "On Energy Saving and Energy Efficiency Improvement" was prepared and approved. The draft-law "On a Heat Supply" is also prepared and now passes coordination.

The policy in the field of energy efficiency and energy saving is defined by authorized body - the Ministry of the Industry and New Technologies.

Coordination, realization and monitoring of all listed actions is assigned to authorized body in the energy saving sphere, local executive bodies and future Institute of Power Industry and Energy Saving Development.

As authorized body in the sphere of control and supervision of execution of requirements of the Law "On Energy Saving and Energy Efficiency Improvement" the Committee of the State Energy Supervision and Control of the Ministry of the Industry and New Technologies which also carries out accreditation of energy

auditors is defined. The operator for formation and maintaining the State Energy register determined JSC "Kazakhenergoekspertiza" by the Government Resolution. This register will include the enterprises consuming over 1500 tons of conditional fuel.

The Program of the Kazakhstan Power Industry Development till 2030 approved in 1999 defined the directions of energy saving policy for electricity generation. For operating plants the main indicator of overall performance is the decrease in fuel consumption on production of 1 kWh of electric power. Input of new capacities has to be carried out only at the expense of use of the last achievements of scientific and technical progress. One of the priority directions of development defined use of renewable energy resources, as well as utilization of the associated oil gases for the purpose of electricity generation.

Realization of goals assumes first of all the fight against losses in production and transmission of energy, the organization of the accounting of all released energy, decrease in losses in electric and thermal grids.

At present there is a huge need for equipment modernization practically in all industries.

The industrial sector of Kazakhstan is five times higher in energy consumption than a similar indicator of EU countries. Considerable share of public institutions (school, hospital, etc.), as well as the residential buildings are equipped with inefficient energy systems and require updating.

In this regard, the following are developed and are carried out: State Program on Forced Industrial and Innovative Development of the Republic of Kazakhstan; Industry Programs, the "Productivity 2020" Program, the Program on Development of Innovations and Assistance to the Technological Modernization which are focused on technological modernization of all industries and development of scientific and technical potential of the industry. Thereby, these measures directly will influence increase of energy efficiency of economy as a whole.

At the end of 2011 the Comprehensive Plan on Energy Efficiency Improvement in the Republic of Kazakhstan in 2012 - 2015 was accepted. It

includes a number of the initiatives proposed and discussed within cooperation with the European Union and the international organizations for realization of which the technical and financial support of the World Bank, the UN Industrial Development Organization (UNIDO), etc. is provided. In particular, the measures and actions offered by UNIDO for example the energy management systems (EnMS), standards and potential building of experts and the enterprises were included in the plan.

The Program on Housing and Communal Services Modernization till 2020 is approved.

Main objective of the Comprehensive Plan on Energy Efficiency Improvement for 2012-2015 is the decrease in GDP energy consumption by not less than 10% by 2015 comparing with the 2008 level.

Target indicators broken down by the main sectors of economy:

- The Industry Sector – ensuring annual economy of primary energy resources by not less than 2.0 million TOE;
- The Energy Sector – ensuring annual economy of primary energy resources by not less than 3.0 million TOE;
- The Housing and Communal Services and the Budgetary Sector – ensuring annual economy of primary energy resources by not less than 3.7 million TOE.

The objective of the plan is realization of a complex of the legislative, organizational, scientific, technical, economic and financial measures aimed at reduction of inefficient consumption of fuel and energy resources.

The Concept of the Electric Power Branch Development of the Republic of Kazakhstan till 2030 on the basis of which the Industry Program of the Power Branch Development till 2030 will be developed is under consideration of the Government. As a part of the Program an Article on energy efficiency development is planned.

Thus, a lot of work on improvement of standard and legal base of energy saving has been carried out in recent years in Kazakhstan, the control system is improved, the energy efficiency improvement potential in the economy sectors is

studied, the system of target indicators and priority actions for branches is created, the attention to training issues is paid. It is important to note also the work carried-out on studying and adaptation of the international experience in the sphere of energy efficiency and systematization of the international cooperation.

