In-Depth Review of the Energy Efficiency Policy of THE REPUBLIC OF BELARUS

ENERGY CHARTER SECRETARIAT
2013

Picture on the Cover:
Castle of Novogrudok, Republic of Belarus

The castle of Novogrudok, a local landmark, dates from the 13th century. The castle has a glorious history; it was destroyed as a result of several attacks by the beginning of the 18th century.

Together with the city of Novogrudok, the Energy Charter Secretariat is developing a project on bringing to Eastern European cities the EU energy efficiency initiative of the Covenant of Mayors. For more information please visit **http://daco.encharter.org**.

The picture for the cover was kindly provided by the Novogrudok Regional Executive Committee.

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Boulevard de la Woluwe, 56
B-1200 Brussels, Belgium

ISBN 978-905948-119-0 (English PDF)

ISBN 978-905948-121-3 (English Paperback)
Depot D/2013/7850/1

INTRODUCTION

The country review process is a core activity in monitoring and facilitating the implementation of the Energy Charter Treaty (ECT) and the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA). In-depth energy efficiency reviews, implemented under PEEREA, have proven to be an important tool in assessing the progress of member countries in terms of fulfilling their commitments under the protocol. They also provide peer guidance to governments in developing and implementing energy efficiency policies.

At the Energy Charter Conference in 2009 in Rome, it was discussed among member states that, to effectively monitor the progress made by the contracting parties in implementing the PEEREA obligations, in-depth reviews should be carried out every five years and regular reviews should be completed in between. The conference also adopted an indicative schedule of reviews for 2010–2012, focusing on countries that are not covered by other international organisations. While fully respecting the criteria discussed by the conference an in-depth review of the energy efficiency policy of the Republic of Belarus was carried out in 2012.

The review team was chaired by Mr Sergei Katyshev, deputy chairman of the PEEREA Working Group, which represents Kazakhstan and is comprised of officials from Armenia, Austria and Sweden, together with Ms Gabriela Prata Dias and Ms Bilyana Chobanova from the Energy Charter Secretariat. The team was also supported by Ms Tatyana Pospelova, consultant to the secretariat. The team visited Minsk between 4 and 8 June 2012 and discussed a range of issues with government agencies and other stakeholders (listed in Annex 8).

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EXECUTIVE SUMMARY

Background Information

The Republic of Belarus (RB) is a signatory of the Energy Charter and has applied the Energy Charter Treaty (ECT) and the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) on a temporary basis, since 1994. Belarus has not ratified the ECT, but Belarusian experts actively participate in the activities of all working and expert groups, and in the Energy Charter Conference. In 2007, the In-Depth Review of the Investment Climate and Market Structure in the Energy Sector of the Republic of Belarus was prepared.

Belarus is a country with a stable and rapidly growing economy. From 2000–2010, the gross domestic product (GDP) grew at an average annual rate of 7%. Factors associated with economic growth include the government's focus on policies regarding social and economic development, external market conditions, which are favourable for export, growing domestic demand and productivity of labour. The energy sector plays a key role in the development of the national economy. A specific feature of Belarus' economic growth is the continuously high level of social equality. In 2011, the economic growth rate equalled 5.3%. The government implements a package of measures to ensure balanced and sustainable economic growth.

Belarus adopts market reforms on a step-by-step basis. Since 2008, progress has been achieved in the privatisation and restructuring of enterprises, price liberalisation and banking sector development.

Energy and Energy Efficiency Policy

RB does not have sufficient primary energy sources and is heavily dependent on oil and gas imports, mainly from the Russian Federation. Imports of fuel and energy are around 85% of the total consumption of primary energy resources. The country has developed an infrastructure for transporting oil, oil products and electricity. These factors determine the key principles of the state energy policy: ensuring energy security through improving the fuel and energy mix in parallel with the rational use of energy resources, increased use of local fuels and renewable energy sources (RES) and promotion of energy efficient and environmentally friendly clean technologies in all sectors of the economy.

Since the beginning of the 1990s, RB has pursued a consistent governmental policy aimed at improving the energy efficiency of the economy, including the establishment of a regulatory framework, an institutional infrastructure, mechanisms of state support and incentives, a system of key performance indicators and state programmes with respective monitoring instruments.

The significant growth of GDP has not resulted in a material change in primary and final energy consumption. Over two decades (1990–2010) the energy intensity of Belarus' GDP decreased 2.7 times, and the gross consumption of fuel and energy resources decreased 1.6 times, with GDP increasing by more than 1.5 times.

However, the energy intensity of the Belarusian economy exceeds the average energy intensity of European OECD countries by a factor of 1.5–1.8, but is lower than in other post-Soviet republics by a factor of 1.4–1.8.

Through the implementation of programmes and measures following governmental policy the share of domestic energy resources in the energy balance increased up to 20.7% in 2010 as compared to 12.8% in 1990.

The current energy and energy efficiency policy and strategy of Belarus for the period until 2020 are set forth and their implementation in the area of energy saving is aimed at restructuring and modernising the national economy based on energy efficient technologies. The following goals have been set.

- Reduction in the energy intensity of GDP (from 2005 level) — by at least 50% in 2015 and 60% in 2020;
- Total saving of fuel and energy resources to the amount of 7.1–8.9 Mtce for the period 2011–2015 and at least 5.2 Mtce in 2016–2020;
- Share of domestic energy resources in the energy balance — 30% in 2015 and 32% in 2020.

The key objective in the electricity sector is to ensure a significant improvement in the energy production efficiency and reliability of the energy supply. For the period 2011–2015 the plan is to put into operation 2,485 MW of high efficiency generation capacities through the construction of gas-vapour power units and modernisation of existing equipment at power plants to provide for an improvement in their efficiency and decommissioning of 1,820 MW of inefficient capacity. Further implementation of the electricity sector development plans will allow the unit consumption of fuel in electricity generation to be reduced by 10% and the level of depreciation of the energy system's generation assets to be reduced to 40% as compared to in 2010. The construction of a nuclear power plant (NPP) of 2,340 MW by 2020 is also foreseen in the Belarusian Government's plans.

The country pays a great deal of attention to renewable energy development. The government has adopted regulations and a system of incentives for electricity produced from RES, and guarantees its purchase and the connection of respective generation capacities to the state power grid.

Future improvement of the energy sector management structure is aimed at a gradual transition to market principles and includes energy system restructuring with the establishment of wholesale and retail markets.

The government plans to reduce cross-subsidies in tariffs for electricity and heat sold by the distribution companies of Belenergo State Production Association (Belenergo SPA), through the elimination of preference energy tariffs for certain legal entities and individual entrepreneurs and a gradual increase in the share of power supply costs covered by households.

Legislation on energy and energy saving is constantly being improved. The Law on Renewable Energy Sources, which was put into effect in 2011, is of key importance for the promotion of RES. The concepts of a new draft Law on Energy Saving and the Law on Electricity have been prepared. For the near future it is planned to develop the Law on Heat Supply and draft new and revise existing regulations on energy system operation, which will set forth a procedure for relationships between business entities in the electricity sector under new economic conditions.

One of the priorities of Belarus' policy on energy efficiency and RES is the development of technical norms and standards. A Programme for Preparation of Technical Regulation, Standardization and Conformity Attestation in the Field of Energy Saving for 2011–2015 is being implemented.

Energy and Energy Efficiency Policies and Programmes

The governmental policy on energy efficiency and RES in Belarus is implemented through national programmes, which have established a framework for sectoral and regional programmes as well as the programmes of individual enterprises and organisations. In the period 1996–2010, three national energy saving programmes were successfully implemented.

The main areas of the Social and Economic Development Programme of the Republic of Belarus for 2011–2015 include an energy saving policy, an improvement in the energy efficiency of the economy, the deployment of energy efficiency technologies and the use of alternative energy.

Renewable Energy Policy

The development of RES is part of the national policy of Belarus in the area of energy supply, energy saving and energy security as well as in the area of environmental protection and climate change mitigation. The main policy principles are outlined in the Law on Renewable Energy Sources: sustainable development, efficient use of RES based on state support and incentives. The law regulates relationships regarding the utilisation of RES for electricity generation and consumption as well as the production of RES-based installations.

Government authorities of various levels organise and support efforts aimed at introducing RES in the fuel and energy mix of the country. Currently, biomass, biogas, municipal waste, wind and hydro energy are recognised as the main economically feasible RES in Belarus. The following measures of state support for RES are determined.

- Guaranteed connection to the state power grids based on energy purchase contracts with state energy supplying organisations, which bear the costs of grid modernisation to ensure technical conditions for connection purposes. Certificates of origin are issued with respect to energy generated from RES;
- Tax and other benefits set forth by the law.

Overall Assessment of Progress

The country has developed a legislative framework, an institutional structure, support mechanisms (including financing), a system of target indicators and state programmes (national, sectoral and regional, and the programmes of individual cities, enterprises and organisations) and there is a monitoring system for their implementation.

Energy saving and energy efficiency are key elements of the state energy policy of Belarus. From 1997–2010, the energy intensity of GDP reduced by a factor of 2.3 at an average annual rate of 4.3%.

The energy saving potential of low-cost organisational and economic measures is almost used up. Today it is necessary to make significant investments in the modernisation of industry based on the introduction of energy efficient equipment and technologies and in the deployment of efficient energy production units, using local fuels and RES. The planned reform of the energy sector will provide favourable conditions for attracting investment in the energy sector.

One of the priorities of Belarus' policy on energy efficiency and renewable energy is the establishment of a system of technical norms and standards and their harmonisation with European and international standards. Standards and regulations will be developed for

improving the energy efficiency of buildings and heat generation equipment, the utilisation of RES and local fuels and energy management and energy audits in organisations.

Pursuant to the Strategy of Energy Potential Development in the Republic of Belarus and the prepared draft, Concept of the Law on Electricity, a step-by-step reform of the electricity sector is planned. The reform provides for the unbundling of activities, development of market structures, harmonisation of legislation and development of the wholesale and retail markets for electricity. This will support the harmonisation of Belarus' legislation and compliance with obligations under international treaties. Basic provisions on electricity pricing and tariffs will be developed.

The government undertakes measures to improve tariff setting policy. In 2011, time-differentiated electricity tariffs for households and tariffs for electricity and heat for legal entities were determined. Efforts are being made to address cross-subsidies in tariffs for energy resources.

Investments in energy saving increase annually. The structure of financing sources is changing. From 1996–2005, about 50% of investments were financed by state funds and about 40% by equity capital; however, from 2006–2010, equity capital was the key source of financing. The share of state financing was one third and the share of borrowings increased up to 20% of the total financing.

Belarus has achieved a certain amount of progress in the development of the regulatory framework and provision of state support for renewable energy. The Law on Renewable Energy Sources, the National Programme of Local and Renewable Energy Sources Development for 2011–2015 and other regulations and targeted programmes have been adopted.

Recommendations

The following recommendations are offered to promote energy efficiency and RES in RB.

General Recommendations

- The Belarusian Government sets strategic goals in the area of energy efficiency and energy saving to ensure energy security and improve the living standards of the population and the competitiveness of the national economy. To achieve these goals the government should implement energy sector reform, which will provide for the use of market mechanisms and the potential for investments in energy efficient technologies and equipment.
- The government should assess the synergies of the national programmes in the area of energy efficiency, renewable energy and environmental protection in order to improve the results and the cost-effectiveness of the programmes.
- The government should continue reviewing the implementation of the state policy on energy efficiency and RES to identify deviations from the foreseen development in a timely fashion and undertake corrective actions.
- The government should use the achieved results and further develop and expand research and efforts to reduce end-use energy losses as well as to continue to provide financing for these measures.
- The government should encourage and stimulate co-operation between national scientific institutions and the international scientific and engineering community for the

further development of advanced technologies and the implementation of pilot projects on energy efficiency and renewable energy.