## Annex 5. The Kyrgyz Republic

The Kyrgyz Republic possesses large supplies of energy resources and is capable to provide with them its' own requirements substantially. However, presently efficiency of functioning of many energy companies decreased, the branch endures considerable financial and economic difficulties. There is a dependence of the republic on import of coal, natural gas, oil products. In structure of fuel and energy balance of the republic import makes more than 50%.

About 5% of GDP and 16% of industrial output, 10% of the income of the state budget fall to the share of power industry. The electrical power grid provides access to the electric power practically for all population. The hydro energy potential of 252 large and average rivers is estimated at 18.5 million kW of power output and over 160 billion kWh of electric power. Potential of hydro power resources of the small rivers and water currents makes about 5 billion kWh - 8 billion kWh a year, but only 3% is used.

In the structure of primary energy resources production the leading place is taken by hydraulic energy with a share of more than 75%. Coal mining in the country provides about 16%. The total share of oil and gas is 8.3%. Kyrgyzstan possesses 30% of hydraulic energy resources of the region from which only the tenth part is mastered. Hydraulic energy is the most important component of the whole fuel and energy complex of the country.

In GDP structure the agriculture weight – 24.5% is considerable. The industry makes 25.8% of GDP, a services sector - 45.2%.

Priorities of the power industry development in the short term are:

- development and implementation of practical measures for reduction of energy losses;
- strengthening of commercial and financial discipline and achievement of profitability of the branch subjects;
- modernization and accumulation of production potential and generating capacities of electrical power sector and increase of its efficiency on the basis of

use of new equipment, introduction of automated control systems and optimum regulation of production schedules;

- input of new generating capacities and transferring power lines;
- active participation in processes of interstate integration by the countries of the Central Asia, the CIS in the field of power industry on a bilateral basis, in preparation and creation of the uniform competitive market of electric energy and power;
- carrying out reform of a control system by electrical power sector, management improvement, creation of a necessary institutional framework and regulatory legal base, completion of structural reform of sector;
- ensuring realization of the balanced tariff and price policy providing a covering of the actual expenses of the energy companies on production, transfer and distribution of electric and thermal energy and reduction of cross subsidizing;
- improvement of a hardware of systems of the commercial account with transition to creation of the automated energy monitoring and metering systems (AEMMS);
- creation of the full value domestic energy market with providing the competitive environment in the field of development and electric power sale by construction of small HPPs and other alternative sources;
- taking measures to preservation of competitive advantage of Kyrgyzstan in the regional export market of the electric power and to development of an export potential;
- improvement of conditions for the private investments attraction into sector development on a basis and the principles of public-private partnership;
- strengthening of potential of energy saving in production, transfer and consumption of energy resources.

The share of household sector considerably increased in the structure of consumption of fuel and energy resources by branches for the last 20 years and the share of the industry and agrarian sector decreased. Now the population consumes

about 60.5% of all electric power put on domestic market; the budgetary sphere – 10.5%; and the industry, agriculture and commercial consumers – 29%.

In the structure of fuel and energy balance essential shifts are also noted – the coal consumption strongly decreased and, in this regard, the heating, the hot water supply and cooking is carried out at the expense of the electric power nowadays. If in 1990 the population consumed 1 billion kWh, in 2010 – it was already 3.64 billion kWh of the electric power, at strong seasonal fluctuation: winter electricity consumption is 3.5 times more than the summer.

Operating tariffs do not stimulate producers in the Kyrgyz Republic and consumers of energy resources to reduce costs of energy. In this regard, improvement of operating tariff policy in the energy industry is required.

Issues of energy efficiency improvement are under authority of the Ministry of Energy and Industry.

The standard and legal base in the sphere of energy efficiency improvement includes the following main acts:

- Law on Energy Saving;
- Law on Power Industry;
- Law on Renewable Energy Sources;
- Law on Energy Industry.

Kyrgyzstan realizes the Program on Energy Saving till 2015. Within the program performance of energy saving actions and measures for the energy efficiency improvement will be carried out soon in the following directions:

- preparation of drafts of legal and normative documents for implementation of requirements of the Law "On Energy Saving" and performance of measures for the energy efficiency improvement;
- reconstruction of the existing energy and energy-intensive enterprises, modernization of the energy sector, thermal insulation of buildings, construction of buildings in which energy resources are consumed more effectively;
- use of local energy resources;

- restructuring of the industry making construction materials, start of production of energy saving and thermo insulation materials;
- development, production and installation of the equipment and systems for metering and regulation of hot water, steam, natural gas, the electric power usage volumes.