- In order to increase the share of domestic energy resources the government should pay special attention to the promotion of RES. To ensure compatibility with international data, RES should be always accounted for and recorded separately from non-renewable domestic energy resources. Furthermore, it is necessary to establish individual target indicators for RES and other local energy sources.
- RB should consider using municipal solid waste at incineration plants for the purposes of generating electricity and/or heat. In order to minimise harmful effects on the environment, these plants should meet strict emission standards.

Regulatory and Institutional Framework

- The government should actively proceed with the harmonisation of technical regulations on energy efficiency and RES with international and European legislation, which has been initiated in RB.
- The government should finalise the adoption of a new draft Law on Energy Saving in accordance with the declared time schedule.
- Upon adoption of the new Law on Energy Saving, the government should provide for further development of secondary legislation and regulatory documents in different sectors in close co-operation with respective stakeholders.
- The government should improve the status of the Department of Energy Efficiency and establish it as a separate structure within the government.
- The government should ensure that sufficient human and financial resources are allocated to the Department of Energy Efficiency as the leading agency, as well as to all units within ministries and regional administrations responsible for the development and implementation of energy efficiency programmes.

Energy Reforms and Pricing

- The government should provide for the adoption of market oriented principles and a respective regulatory framework on the basis of international experience when developing energy sector legislation.
- The government should consistently pursue the policy of restructuring energy prices (tariffs) to remove cross-subsidies.
- The government should continue with planned activities on energy pricing reform to achieve the level of prices that reflects the costs of production.
- The government should review the possibility of further long-term differentiation of the incentives for electricity generated from RES depending on the types of RES.
- Procedures for reviewing and approving financial support from donors should be revisited to ensure that no delays caused by the approval process lead to the cancellation of potential financing.
- The government should analyse and identify a system of measures aimed at accelerated

improvement of energy efficiency and the RES financing structure to increase the share of equity capital, private capital, loans and borrowings.

- The government should encourage the establishment and functioning of ESCOs and other market mechanisms for attracting investments in energy efficiency and to initiate exchange of experience, training and pilot projects in co-operation with international organisations.
- The government should strengthen co-operation with commercial banks to establish and promote financial and credit products in the area of energy efficiency technologies and energy saving equipment.
- The government should guarantee that the financial resources saved through energy efficiency measures are accumulated in the budgets of respective organisations undertaking such measures.

Specific Energy Efficiency Programmes and Measures

Industry

- The government should continue ambitious energy efficiency and energy saving programmes in industry.
- The government should provide for regular benchmarking analysis of similar production processes' energy efficiency and compare the unit consumption of energy resources for the production of goods in order to align with the best international practices.

Buildings

- The government should pay special attention to ensuring compliance with adopted building codes and rules.
- The government should continue to lead the way in the sphere of public buildings and the construction of new housing.

District heating

- The government should continue efforts to reduce losses within the district heating system.

Electricity

- The government should continue efforts to improve energy efficiency in the electricity sector.
- The government should provide for the use of the best available energy efficient technologies at new power plants, including those based on the use of biomass.
- To facilitate the use of available biomass potential, the government should develop a logistic support system for biomass transportation to power plants.
- The government should continue to support investments in co-generation.

Renewable Energy

- Given the importance of escalating the use of domestic energy sources and RES in Belarus,

the attention the government pays to these areas of the energy policy and the availability of special state programmes, we recommend that separate target indicators be differentiated and specified and special systems of performance monitoring and record keeping of the results be set up.

- The government should improve the institutional framework in the renewable energy sector to provide for better organisation of and co-ordination in implementing the strategic goals established.
- To provide for the implementation of the adopted Law on Renewable Energy Sources it is recommended that the development and adoption of secondary legislation be accelerated.
- The government should continue encouraging the use of biomass at CHPs to increase the share of RES in electricity and heat generation.

Monitoring

- For the purposes of improvement, it is recommended that a comparative analysis be conducted of the monitoring systems applied in the sphere of efficiency and renewable energy in RB against international practices.
- The government should assess and monitor the cost effectiveness of all energy efficiency plans and measures in order to develop a comprehensive data base for energy efficiency plans and programme optimisation to maximise their benefits.

Information, Training and Awareness Raising

- The government should continue to support measures aimed at raising awareness of energy efficiency and educating public officials and the wider population on local, regional and national levels.

BACKGROUND

Brief Overview of the Country

Since 1991, RB has been an independent state. Its state policy is aimed at evolutionary social and economic development that combines market economy advantages with efficient social protection for the population and at consistent integration into the global economy, while preserving historical continuity and the traditions of its people.

RB is situated in Eastern Europe at the crossroads of strategic railways and roads, transit pipelines for gas and oil products and communication systems connecting Western Europe, the Russian Federation and Asian countries; it lies between the Black Sea and the Baltic Sea regions.

Figure 1: Map of Republic of Belarus

Source: http://mapsof net/map/belarus-political-map#.UStDih2G2Pw

The territory of Belarus exceeds 207,000 sq. km, stretching 560 km from north to south and 650 km from west to east. The population of Belarus is 10 million. The capital is the city of Minsk. In terms of administration, the territory is divided into six regions, the centres of which are Minsk, Brest, Vitebsk, Gomel, Grodno and Mogilev. Each region consists of districts, cities and other territorial and administrative units. The share of the urban population is 70% of the total population of the country. This allows Belarus to be included in the category of countries with a high level of urbanisation. About one fifth of the country's population live in the capital.

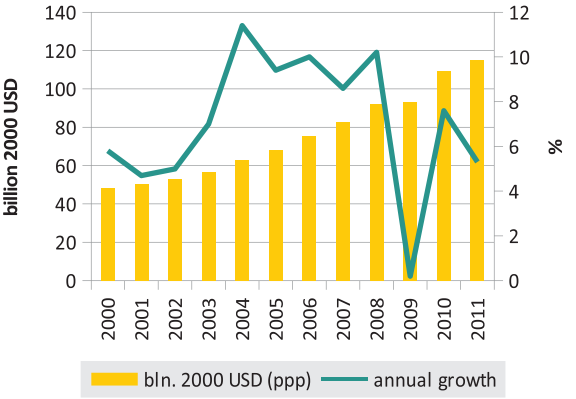
The Constitution of the Republic of Belarus was adopted in 1994 with further amendments and revisions being adopted at the republican referendums on 24 November 1996 and 17 October 2004. RB acknowledges that the common principles of international law are a priority and aligns national legislation accordingly.

Belarus is a member of integration associations established in the post-Soviet area - the Commonwealth of Independent States (CIS), Eurasian Economic Community (EurAsEC), Common Economic Space, Collective Security Treaty Organization, etc.), many international organisations (UN, UNDP, UNEP, UNECE, IAEA, ISO, etc.), special institutions of the UN (UNESCO, UNIDO, IMF, IBRD, etc.) and regional organisations (OSCE, the European Energy Charter, EBRD, etc.), and it participates in the regional programmes of the European Union — Eastern Partnership and INOGATE.

Economic Background

Since 1996 the economy of Belarus has been steadily growing annually at an average rate of 7%. In 2011, GDP of Belarus in comparable prices totalled USD 114.9 billion (2000 USD) (Figure 2), or 212% of the 1990 level.

Figure 2: Changes in GDP

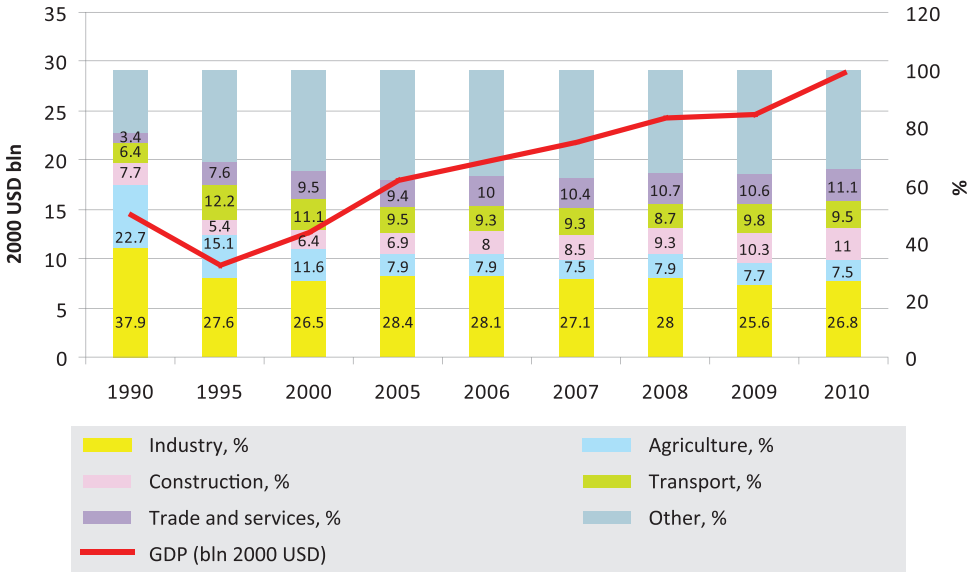


Sources: National Statistical Committee of the Republic of Belarus, Statistical Data Book of the National Accounts of the Republic of Belarus, 2011; IEA Energy Statistics, electronic version, 2011

Economic growth is determined by a combination of factors: the targeted and socially oriented economic policy of the state, favourable market conditions in the Russian Federation and EU countries for the export of Belarusian goods and an increase in labour productivity. The energy sector, including the fuel, petrochemical and electricity subsectors, has played a key role in the recovery and growth of Belarus' economy.

The changes in the industry structure of GDP during 1990–2010 and the share of certain sectors in the total industry output in 2010 is presented in figures 3 and 4. Table 1 presents a comparison of GDP dynamics in certain periods and during 1990–2010 in general.

Figure 3: Sectoral structure of GDP



Sources: National Statistical Committee of the Republic of Belarus, Statistical Yearbook of the Republic of Belarus, 2011; IEA Energy Statistics, electronic version, 2011

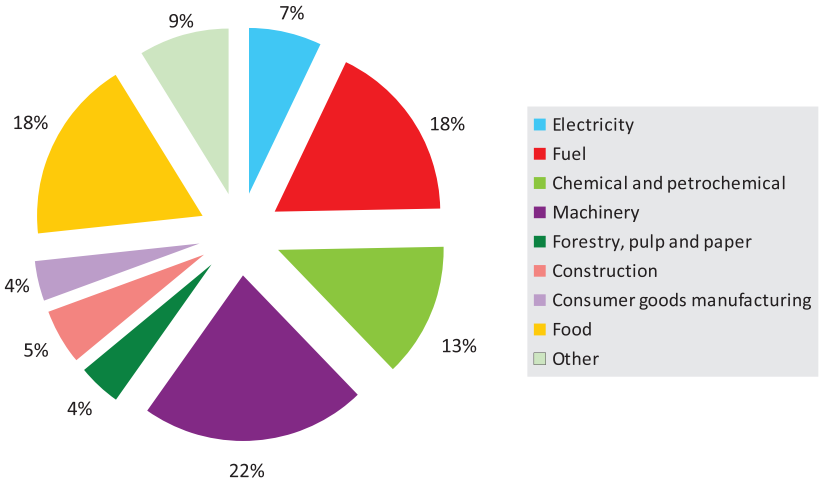
Table 1: Changes in GDP, 1990¬2010

Years	1991-1995	1996-2000	2001-2005	2006-2010	1991-2000	2001-2010	1991-2010
Growth of GDP (PPP), %	-34.7	+35.9	+41.4	+60.4	-11.3	+126.8	+101.3
Average annual growth of GDP (PPP), %	-8.1	+6.3	+7.5	+7.3	-0.9	+8.0	+3.3

Sources: National Statistical Committee of the Republic of Belarus, Statistical Yearbook of the Republic of Belarus, 2011; IEA Energy Statistics, electronic version, 2011

A specific feature of Belarus' economy growth is the sustainably high level of social equality. The level of average wages in the republic increased from USD 63 in 1998 to USD 475.9 in 2010. The ratio of the unemployed to economically active population reduced from 2.3% in 1998 to 0.7% in 2010. The rapid growth in productivity is determined to a significant degree by investments in the renovation of fixed assets. The average annual increase in investments in fixed assets during 1996–2000 equalled 7%, in 2001–2005 it equalled 12/4%, in 2006–2010 18.7% and in 2011 13.3% as compared to the 2010 level. The main sources of investments were equity capital, the funds of the consolidated budget and bank loans.

Figure 4: Share of certain industries of the total industrial output in 2010, % of total

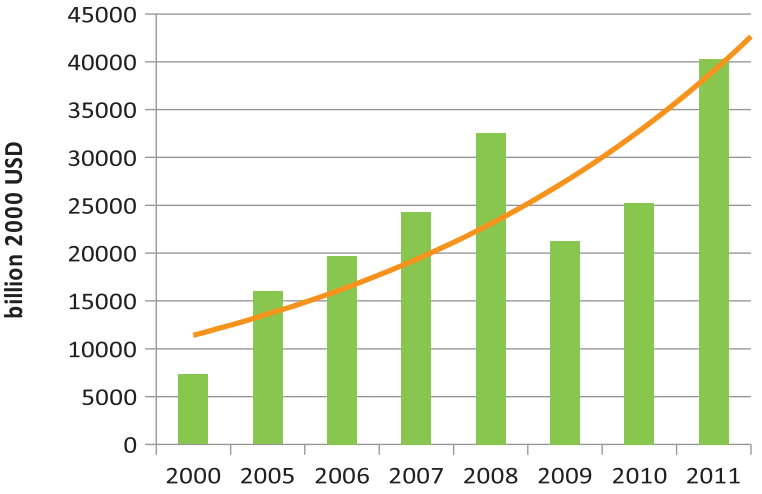


Source: Official web-site of the National Statistical Committee of the Republic of Belarus, 2012

In 2009, when the world economy experienced a very severe recession, Belarus' economy stayed afloat. In spite of the worsening conditions for the energy supply during the financial crisis and the contraction of the demand on external markets, the country managed to avoid a sharp deterioration in the living standards of the population, shutdowns and an increase in unemployment due to a shift in the consumption focus in the domestic market. The key areas of economic policy during the crisis included the attraction of external borrowings, boosting of internal demand, changes in the added value structure in economy sectors, significant growth of this indicator in the construction sector and intensive development of housing construction (Figure 3).

In 2011, Belarus faced new challenges that threatened the sustainable development of the national economy. These challenges coupled with the existing factors that were having a destabilising effect (the inefficient sectoral structure of production and heavy reliance on imports) resulted in currency market instability, the devaluation of the Belarusian Ruble and high inflation. However, in 2011 the economic growth was 5.3% (Figure 2). The volume of exports reached its maximum (Figure 5) mainly due to supplies of Belarusian goods (in the first instance, oil products) to EU countries. Exports to the EU more than doubled in 2011.

Figure 5: Export of Belarus' goods



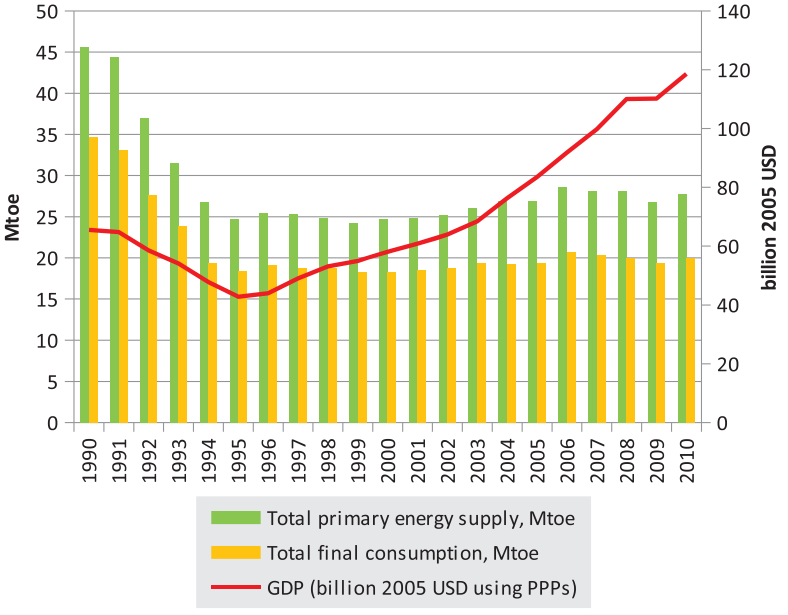
Source: National Statistical Committee of the Republic of Belarus, 2012

Energy Sector Data

Energy Consumption Trends

A significant growth in GDP by a factor of 2.4 from 1997–2010 did not have any material effect on energy consumption. The gross consumption of fuel and energy hardly changed at all (Figure 6).

Figure 6: GDP, primary and final energy consumption



Source: IEA Energy Statistics, electronic version, 2012

The energy intensity of GDP has reduced annually at an average rate of 4.3% (Table 2) and most significantly during 1997–2000, when GDP grew at an annual rate of 6.2% on average due to the implementation of state energy saving programmes aimed at actively using the potential of fast payback and no-cost energy saving measures in all sectors of the economy. From 1997–2010, in general, energy intensity significantly reduced annually at an average rate of 4.3% against the background of high annual GDP growth rates of 7.0% due to the fact that energy saving and energy efficiency were made the priorities of the state energy policy.

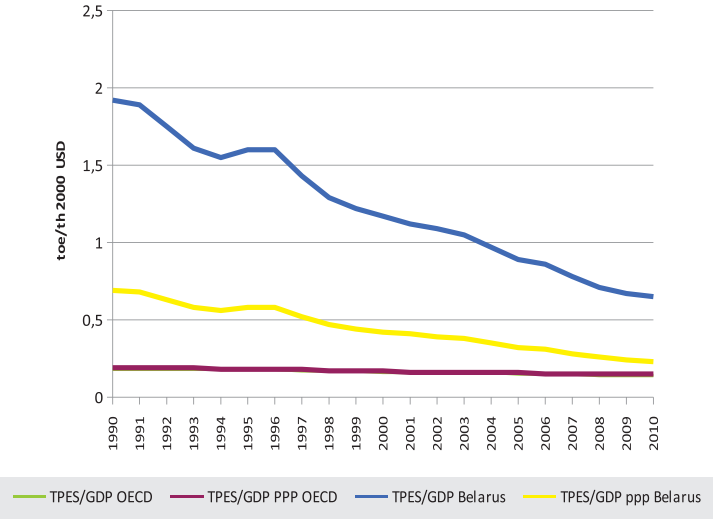
Table 2: Average annual reduction in the energy intensity of GDP and the growth of GDP in Belarus

% annually	1997 – 2000	2001 – 2005	2006 – 2010	1997 – 2010	2011–2015 (planned)
Energy intensity	- 6.3	-5.2	-5.8	-5.7	- 5.8…- 6.4
GDP	+ 6.2	+ 7.4	+ 7.3	+ 7.0	…..

Source: National Statistical Committee of the Republic of Belarus

In 2010, the energy intensity of Belarus' economy equalled 0.23 toe per thousand of 2005 USD (1990: 0.69 toe per thousand of 2005 USD PPP) and the gross consumption of fuel and energy was 27.58 Mtoe (1990: 44.13 Mtoe). Therefore, over two decades (1990–2010) the energy intensity of Belarus' GDP decreased 3 times and the gross consumption of fuel and energy resources decreased 1.6 times, while GDP increased more than 1.5 times. However, the energy intensity of the Belarusian economy is still higher than the average energy intensity of European OECD countries (Figure 7): 0.15 toe per thousand of 2005 USD PPP in 2010. This demonstrates the level of the fuel and energy saving potential of Belarus.

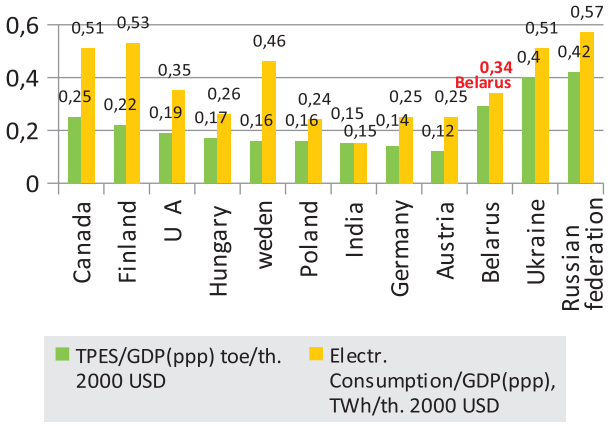
Figure 7: Energy intensity in Belarus and European OECD countries



Source: IEA Energy Statistics, electronic version, 2012

As compared to developed European economies with similar climatic conditions, the energy intensity of Belarus' GDP (PPP) still exceeds the indicators of these countries by a factor of 1.5–1.8, but is lower than in other post-Soviet countries (Figure 8).

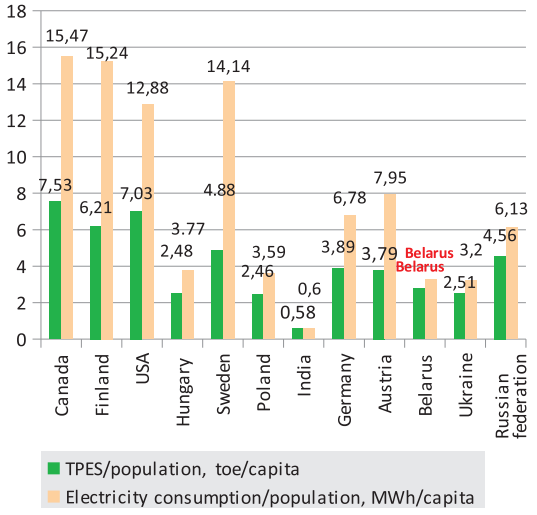
Figure 8: Energy intensity and electricity intensity of GDP (PPP) in RB and globally



Source: IEA Energy Statistics, electronic version, 2011

The level of per capita energy consumption in Belarus is comparable to that of EU countries with similar climatic conditions, but is considerably lower than that in the Russian Federation (Figure 9).

Figure 9: Per capita energy and electricity consumption in Belarus and globally



Source: IEA Energy Statistics, electronic version, 2011

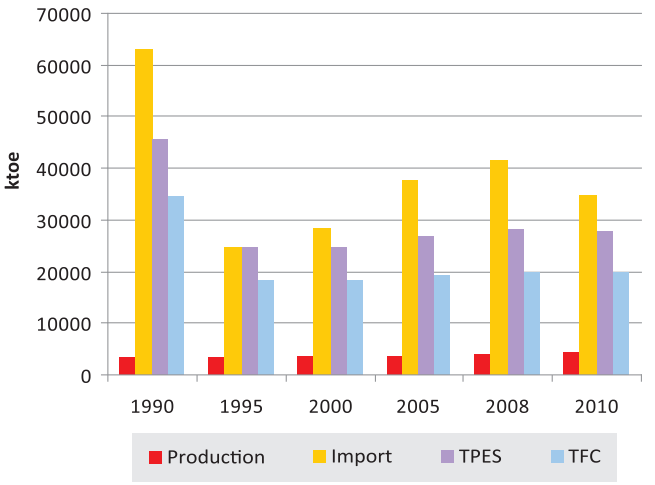
Energy Balances

Due to natural and geological conditions, RB cannot cover its demand for energy with domestic resources (small reserves of crude oil, biomass, mainly wood, peat, coal, associated gas and hydro energy). The country has to import fuel and energy (Figure 10), mainly from the Russian Federation. The share of the net import of total primary fuel and energy consumption is around 85%.

Only 8–10% of the country's demand for crude oil may be covered through domestic production. Belarus has a well-developed export oriented petrochemical industry, which produces high-class oil products. In 2010, crude oil imports totalled 14.7 Mt (89.6%) and local production amounted to 1.7 Mt (10.4%). The net export of oil products was 9.62 Mt.