The country solves problems of achievement of financial and economic improvement of the energy branch, commissioning of new generating and transferring capacities, increase in a share of renewable energy in production structure, to energy efficiency improvement at the expense of energy saving, the increase of consumers energy supply reliability and carrying out socially acceptable tariff policy by 2014-2015.

Main objectives of the Energy Saving Policy in Kyrgyzstan are: rational use of energy by its production and consumption at the expense of active introduction of energy saving and innovative technologies, as well as the renewable energy sources.

## Annex 6. Republic of Moldova

The economy of Moldova is represented by the following major sectors: industry (13.82 %), agriculture (12.2 %), wholesale and retail trade (13.8 %), transport and communications (10.7 %), building (3.4%).

There is a small number of hydrocarbons in Moldova. Moldova imports 96 % of energy resources.

Oil-product extraction from south production field in Moldova is rather small compared to the demands of the country.

Gas industry regulation is mainly provided by JSC “Moldovagas”. There is a gas transmission network in Moldova.

Power generation from countries own energy resources was 1.016 billion kWh in 2011, total electric power consumption on the right bank of the Dniester river in 2011 was 3,571 million kWh.

Public administration in the field of energy efficiency is performed by the Government of Moldova, which has the following functions:

- to identify priorities in state energy efficiency policy;
- to approve national energy efficiency programs and plans of actions;
- to develop and apply energy efficiency tools and financial instruments for energy saving;
- to identify organizations, structures and key activities for energy efficiency improvements to be undertaken by state bodies.

The main administrative body that identifies key areas of energy efficiency development is the Ministry of economy. Agency for energy efficiency and renewable energy is an administrative body subordinated to the Ministry of economy.

Energy efficiency issues are stated as priorities in many documents in energy sphere, transport industry and economic development, particularly:

- 1) Energy efficiency law;

- 2) National development strategy: 7 solutions for economic expansion and poverty level reduction. Moldova-2020;
- 3) Energy strategy until 2030;
- 4) Renewable energy law;
- 5) National energy efficiency program 2011 – 2020;
- 6) National efficiency action plan 2013 – 2015.

General goals are specified for each energy sector:

- 1) Power sector: to promote investments into power generation, including renewable electricity generation; to promote consumer electrical equipment and energy products produced in compliance to EU energy efficiency requirements;
- 2) Thermal power sector: to reduce the losses in transport and distribution grids, to promote new energy efficient technologies;
- 3) Natural gas: to address opportunities for renewable energy sources development in National gasification program and to study potential and opportunities for biogas production and utilization in public facilities;
- 4) Industrial sector: to promote investments in order to replace ineffective technologies with energy efficient technologies;
- 5) Building sector: to develop administrative, legal and financial potential in order to apply measures for energy efficiency increase in housing, to promote state and private investment into energy-efficient buildings.
- 6) Transport:
  - to stimulate biofuels as a part of traditional fuels and to promote fuel efficient tires;
  - to reduce fuel consumption by introduction of electrical and rail transport, to replace old transport with energy efficient models;
- 7) public sector: to develop the following programs: street lighting improvement, low and net zero-energy buildings, renewable heating etc.

## Annex 7. Russian Federation

Energy intensity of GDP in Russia is 7 times higher than in Japan and 4.5 times higher than in USA. In housing and community services consumption of heat and water is 3 times (actual data: 4 – 5 times) higher than in Finland and Norway.

Technical potential of energy saving in Russia is estimated to be between 420 to 480 mil toe. The highest technical potential of energy efficiency increase is in the following sectors: housing, power generation and industry. Energy efficiency increase potential in final consumption is higher than in energy production.

Russia has recently begun to develop and implement state energy efficiency policy. Existing legal framework has mainly been developed in the past 6 years. At the same time energy saving is one of key tasks of economic development. International experience is taken into consideration during the state policy development.

The main aim of energy saving policy in Russia is to reduce energy intensity of GDP until 2020 by minimum 40 % (compared to 2007). The resources saved are considered to be the main factor of economic growth.

Currently main energy saving goals and objectives, as well as regulation and promoting instruments have been identified. Energy saving public administration, energy efficient technologies' and services' markets are being constructed. It is planned to develop a system of indicators for energy efficiency performance assessment, and to develop regular assessment and monitoring.

The state regulatory framework for energy saving in Russia is represented by the following legislative acts:

- Presidential Decree No. 889, 4 June 2008 “Concerning some measures for improving energy and ecological efficiency of the Russian economy”, which established a goal of a minimum 40% reduction in energy intensity of the Russian economy by 2020 compared to 2007;

- Federal Law No. 261-FZ, 23 November 2009 “On energy saving and energy efficiency increase and on amendments to certain legislative acts of the Russian Federation”;
- Other legislative acts and regulations, state program “Energy saving and energy efficiency increase for the period until 2020”, adopted by Government Decree dated 27 December 2010 No. 2446-p, other regional, municipal and companies programs.

The Ministry of energy of Russian Federation is the key governmental body that develops state energy efficiency policy.

State program “Energy saving and energy efficiency increase for the period until 2020” is being implemented at present. Measures of the state program focus on all sectors of the Russian economy and social sphere. The program consists of industrial subprograms, as well as a regional energy saving and energy efficiency program, and administrative subprogram on methodology, information and human resources issues for program implementation.

There are two types of measures in the Program: cross-functional measures (eligible for all or several sectors of the economy), and specific measures used in specific sectors depending on their technical features. The Program includes measures on inefficient capacities and technologies replacement with innovative and new progressive technologies in building and modernization. As the result the Program has been developed in an integrative approach.

During the last two years when state program has been implemented energy intensity of GDP in Russia has decreased by more than 5.5 %.

State energy efficiency policy in Russia is consistent; the Program is financed both from budget and non-budgetary resources. It is important to notice that annual federal budgeting spending on the state program implementation account for 7 billion rubles (in 2011 – 2013).

Regional energy saving and energy efficiency programs have been developed in all Russian regions. These programs include heating systems modernization projects,

smart metering equipment deployment, efficient street lighting, metering devices installation, utilization of energy efficient building materials.

Implementation of regional energy saving and energy efficiency programs in 2011 cost 47 billion rubles.

In 2011 most subsidies from federal budget were allocated to the following regional programs' measures: mandatory energy audits of state and municipal buildings (14% of all subsidies, equal to 777.3 billion rubles), installation of energy metering devices (12.2%, 646.5 billion rubles), replacement of incandescent lamps with energy efficient lamps (5.4% or 287.3 billion rubles). Another priority for federal budget financing had pre-investment phase projects that create conditions to attract investors into region.

Federal energy service company as well as 100 other ESCOs have been established. In practice, however, energy service contracts are not functioning well and energy service market is developing slowly.

Preliminary results of the state program show that a sufficient and comprehensive legal and regulatory framework for energy saving has not been established yet. In many sectors of economy investors cannot gain from energy saving. However a monitoring and assessment system has already been created, as well as the goals adjustment process and energy efficiency increase instruments.

## Annex 8. Republic of Tajikistan

There are significant reserves of renewable energy sources in the Republic of Tajikistan. The most widely used type of renewable energy sources is hydropower, which is considered to be the most efficient and cheap renewable in Tajikistan. Hydropower reserves in Tajikistan that can be explored and developed are 3.5 times higher than the Central Asian electricity consumption.

The biggest share of gas is imported from Uzbekistan.

The main priorities of fuel and energy complex that are expected to provide energy security include:

- to develop potential hydropower reserves of big and small rivers;
- to develop internal and external power grids and systems;
- to develop new deposits, improve existing capacities in oil, gas and coal industries;
- to develop new, modernize and develop old coal TPS;
- to create technical potential for non-conventional energy sources (solar energy, wind energy, geothermal energy).

Electric power complex of Tajikistan is operated by state vertically integrated Joint Stock Holding Company “BarkiTochik”. There is no regulatory body in gas industry. The tariffs are based on the price of natural gas imported from Uzbekistan.

State utility company “TajiktransGas” is responsible for distribution and delivery of natural gas to end users.

The most important political issue in energy efficiency is to develop renewable energy and to reduce consumption of non-renewable energy sources, to increase attractiveness of investments.