Almost all (99%) natural gas is imported. In 2010, natural gas imports totalled 21.6 billion cubic metres (bcm), or 63% of the primary energy consumption in the country.

Figure 10: Energy balance of Belarus



Source: IEA Energy Statistics, electronic version, 2012

Belarus is a typical transit country. Due to the geographical location of Belarus its energy infrastructure is important for the energy security of Europe. Belarus is located between Western Europe, the Russian Federation and other post-Soviet countries and has developed an infrastructure for the transportation of oil and oil products and the transmission of electricity.

These factors determine the key principle of the state energy policy: providing for energy security through changes in the fuel and energy mix with the rational use of energy resources, maximising local fuels and RES use and introducing energy efficient and clean technologies in all sectors of the economy.

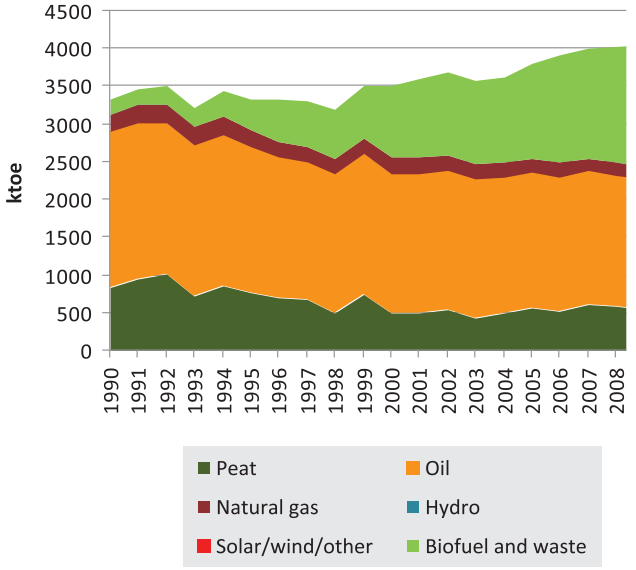
The changes in the structure and the level of domestic energy production in Belarus from 1990–2009 are presented in Figure 11. The percentage of domestic energy resources produced in the country (oil, associated gas, peat, fuel wood and other), taking into account secondary energy resources, in the total energy (boiler and furnace fuel mix) consumption for electricity and heat generation increased from 17.0% in 2005 to 20.7% in 2010 (Table 3).

The mineral resources of Belarus for energy use purposes include oil, petroleum gas, peat, lignite and shale. Belarus' oil and associated gas deposits are located in the eastern part of the Pripyat Trough. As of 2010, a total of 75 deposits have been discovered and explored; the largest include Rechitskoye, Ostashkovichskoye and Vishanskoye. Annual oil production amounts to 1.7-1.8 Mt.

Belarus has over 9,000 discovered peat deposits, which contain 4 billion tons (1.36 billion tce) of peat. The State Programme Peat for 2008–2010 and until 2020 determined the economically feasible annual level of peat consumption for fuel purposes and targets for peat fuel use. The related target indicators are as follows: 1.3 Mtce in 2015 and 1.4 Mtce in 2020. In 2010, the actual consumption of peat for fuel purposes totalled 0.8 Mtce. Commercial reserves of shale are concentrated in two deposits Liubanskoye and Turovskoye. 30% of these reserves have been preliminarily explored. The development of shale deposits is only possible through mining. Shale may be used for fuel purposes only after it has been thermally processed using a hard heating agent.

The explored reserves of lignite equal 160 Mt. Lignite is used in the form of peat-and-coal briquettes produced from lignite and peat. Currently, the occurrence of Lelchitskoye lignite is being explored and its forecasted reserves are estimated to be 250 Mt.

Figure 11: Energy production in Belarus



Source: IEA Energy Statistics, electronic version, 2012

Table 3: Trend in domestic energy sources and RES in the energy balance, 2005–2015

Year	2005	2006	2007	2008	2009	2010	2012 (forecast)	2015 (forecast)
Share, %	17.0	17.2	18.1	18.3	20.3	20.7	25	30

Source: National Programme of Local and Renewable Energy Sources Development for 2011–2015

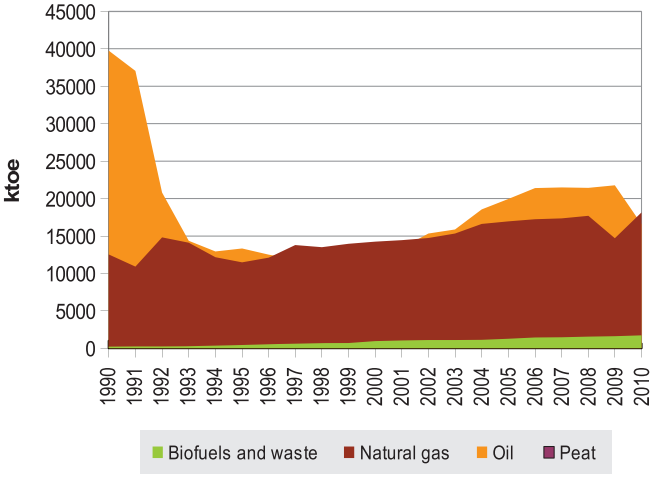
Forests, which cover almost 40% of the territory, play a key role in the natural resources of Belarus. Forests cover more than 9.4 million hectares and reserves of standing timber are estimated to be 1.5 bcm; the annual increase in timber exceeds 30.3 million cubic metres (mcm). The potential of wood fuel and industrial wood waste is estimated to be 11.65 mcm

(3.1 Mtce) per annum. The production of wood fuel resources by 2015 and 2020 is estimated to reach up to 2.81 Mtce (10.56 mcm) and 3.10 Mtce (11.65 mcm), respectively.

The potential of hydro energy in Belarus is estimated to be 2,270 million kWh (0.64 Mtce). In 2010, there were 41 operational hydro power plants (HPPs) in the country with a total capacity of 16.1 MW (about 3% of the technically feasible potential), which generated 48.6 million kWh of electricity annually.

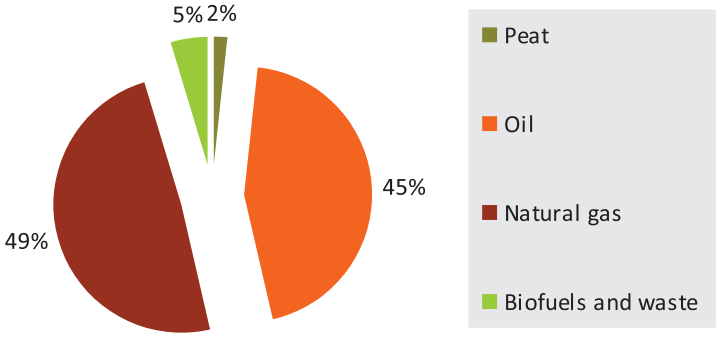
Crude oil is the main resource in the fuel and energy mix of Belarus and natural gas ranks second. Changes in the fuel and energy mix structure by primary energy type during 1990–

Figure 12: Structure of TPES by primary energy source



Source: IEA Energy Statistics, electronic version, 2012

Figure 13: Structure of TPES, 2010



Source: IEA Energy Statistics, electronic version, 2012

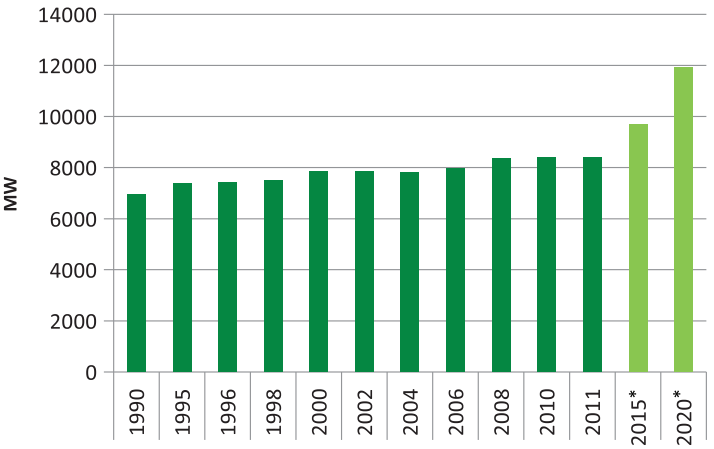
2009 may be illustrated by movements in their consumption (Figure 12). Figure 13 presents the structure of primary fuel and energy consumption in 2010.

Electricity and Heat Supply

As of 1 January 2012, the total installed electricity capacity in Belarus was 8,362 MW (Figure 14), including large condensation electric power plants (CPPs) (41.9%), large thermal power plants (TPPs), which combine the generation of electricity and heat (53.0 %), and small thermal (15 MW) and wind power plants (2 MW), which are responsible for the remainder of the installed capacity. The total installed capacity increased by approximately 1,420 MW from 1990–2011; it is planned that by 2020 the total installed capacity will reach 11,900 MW.

The major producer of almost all the electricity and about half of the heat is Belenergo SPA As of 1 January 2012, the total installed capacity of Belenergo power plants totalled 7,8957 MW (3,738 CPPs and 4,148 TPPs). In addition to the thermal power plants within the interconnected power grid, there are 22 small HPPs with a total installed capacity of 9.4 MW and one wind power plant with a capacity of 1.5 MW. The total installed capacity in industrial and other plants not belonging to Belenergy is 498 MW.

Figure 14: Total installed electricity capacity in Belarus



** planned*

Source: Ministry of Energy of the Republic of Belarus, 2012

In 2011, the level of electricity generation was only 32 billion kWh, including from sources of Belenergo SPA: 29.6 billion kWh (CPPs – 15.8 and TPPs - 13.8); HPP were responsible for 27.4 million kWh; wind power plants (WPPs) were responsible for 2.5 million kWh; and isolated generating plants (thermal power plants of other organisations) for 2.4 billion kWh. Tables 4 and 5 present the main figures for the Belarusian energy system, as well as the electricity generation capacities owned by Belenergo SPA.

Table 4: Main figures for the Belarusian energy system

Installed capacity of the power grid, MW	8 445.4
Electricity generation by sources of Belenergo SPA, billion kWh	29.66
Import of electricity, billion kWh	5.74
Export of electricity, billion kWh	0.15
Domestic electricity consumption, billion kWh	37.62
Heat production Belenergo, million Gcal	34.65
Unit consumption of fuel for supply of (Belenergo):	
electricity, gr.ce/kWh	264.3
heat, kg.ce/Gcal	167.8
Technological consumption of energy for energy transportation of Belenergo, %:	
In electricity grids	10.06
In heat supply networks	9.89
Length of electricity transmission lines, th. km:	
Total	238.96
35-750 kV aerial electricity transmission lines	35.76
0.4-10 kV aerial electricity transmission lines	203.20
Cable lines, th. km	31.92
Heat supply network, Belenergo, , th. km	5.9
Average staff number (organisations in the structure of Belenergy)	66497

Source: Web-site of Belenergo SPA, http://www.energo.by/okon/p21.htm, 2012

Table 5: Development of the electricity capacities of Belenergo SPA

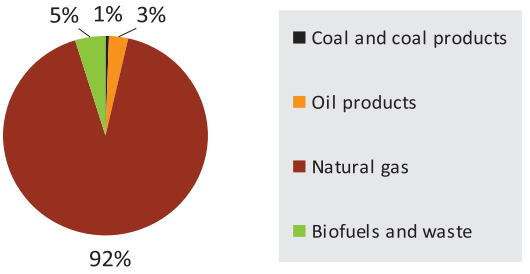
Power plants	Installed capacity, MW		
	As at the end of 2010	As at the end of 2011	As at the end of 2012 (plan)
Belenergo SPA (without local sources, other HPPs and wind power plants) – total	7812.4	7894.6	8364.6
HPP – total, including HPPs owned by Belenergo SPA	14.8 9.4	15.3 9.4	33.3 26.4
Local sources	446.7	461.8	574.1
Wind power plants	1.5	3.4	3.4

Source: National programme of energy system development up to 2016, 2012

The installed generation capacities, other than those owned by Belenergo SPA, provide 446.7 MW (2011).