Another important issue is to provide secure and sustainable energy supply in isolated and remote regions, as well as for small and medium sized business.

The Ministry of energy and industry is responsible for the development and implementation of state energy efficiency policy. Energy saving regulatory framework consists of:

- Energy law;
  - Energy saving law;
  - Renewable energy sources law;
  - Targeted integrated program on renewable energy including river energy, solar energy, wind energy, biomass;
  - Program on hydro-energy efficiency and conservation 2012 – 2016;
  - Presidential decree of the Republic of Tajikistan “On additional measures for economical energy use and energy saving”;
  - Concept on fuel and energy complex industries development in 2003 – 2015.
- Energy policy is based on energy systems integration principle.

Plan of actions on the implementation of priority projects in energy industry in the Republic of Tajikistan from 2010 till 2015 is approved. The plan includes building of priority power facilities that will provide energy security and opportunity for electricity export to neighboring countries. The plan contains priority projects, completion period, financing sources etc.

The program on hydropower efficiency and conservation for the period 2012 – 2016 is focused on major issues of hydro resources saving, implementation of EE&ES plans and measures, rational power energy utilization and reduction of energy losses, modernization of existing capacities.

According to experts estimates after implementation of measures stated in Program and Plan the republic will achieve energy independence and will have own electricity sources for internal needs and will export its cheap electricity. The Government of Republic of Tajikistan approved decree “Regulation of the growth rate of thermal and electrical energy in national economy”. In order to improve energy supply another Government decree “Small-scale power generation” was adopted.

Comprehensive state policy will focus on the following objectives:

- to improve regulatory and legal framework in order to provide free transfer of capital, human resources and technologies between fuel-energy complex of partner countries;
- to develop a mechanism for better communications at markets of different countries based on the principle of mutual interests of partner countries;
- to contribute to creation and promotion of transnational energy companies, corporations and consortiums;
- to develop mechanisms regulating mutual non-payment in energy sphere, including clearing agreements, net offset agreements, common ownership agreements.

It is important to notice that reforms include financial rehabilitation of the industry by payment regulation and energy tariff growth. The most important measure at this period is to make amendments into the legislation in order to establish an independent regulatory body in power industry; to reform tariff policy for making private sector participate in the next steps of restructuring.

Because of the lack of generating capacities and the necessity to address social issues the Government of Tajikistan from 1 October 2009 made mandatory for all the budgetary organizations, manufacturing facilities and commercial enterprises as well as the population utilization of energy saving light bulbs. 241,000 of low-income households were provided with energy saving light bulbs from the federal budget. As a result daily electricity consumption in the country was reduced by 7 – 8 mln kWh.

## Annex 9. Turkmenistan

Turkmenistan is self-sufficient country in the area of energy supply and is a significant net exporter. In 2010 net export of primary energy sources was 24.6 mln toe, which equals 53 % of domestic production.

According to International energy agency in 2010 primary energy consumption in Turkmenistan was 2.,3 mln toe, production – 46.3 mln toe. Gas and oil dominate in the fuel mix of the country; gas and oil share in energy sources production is 79.7 % and 20.3 %, accordingly, in consumption – 81.4 % and 19.6 %.

According to World Bank data the structure of GDP in 2011 was comprised of 54% of industry, 34% - service and 12% of agriculture. The main industries are oil and gas, chemical industry, consumer goods industry (including cotton industry). Significant role in the countries' economy has fuel-energy complex which account for 80 % of export income (others: cotton, chemicals).

One of the most important resources is natural gas. According to British Petroleum in 2011 proved gas reserves accounted for 24.3 trillion cubic meters (+81% to 2010), which is the fourth largest in the world. The biggest deposits are South Ioltan (22 trillion cubic meters, discovered in 2006), Dovletabad (1,3 trillion cubic meters).

Natural gas production in Turkmenistan is constantly rising after a crucial decline in 2009 (– 46% in comparison to 2008). In 2011 54.6 billion cubic meters of gas were produced, mostly from South Ioltan and Dovletabad reserves. In 2000 – 2011 domestic gas consumption has almost doubled and was 25 billion cubic meters in 2011. More than half of gas produced (53 %) is exported into China, Russia and Iran. Supply is made through gas transmission systems. Turkmenistan is aimed at gas supply diversification, as a result in 2009 Turkmenistan began to export gas into China, the export volume is going to be increased in the future. There are also plans to export gas to Europe (through

Azerbaijan) and South Asia (project of gas transmission system Turkmenistan – Afghanistan - Pakistan - India, TAPI).

Turkmenistan does not possess large oil reserves; according to BP in 2011 proved oil reserves accounted for 82 million tons and are situated in Caspian shelf. In 2010 oil production was 9.4 mln tonnes (10.4 million tons in 2011), 1.8 million tons of which were exported (crude oil). The country is fully self-sufficient in oil products, surpluses are exported (3.2 mln tonnes in 2010). Oil refining capacities (approximately 12 million tons per year) are used for 50-60%.

In 2010 energy intensity of Turkmenistan's GDP was 0.58 toe/1000 USD PPP, which is one of the highest in the worlds.

Turkmenistan has a high potential of energy saving and energy efficiency increase. The legal framework and incentives for energy saving has not been developed yet, but the country is working under the development energy saving law.

In 2012 a joint project between UN and Global Environment Facility was established “Energy efficiency improvement in buildings in Turkmenistan” to be implemented until 2015. The project will focus on two main issues: the first one addresses energy efficiency principles in the process of engineering, building and housing operation, the second – rational utilization and exploitation of energy commodities and sources in houses.

The renewable energy sources potential in Turkmenistan is estimated to be 110 billion t.f.e. per year. Highest potential have sun and wind energy sources.

Turkmenistan has high potential for wind power generation (640 billion kWh per year). Solar energy potential is estimated to be 1.4 billion t.f.e. per year. There are small hydropower capacities in Turkmenistan (approximately 5 MW). Energy strategy of Turkmenistan until 2030 is being developed recently. There are the following priority issues in Energy strategy project:

- to increase fuel efficiency in power plants through modern combustion systems;

- to increase energy efficiency in municipal services and industry, heating system modernization;
- energy saving measures in housing and industries;
- to increase the share of non-fossil renewables in energy mix.

## Annex 10. Republic of Uzbekistan

The GDP structure of Uzbekistan is composed by industrial sector – 33%, service – 45.2%, and a significant share of agriculture – 21.8%. Private sector has 81.7% of GDP, small business – 52.5% of all production.

Since 2001 power energy sector in Uzbekistan is managed by State Joint Stock Company “Uzbekenergo”.

State inspection of the Republic of Uzbekistan on supervision for power industry (Uzgosenergonadzor) is the main regulatory body in power industry. More over State Joint Stock Company “Uzbekenergo” and National Holding “Uzbekneftegaz” are responsible for energy efficient and energy saving technologies deployment.

Department of pricing under the Ministry of finance of Uzbekistan Republic defines tariffs for all energy sources in country.

National Holding “Uzbekneftegaz” is a vertically-integrated three-level company and controls the whole oil and gas branch in Uzbekistan.

Energy policy is focused on the following issues: to provide energy independence and energy security, to increase energy efficiency and to reduce negative impact on the environment. In order to achieve these tasks new, innovative, safe ecological technologies are being developed and deployed; measures that influence optimal fuel mix structure, that introduce new methods and principles of energy saving management and that in general increase energy efficiency of energy and power production and consumption are being introduced.

One of the most important factors in achieving these tasks, as defined in Law “On rational energy utilization” is the development of technical standard documentation in compliance with international standards in energy production, transporting and consumption that are focused on energy efficiency increase. The development of such documents is also under the responsibility of Uzgosenergonadzor).

In order to implement the Law “On rational energy utilization” the company has developed “Energy saving program of Uzbekenergo until 2020”. This program has started its implementation recently and addresses energy saving measures.

One of the priorities in energy policy is to secure consistent energy efficiency increase based on technologies, power machines, equipment, transport and other.

The Government of Uzbekistan considers energy efficiency as one of the key instruments that will secure sustainable economic development that will influence capacities modernization, social and environmental situation, fuel and energy production growth.

## Annex 11. Ukraine

Ukrainian economy has one of the highest energy intensity in the world. According to International Energy Agency (IEA) in Ukraine in 2007 414 g of fuel equivalent were used for every dollar of GDP, while in the United Kingdom – 115 g of fuel equivalent, in Germany and in Japan – 140 g of fuel equivalent, in Russia – 350 g of fuel equivalent.