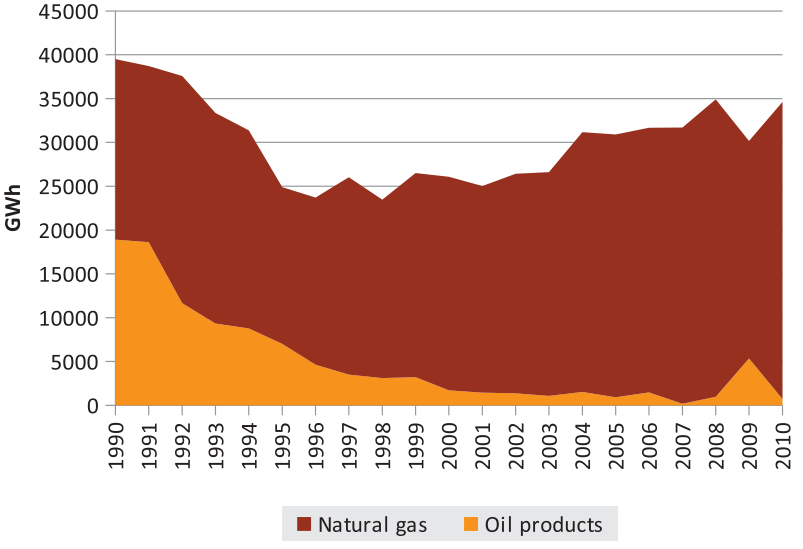
The structure of fuel consumption for electricity and heat generation in 2009 is presented in Figure 15. The share of natural gas is the largest. The structure of electricity generation by fuel and energy type is presented in Figure 16.

Figure 15: Fuel mix for electricity and heat generation, 2010



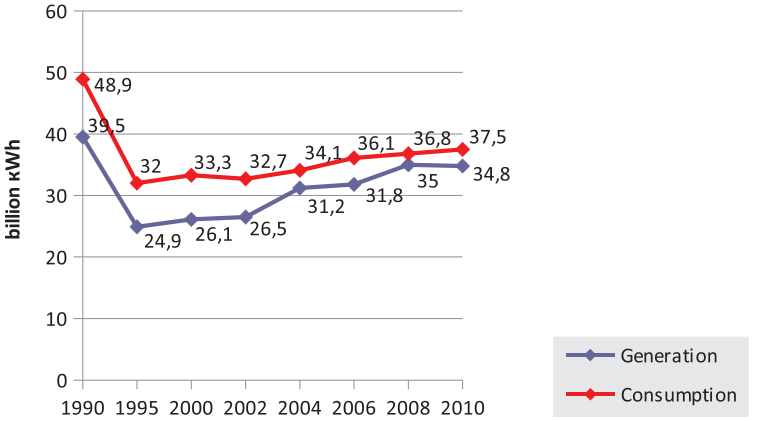
Source: IEA Energy Statistics, electronic version, 2012

Figure 16: Electricity generation by type of energy source, 2009



Source: IEA Energy Statistics, electronic version, 2012

Figure 17: Electricity generation and consumption trends



Sources: IEA Energy Statistics, electronic version, 2011;
Data of the Ministry of Energy of the Republic of Belarus: Results of activities in 2010 and objectives for 2011

The installed capacities of electricity generation in Belarus are sufficient for meeting domestic demand. A relatively small part of electricity is imported due to cost-effectiveness and energy security.

The high-voltage power grids of the Belarusian energy system are included in the larger high-voltage ring interconnection, which connects the grids of Baltic countries and Russia, and provide for connections with Russia, Lithuania, Ukraine and Poland. Balances have been developed for the electricity and gas supply within the Union State and EurAsEC.

In 2010, due to an increase in the domestic generation of electricity, imports decreased to approximately 2.97 billion kWh and equalled 66.3% of the 2009 level. Table 5 presents the energy balances of the Belarusian energy system in 2011 and four months of 2012.

Table 6: Energy balances

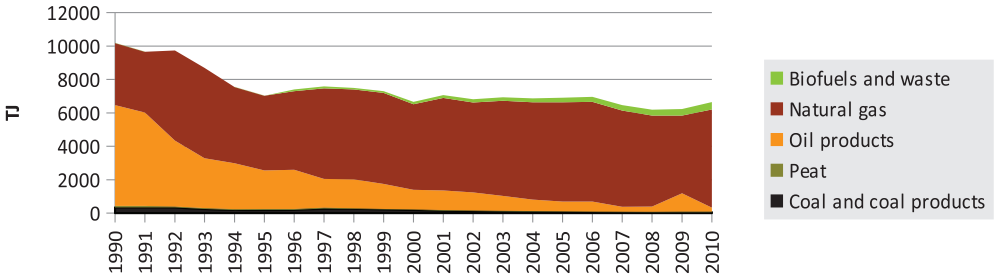
	2011, billion kWh	1 May 2012, billion kWh
Consumption	37.62	13.44
Generation	32.03	11.35
Balance	5.59	2.09
Import	5.74	2.19
Export	0.15	0.10

Source: Ministry of Energy of the Republic of Belarus, 2012

According to the State Programme of Energy System Development in Belarus until 2016 and taking into account the trends that existed for 1990–2010, the planned rates of GDP growth and the reduction in the energy intensity of GDP, the demand for electricity in 2015 will mean be 39.35 billion kWh; the peak load will be 6,850 MW and the required installed capacity 8,934 MW.

In 2011, the sale of heat from Belenergo SPA's sources totalled 34.7 million Gcal, which covered about 50% of the demand. The remainder of the demand was covered by heat supply systems owned by municipal utilities and industrial enterprises. About 50% of all the required heat is generated by CHPs and the remaining part by boiler houses. Belarus has well-developed heat supply systems, which provide heat to the industry and buildings sectors. The heat supply in large cities is centralised. The main fuel is natural gas and the shares of heavy fuel oil, biomass and waste heat resources are small. Movements in heat generation and the structure of fuel use are presented in Figure 18. Since the early 1990s, while the total consumption of resources for heat generation has reduced, the structure of heat generation by type of fuel has changed considerably. According to the Department of Energy Efficiency, in 1993 the share of natural gas was 62.2% and for oil products it was 34.2%, while biofuel and waste was virtually unused. However, in 2009 the share of natural gas increased up to 88%, the share of oil products decreased to 3.5% and the share of biofuel and waste consumption equalled 6.6%.

Figure 18: Heat output by energy source



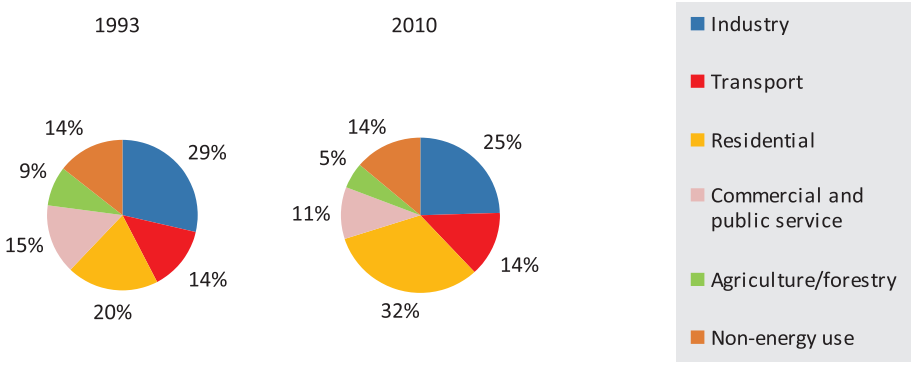
Source: IEA Energy Statistics, electronic version, 2012

The most important strategic infrastructures of the country are the gas and oil transportation systems. The gas transit network provides the gas supply in Belarus and the transit of natural gas to Europe. The annual throughput capacity of the gas transportation system is 63 bcm. The Belarusian oil transportation system provides a transit service for Russian oil and supplies crude oil to the refineries in the country. In 2009, a total of 79.6 Mt of oil was transported through Druzhba transmission oil pipelines across the territory of Belarus.

Energy Consumption Trends by Sector

From 1993–2010, the total final energy consumption (TFC) in Belarus reduced from 23.86 Mtoe/year to 19.93 Mtoe/year, or by 16.5 %. The efficiency of primary energy conversion is 72–73%. The structure of TFC by sector has changed too between 1993 and 2010 (Figure 19). The share of the residential sector in TFC increased by a factor of 1.55 up to 31% of the total. The next largest energy consumer is the industrial sector at 25% in 2010 (in 1993 it was 28%). The level of non-energy consumption is stable: 14% in 1993 and 2010. The share of the transport sector in final energy consumption has also virtually not changed — with 14% of the TFC in 1993 and 2010. The share of commercial and public services has reduced from 15% to 11% and agriculture and forestry has reduced from 9% to 5% of the annual TFC.

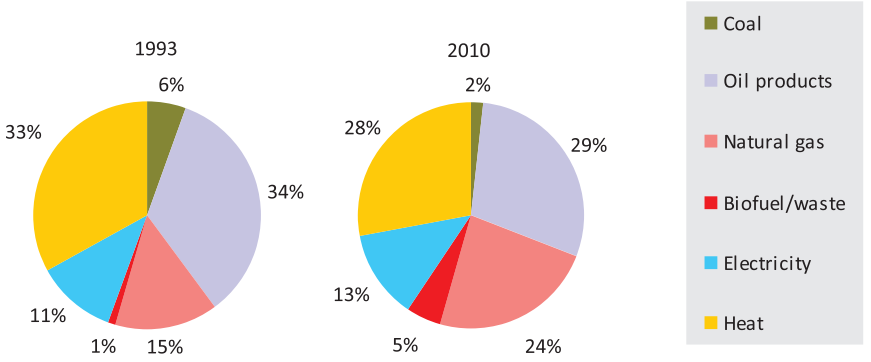
Figure 19: Structure of final energy consumption by sector



Source: IEA Energy Statistics, electronic version, 2012

From 1993–2010, positive changes took place in the structure of the TFC by sector (Figure 20). Historically, due to the significant production capacities of the refinery sector, the share of oil products in the TFC was the largest (28%) in 2010. The role of heat consumption was also significant (28%), due to heat consumption by the central heating and hot water supply systems and for the technological purposes of Belarusian enterprises. However, the share of oil products and heat in the TFC was considerably reduced by 6% as compared to in 1993. At the same time the share of natural gas in the TFC significantly increased from 15% in 1993 to 24% in 2010, or by 9%. The driving factors included the national GDP growth, connection of communities to gas supply and introduction of gas-fired co-generation plants. The share of electricity in TFC slightly increased from 11% to 13% and biofuel, peat and waste increased from1% in 1993 to 5% in 2010.