More than 40% of all energy sources are consumed in industrial sector. According to IFC overview “Energy efficiency: new source for sustainable development” energy saving potential in Ukraine is 65 %.

Main goals in Ukraine at present are as follows:

1. to reduce energy intensity of GDP by 20 % till 2015 in comparison to 2008 (3.3 % annually), to increase energy efficiency and competitiveness of the national economy;
2. to diversify energy mix, to increase the share of renewable and alternative energy sources by minimum 10 % until 2015 through reduction of fossil fuel share in import, in particular natural gas and to rise the share of alternative and secondary energy sources.

In order to address these goals Ukraine has the following objectives:

- to substitute natural gas in energy mix, starting from 2016 by minimum 15 billion cubic meters; substitute oil products – 1 million tons;
- to increase the level of heating supply to the population and to decrease the consumption of natural gas for heating production in housing stock by 60 %, in public sector buildings by 35 %;
- to reduce state budgetary financing of public facilities and public sector energy procurement by 50 %;
- to reduce the consumption of imported gas by 25 %;
- to reduce energy intensity by 20 % in transportation, storage and distribution of gas in comparison to 2008; to provide security and energy efficiency in natural gas transmission through gas transmission pipelines;

- to reduce the amount of natural resources consumption by 15-20 % through fuel energy consumption reduction.

New technologies are the main factors of energy intensity reduction in Ukraine, especially in metallurgy and chemical industries, housing and community services.

State targeted economic program on energy efficiency for the period 2010-2015 is aimed at GDP energy intensity reduction in order to reach the level of advanced economies and EU standards as to provide energy efficiency growth.

Energy efficiency and RES issues are regulated by or mentioned in more than 200 regulatory acts, including 11 laws of Ukraine, 15 presidential decrees and more than 120 governmental decrees, state and international energy saving programs.

The most important are:

- “Energy saving” law, 1994;
- “Power energy” law, 16.10.1997;
- “Alternative energy” law, 20.02.2003;
- “Combined heat and power and waste utilization” law;
- “Energy strategy of Ukraine until 2030”, 2006;
- “State energy efficiency program until 2015”, 2010.

The main document in energy saving and energy efficiency increase is the State target economic program on energy efficiency and energy production sector development based on renewable and alternative energy sources in 2010-2015.

The adoption of National action plan on energy efficiency until 2020 by State agency on energy efficiency and energy saving is expected to be the most important event in energy efficiency.

The main executive body in energy efficiency, energy saving and renewable and alternative energy sources policy in Ukraine is the State Agency on Energy Efficiency and Energy Saving.

State Agency on Energy Efficiency and Energy Saving will develop and approve National energy efficiency action plan until 2020 in the frames of Ukraine obligations to EU. The main goal of National action plan is to contribute to energy

efficiency increase by 20 % until 2020 and to increase the share of renewables by 11 %. The general goal of the Plan is to reduce energy consumption at national level by 9 % of the final consumption which equals to 6.23mln toe.

Moreover, it is planned in Ukraine to develop and adopt the following programs on energy efficiency and energy saving:

- Long-term energy saving program in Ukraine foresees to substitute natural gas with alternative energy, to increase the share of own energy resources production and to reduce the energy intensity in housing and community services;
- Integrated state target program in housing and community services modernization. The program should replace two existing programs and three programs, which are under development;
- Industrial energy efficiency and energy saving program of the State committee in television and radio-broadcasting;
- Industrial energy efficiency and energy saving program of the Ministry of defense;
- Communication strategy of agriculture and industry of Ukraine, which should increase the awareness of market actors about best practices in energy efficiency in agro-industrial complex in Ukraine.

Among the measures for RES stimulation and energy efficiency increase in Ukraine should be mentioned: custom tariffs, taxing, state guarantees and public-private partnership as well as green tariffs.

It is important to notice that Ukraine demonstrates a comprehensive approach to energy efficiency increase. There is a developed regulatory and legal framework existing already, a regulatory and monitoring energy saving system is functioning. There are steps provided to stop cross-subsidizing in energy sector.