Figure 20: Structure of final energy consumption by energy source

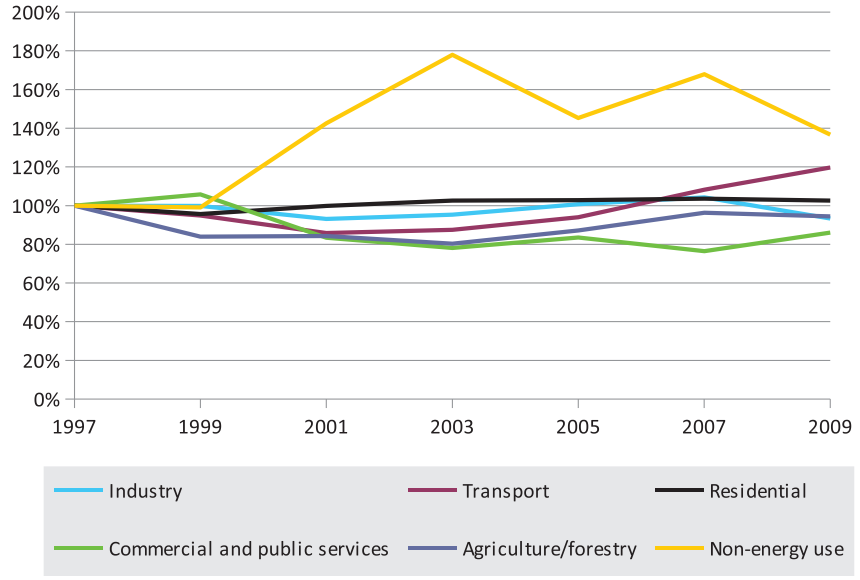


Source: IEA Energy Statistics, electronic version, 2012

With the background of a significant GDP growth and general reduction in the energy intensity of the economy (by more than a factor of two as compared to in 1997 — the year of stabilisation and the beginning of economic growth), the level of the TFC remained almost the same.

As compared to in 1997, the industry sector's TFC remained the same (Figure 21). From 2003 onwards, the level of end-use consumption by the residential sector increased insignificantly — at a rate of 2–3%. The reduction in TFC by the commercial and public services sector (14–23%) and agriculture and forestry (more than 5–19%) was considerable. These results were achieved due to a package of energy saving measures (administrative, economic and technical) in accordance with priorities set forth in the state energy saving programmes. Noticeably, the energy consumption increase for non-energy use was significant — by 40–70% (up to 80% in 2003) from the level of 1997, mainly due to the expansion of production activities of the refinery and chemical sector enterprises of the country.

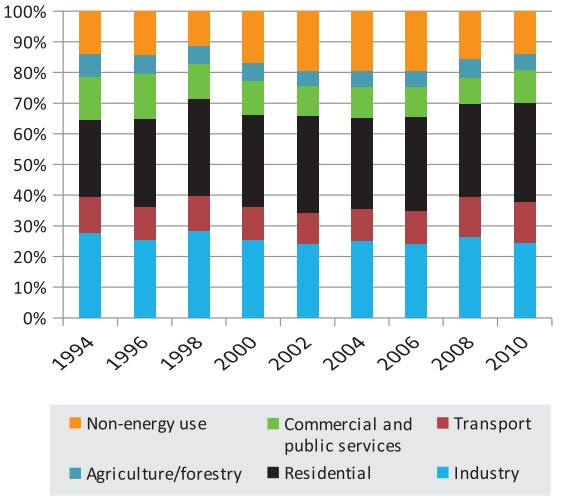
Figure 21: Final energy consumption by sector



Source: IEA Energy Statistics, electronic version, 2012

An analysis of movements in various economy sectors' contributions to TFC during 1994–2010 (Figure 22) demonstrates that in general the structure has not changed, which can be explained in terms of the relative stability of the national economy's sectoral structure. One may see a trend for an insignificant reduction in the industry sector's contribution to the TFC (25% in 2010 as compared to 27% in 1994). The share of the transport sector is still about 13%, while that of the residential sector has increased as compared to in 1994 (24%), and starting from 1995–1996 it has remained stable — 30% — and this is due more to intensive construction activities in the country. The share of non-energy use ranged from 11.8–20.5%. There is a stable trend for a reduction in the contribution of the commercial and public services sector (11% in 2010 as compared to 15% in 1994) and agriculture and forestry (5% in 2010 as compared to 8% in 1994) in the total final consumption.

Figure 22: Contribution of economy sectors in final energy consumption



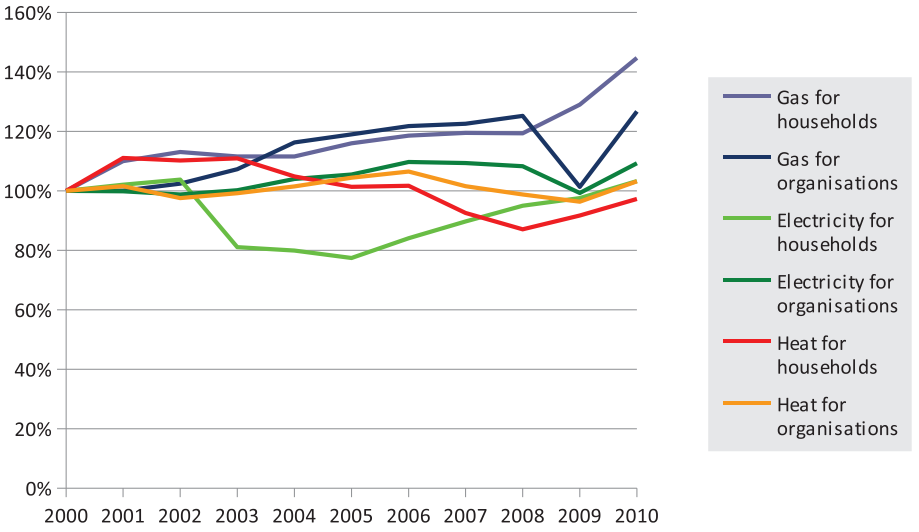
Source: IEA Energy Statistics, electronic version, 2012

Changes in the consumption of natural gas, electricity and heat by households and organisations/enterprises in Belarus over the last decade are presented in Figure 23. The level of heat consumption, with insignificant fluctuations (due to climatic conditions) in general, has remained unchanged. Electricity consumption by households practically returned to the previous level in 2010, after a reduction from 2003–2006; changes in the level of electricity consumption by organisations and enterprises were insignificant. The supply of natural gas steadily increased due to communities being connected to the gas supply system, in particular under the State Comprehensive Programme of Developing Regions, Small and Medium Cities for 2007–2010. By 2010, gas consumption by organisations and enterprises, as compared to the 2000 level, increased by almost 27%, and households by almost 45%.

In 2010, the sectoral structure of natural gas consumption (Figure 24) was as follows: a dominant contribution of 81% was made by industry and the second largest contribution was 8%, by households. The ratio of natural gas consumption by organisations and households remained virtually the same.

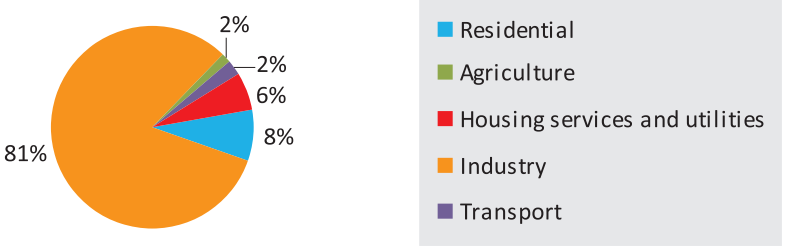
The main consumer of electricity is industry; the households sector is the second largest consumer. In 2010, their contribution was 61.1% and 16.6%, respectively (Figure 25).

Figure 23: Energy consumption by households, organisations and enterprises



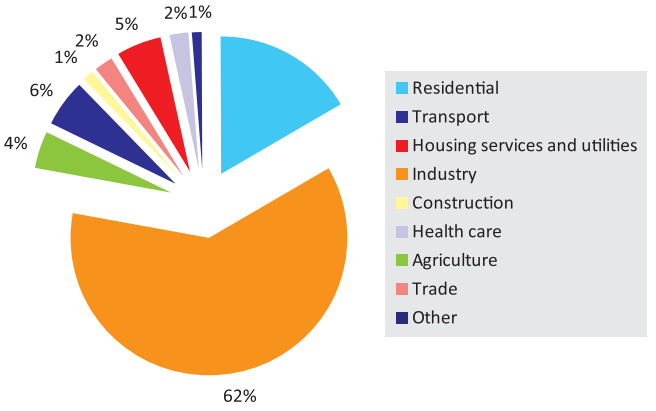
Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 24: Natural gas consumption by sector, 2010



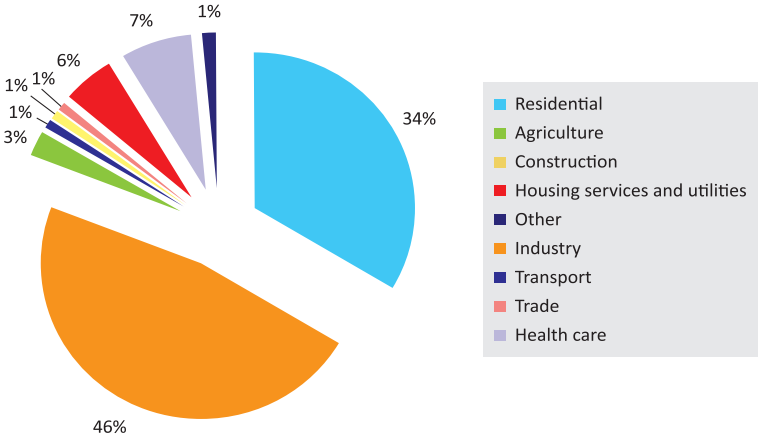
Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 25: Electricity consumption by sector, 2010



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 26: Heat consumption by sector, 2010

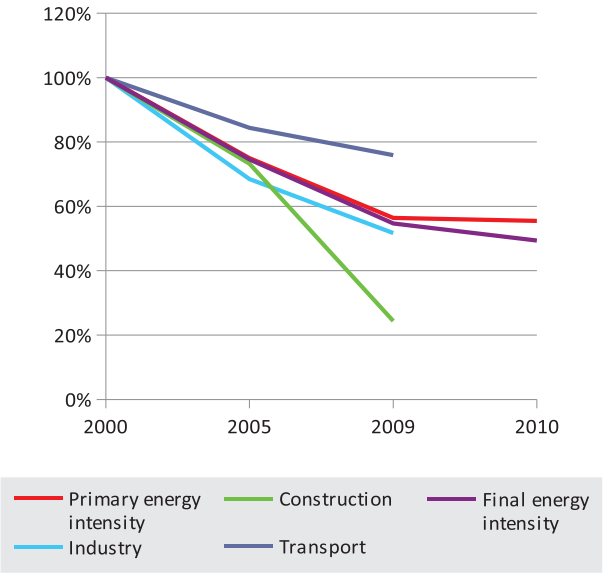


Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus

The main consumers of heat are industry and households. In 2010, these sectors' contribution in terms of the final consumption equalled 47.1% and 33.6%, respectively (Figure 26). The ratio of heat consumption by organisations, enterprises and households over the last decade has not changed significantly.

Positive changes in the energy intensity of the national economy in general and the industry, construction and transport sectors are presented in Figure 27.

Figure 27: Energy intensity of end-use consumption

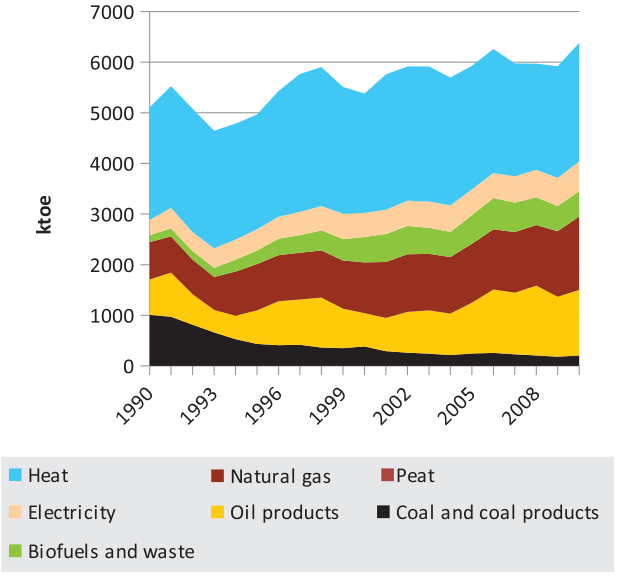


Sources: IEA Energy Statistics, electronic version, 2011;
National Statistical Committee of the Republic of Belarus, 'Belarus v Tsyfrakh', Statistical Yearbook, 2011

Energy Consumption in the Residential Sector

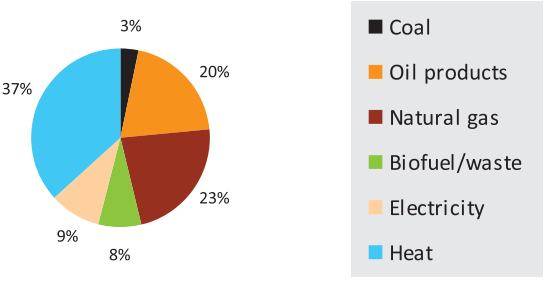
Currently, the major consumer of final energy is the residential sector, with a share exceeding 32% (Figure 22). The increase in final energy consumption by the residential sector is mainly due to active housing construction supported by the encouraging state policy. In addition, more efforts are being made to implement the thermal modernisation of existing housing and to construct new energy efficient buildings. Heat dominates with respect to energy consumption (Figure 28) due to the high level of development of district heating in the country. In 2010, the share of heat equalled 37% and natural gas and oil products amounted to 23% and 20%, respectively (Figure 29). One should note a significant increase in the level of biofuel use at 8%, which is very close to that of electricity at 9%. This trend is determined by the state energy policy aimed at the maximisation of the local fuel and RES use.

Figure 28: Final energy consumption in the residential sector



Source: IEA Energy Statistics, electronic version, 2012

Figure 29: Energy consumption in the residential sector by energy source, 2010

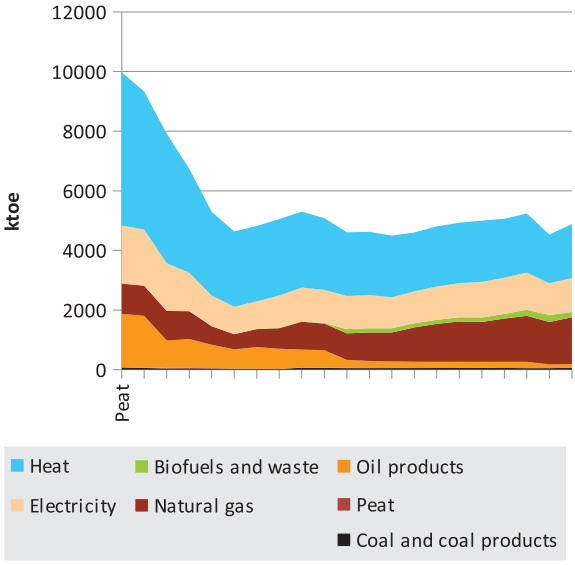


Source: IEA Energy Statistics, electronic version, 2012

Energy Consumption in the Industry Sector

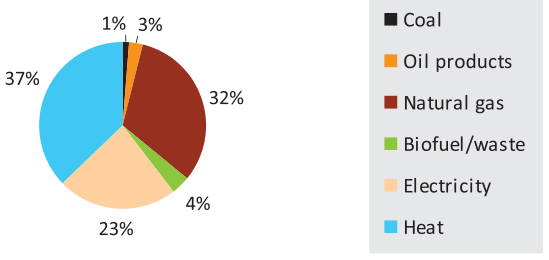
Since the early 1990s, the industry sector's contribution to the TFC has remained almost unchanged, and has even somewhat reduced due to an increase in the share of the contribution of residential, services and non-energy use sectors. The structure of energy consumption is dominated by heat, natural gas and electricity (Figure 30). In 2010, the share of these energy resources was 37%, 32% and 23%, respectively (Figure 31). The noticeable trends are as follows: a significant reduction in the share of oil products and an increasing use of biofuels, the share of which in 2010 was 4%.

Figure 30: Final energy consumption in the industry sector



Source: IEA Energy Statistics, electronic version, 2012

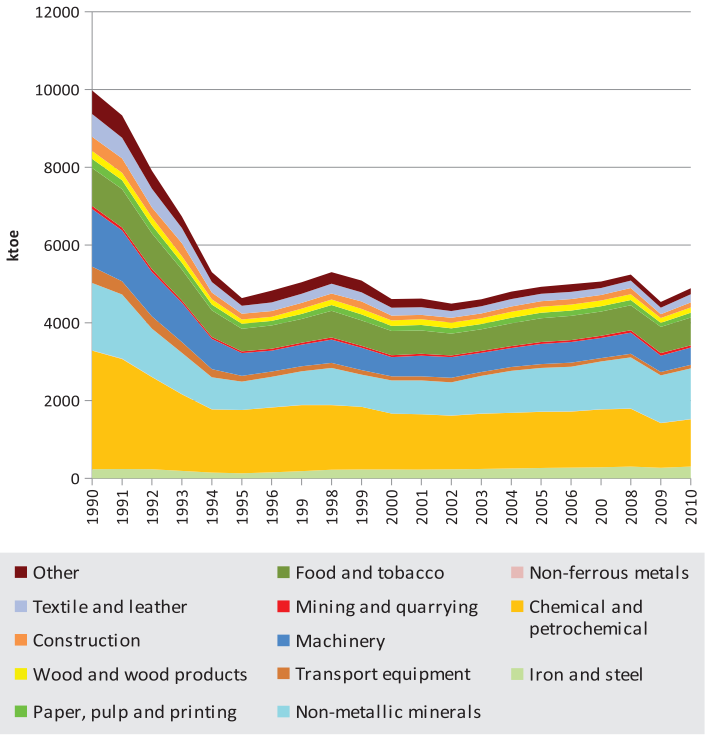
Figure 31: Energy consumption in the industry by energy source, 2020



Source: IEA Energy Statistics, electronic version, 2012

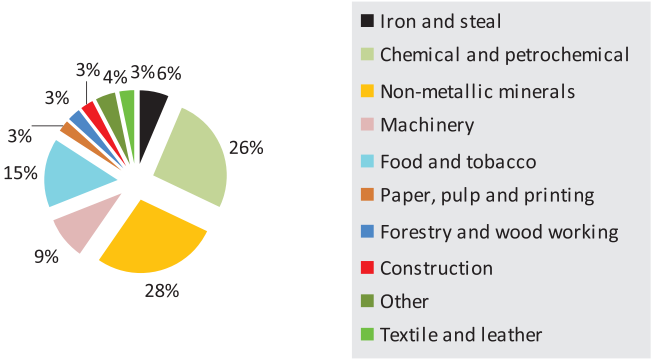
The structure of the final energy consumption by industry subsectors and changes in the structure since the early 1990s totally reflect the balance and changes in the development of the production capacities of the national economy (Figure 32). In 2010, the largest consumers were non-metallic minerals (potassium production) and the chemical and petrochemical subsectors, at 28% and 26%, respectively (Figure 33), followed by the food industry and machinery, at 15% and 19%, respectively.

Figure 32: Energy consumption in the industry by subsector



Source: IEA Energy Statistics, electronic version, 2012

Figure 33: Final energy consumption in the industry by subsector, 2010



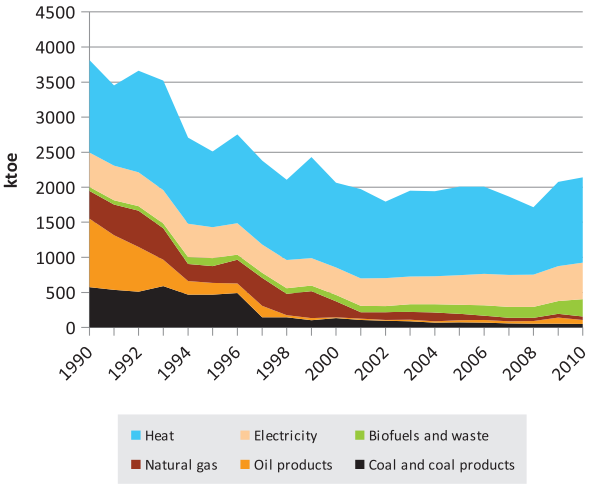
Source: IEA Energy Statistics, electronic version, 2012

Energy Consumption in the Services Sector

From the beginning of the 1990s until 2003 final energy consumption by the commercial and public services steadily decreased in spite of the growing amount and quality of the services. Since 2004, the level of consumption has become relatively stable (Figure 34). Oil products and

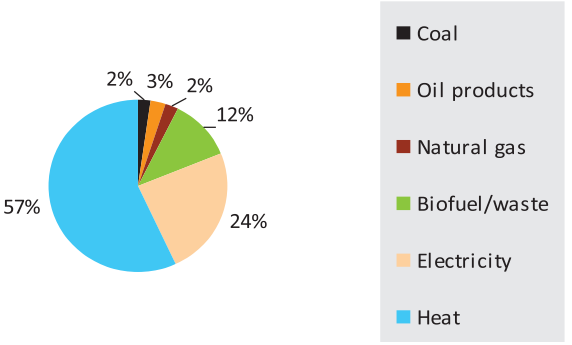
coal consumption are minimal in this sector and the share of biofuel is increasing and in 2010 it reached 12%. The main energy resources consumed are heat and electricity, at 57% and 24%, respectively (Figure 35).

Figure 34: Final energy consumption in the services sector, 1990–2010



Source: IEA Energy Statistics, electronic version, 2012

Figure 35: Energy consumption in the services sector by energy source, 2010

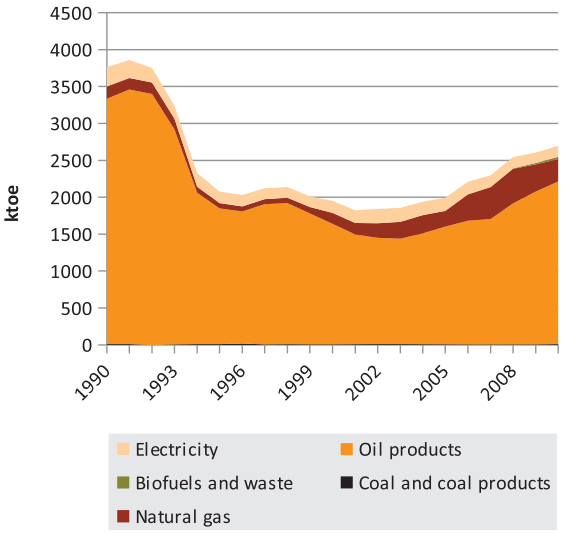


Source: IEA Energy Statistics, electronic version, 2012

Energy Consumption in the Transport Sector

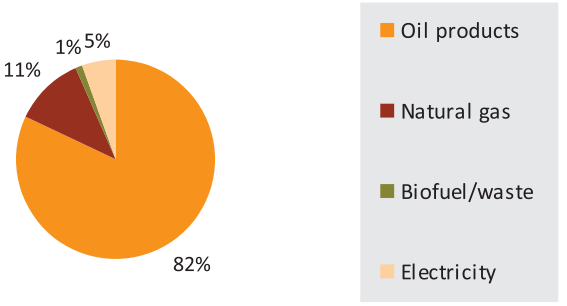
The structure of energy consumption in the transport sector is dominated by oil products. (Figure 36). As of 2008 biofuels are used in the transport sector; however, their share is still only 1%.

Figure 36: Final energy consumption in the transport sector, 1990–2010



Source: IEA Energy Statistics, electronic version, 2012

Figure 37: Energy consumption in transport sector by energy source, 2010



Source: IEA Energy Statistics, electronic version, 2012

ENERGY POLICY

Strategic and Regulatory Framework of the Energy Sector

The goal of Belarus' energy policy is to ensure a sustainable energy supply for consumers through improving the energy security of the country, maximising the efficient use of fuel and energy resources and the potential of the fuel and energy complex and reducing the dependence on energy resources imports in parallel with using the benefits of Belarus' geo-political position as a transit country for energy trade between Russia and the European Union. The main policy documents in the energy sector include the Concept of Energy Security of the Republic of Belarus, Directive No. 3 of the president of RB (dated 14 June 2007), Saving and Thrift are the Key Factors of Economic Security of the State and the Strategy of Energy Potential Development in the Republic of Belarus.

Concept of Energy Security of the Republic of Belarus (*approved by Decree of the President of RB dated 17 September 2007 No. 433*, hereinafter referred to as the Concept).

The Concept sets forth the long-term energy policy guidelines and 12 target indicators (energy intensity, rate of wear of energy systems' equipment, share of natural gas in boiler and furnace fuel usage, etc.), respective thresholds and target values. The key priorities include the following.

Diversification of fuel resources and energy resources suppliers in energy mix due to:

- reducing the use of natural gas as the primary fuel for electricity and heat generation;
- constructing a NPP with an installed capacity of about 2,000 MW, coal power plants, HPPs (Zapadnaya Dvina and Neman);
- promoting the use of local fuels (wood fuel, peat, lignite and shale), RES, biomass, small HPPs and biofuel.

Improving the energy efficiency of energy production:

- introducing new and the renovation of existing technologies and putting into operation energy efficient CHPs, as well as energy saving in the final consumption.

Improving the reliability of the Belarusian energy system:

- accelerating the renovation of existing power plants, transmission lines, distribution networks and energy systems in the supply sector;
- developing 330 kV electricity grids;
- introducing state-of-the-art automated monitoring and control within the supply systems;
- decentralising the electricity and heat supply systems through the deployment of small CHPs, which should be constructed at industrial enterprises and in small towns to ensure reliability and efficiency at the local level;
- developing interconnections with neighbouring countries' energy systems.

To ensure energy security and improve the reliability of the transit service the plan is to develop infrastructure and increase oil and oil products reserves. The Concept draws attention to the monitoring of compliance with the agreements and international treaties of Belarus.

Directive No. 3 of the President of RB (dated 14 June 2007) Saving and Thrift are the Key Factors of Economic Security of the State (hereinafter referred to as Directive No. 3), which determines and documents strategic areas of energy saving and energy efficiency and the use of RES and local fuels as the major energy policy components.

Strategy of Energy Potential Development in the Republic of Belarus (approved by Resolution of the Council of Ministers of RB dated 9 August 2010 No. 1180, hereinafter referred to as the Strategy) for 2011–2015 and the period until 2020 with the aim of determining further development and improving legal, organisational, economic, technical and technological conditions for the efficient use of the energy potential and improvement of energy security in the country. The main objective of the Strategy is the innovative and advanced development of the fuel and energy sector for the purposes of providing for the production of competitive goods to meet international standards in parallel with an absolutely reliable and efficient energy supply of all sectors of the economy and population. The key task for the near future if to establish an organisational framework for the efficient development and functioning of the energy sector under market conditions. The Strategy's goal is to achieve the indicators presented in Table 7.

Table 7: Target indicators of energy policy set forth by the Strategy, %

Indicator, %	2009	2015	2020
Reduction in energy intensity of GDP from the 2005 level	24.8	50.0	60.0
Share of domestic energy resources* in the energy balance	20.3	28-30	32-34
Share of natural gas in the energy balance	71.8	64.0	55.0
Depreciation of fixed assets of the fuel and energy sector organisations	54.3	48.3	43.0
Share of dominating provider of energy resources in the consumption of gross fuel and energy resources	82.3	70-71	64-57
Provision with reservoirs for storing boiler and furnace fuel reserves (for gas and heavy fuel oil), days	61.2	78.9	118.0

** With the products of domestic oil refining and secondary energy resources, associated gas and export of fuel briquettes.*

The goals set will be achieved through the following.

- State Programme of Energy System Development in Belarus until 2016 (approved by the Council of Minister of RB on 29 February 2012 Nr: 194);
- Resolution of the Council of Ministers of RB on Measures to Implement Directive No. 3 of the President of RB dated 14 June 2007;
- National Programme of Local and Renewable Energy Sources Development for 2011–2015;
- National Energy Saving Programme for 2011–2015;
- National Programme of Converting Boiler Houses into Mini-CHPs for 2007–2010;
- Programme of Constructing Biogas-Based Generation Facilities for 2010–2015 (approved by the Council of Minister of RB on 9 June 2010 Nr: 885);
- State Programme of Constructing Generation Facilities Using Local Fuels Sources for 2010–2015, etc.

The Strategy provides for the improvement of the energy sector regulatory framework. The following legislation is currently effective.

- Law of RB dated 15 July 1998 No. 190-3 on Energy Saving, a concept of the draft Law on Energy Saving has been prepared;
- Law of RB dated 4 January 2003 No. 176-3 On Gas Supply;
- Law of RB dated 30 July 2008 No. 426-3 On Use of Nuclear Power;
- Law of RB dated 27 December 2010 No. 204-3 On Renewable Energy Sources;
- A package of regulatory documents, including the Rules of Energy Supply, the Rules of Heat Use, etc.

For the purposes of the planned electricity sector reform, provision is made for the development and adoption of the saws of RB on Electricity and on Heat Supply, as well as the development and revision of existing regulations on the energy system functioning, which will establish a procedure of relationships between the electricity sector entities under new economic conditions.

RB participates in a number of energy-related international treaties (the Concept of Forming Electricity Markets in the Commonwealth of Independent States, the Agreement on Coordination of Interstate Relations in the Electric Power Industry of the CIS, the Agreement on the Parallel Operation of Power Systems of the CIS Member States, the Decision of the Interstate Council of EurAsEC On Fundamentals of Energy Policy of the EurAsEC Member States, the Agreement on Joint Development of Fuel and Energy Mix of the EurAsEC Member States, etc.). RB and the Russian Federation have signed the fuel and energy balance for the period until 2020. The power grid of Belarus is included in the interstate interconnection of the parallel operated power grids of other CIS member states. Belarus is interested in a staged association of its power grid with the power grids of neighbouring countries and in the implementation of road maps for the convergence of the market and ecological conditions of the EU and CIS.

Energy Sector Reform

Electricity sector

The electricity sector is a state monopoly and includes a hierarchy of vertically integrated enterprises. 'Belenergo' State Production Association of Power Industry (Belenergo SPA) operates the economic activity of the Belarusian power system. There are six power supply companies providing electricity to six regions (oblasts): Brestenergo, Vitebskenergo, Gomelenergo, Grodnoenergo, Minskenergo and Mogilevenergo. These companies are managed by Belenergo SPA.

Recently, the number of independent electricity producers has been increasing (mini-CHPs and small and mini-HPPs). The legislation of Belarus permits foreign investors to own newly built power plants. Foreign companies have expressed an interest in the construction of power plants, including CHPs and RES installations (small hydro and wind power plants, etc.). There are state support mechanisms for private and foreign investors. The legislation of Belarus guarantees the connection of independent electricity producers to the state power grid and the purchase of electricity generated by them. Special stimulating coefficients are applied to

purchase prices for electricity generated by independent electricity producers from RES, with the use of local fuel sources and energy efficient technologies.

Aiming to increase the energy efficiency and financial sustainability of the energy sector as well as to create attractive conditions for foreign investment, the Strategy for energy potential development provides for the step-by-step restructuring of management and economic activity in the electricity sector of Belarus. This will be achieved through the creation of generating, transmission and distribution enterprises and the establishment of a national electricity market; the state will keep the dispatch management and electricity transmission functions as well as providing for the general technical policy.

Natural gas supply sector

Beltopgas SPA conducts commercial activities. The gas supply system is a state monopoly and its development is planned on a centralised basis. One of major functions of Beltopgas SPA is the supply of gas, hard fuels and liquefied gas to economy entities and the population of the country. There are seven distribution companies in Belarus that supply gas to Minsk and six oblasts.

Heat supply sector

As a generating company, Belenergo SPA covers about 50% of the heating demand. The remaining part of the demand is covered by heat supply systems owned by utilities or industrial enterprises. The majority of consumers receive heat supplies from district heating systems. Local distribution companies owned by municipalities are unitary enterprises (RUEs). There are a number of local distribution networks owned by industrial or commercial companies.

Energy Pricing Policy

The Law On Pricing of 10 May 1999 No. 255-3 is a framework legislation, which determines sale prices (tariffs) for gas, electricity and heat in Belarus. According to Decree of the President of RB dated 25 February 2011 No. 72 On Certain Issues of Regulating Prices (Tariffs) in the Republic of Belarus the regulation is performed by the following.

- The Council of Ministers of RB – with respect to utility services for the population, including gas, electricity, heat and hot water supply (upon approval by the president of RB).
- The Ministry of Economy – with respect to legal entities and individual entrepreneurs: for electricity and heat supplied by the organisations of Belenergo SPA; for electricity generated from RES in Belarus by legal entities not incorporated in Belenergo SPA and individual entrepreneurs, and sold by the energy supply organisations of Belenergo SPA; for natural gas and liquefied gas; for the pipeline transportation of oil, oil products and gas; and for exported goods (according to lists established by the Council of Ministers of RB or the Ministry of Economy).
- The Belarusian State Concern for Oil and Chemistry – with respect to oil products (other than oil products sold by the CJSC Belarusian Oil Company according to the list established by the Council of Ministers of RB).
- Regional Executive Committees and Minsk City Executive Committee – with respect to heat (other than heat, which is subject to tariff regulation by the Council of Ministers of RB (upon approval by the president of RB) and the Ministry of Economy); heat and water

supply services provided to legal entities within the system of the Ministry of Housing and Utilities, and individuals (including individual entrepreneurs), who operate non-residential premises.

Currently, in accordance with the action plan determined by the Strategy, the government undertakes active measures to improve tariff policy through the following.

- Gradual optimisation of energy tariffs to include:
  - establishment of electricity tariffs differentiated by points of consumer connection to grids with further breakdown by voltage level
  - transfer to settlements with consumers based on electricity tariffs differentiated by day time
  - technically and economically feasible differentiation of heat tariffs depending on the technical parameters of the heat agent
  - provision for an optimal balance between the rates of the dual rate electricity tariff and between these rates and the flat rate tariff;
- Establishment of economic incentives for the use of energy efficiency technologies in production processes and energy resources saving by consumers;
- Establishment of electricity tariffs differentiated by type of activity (generation, transmission, distribution and sale);
- Phase-out of cross-subsidies in energy tariffs, to include household tariffs.

Electricity prices tariffs are differentiated according to groups of consumers: industrial consumers with a connected capacity of 750 kVA and more (dual rate tariff); industrial consumers with a connected capacity up to 750 kVA (flat rate tariff); transport customers; non-industrial consumers including budgetary organisations, hospitals, street lighting systems and households; and agriculture sector consumers and their production needs; heating and hot water supply and the economic needs of the energy system.

Time-differentiated household electricity tariffs were established (according to minimum and maximum loads, weekends and public holidays). Housing tenants, owners of housing, members of associations of home owners, the housing units of which are equipped with multi-tariff electronic meters for electricity or an automatic system for the commercial accounting of power consumption (ASCAPS), make payments for the electricity consumed, according to their choice, based on a flat rate tariff or differentiated tariffs.

The plan is to introduce differentiated electricity tariffs for households in 2012. According to these tariffs citizens will only be able to pay at reduced rates for part of the electricity consumed. Currently, all final consumers of electricity are equipped with meters (100% industrial consumers and households). An ASCAPS has been introduced at many industrial enterprises. There are pilot 'smart' buildings equipped with meters that can be read remotely. The majority of consumers pay electricity bills on time.

Gas prices for end consumers are based on import prices and transportation costs. All industrial consumers and the majority of households have been provided with natural gas meters.

Tariffs for heat sold by the enterprises of Belenergo SPA are differentiated according to groups of consumers and the parameters of the heating agent. Heat tariffs differ according to groups of consumers (households, budgetary organisations, hospitals, industrial enterprises, etc.) and regions. Tariffs for heat sold by enterprises in the Minsk Municipal Heat Supply Network are different for households and other consumers. Heat meters have been installed.

Electricity and heat tariffs for legal entities and individual entrepreneurs are linked to the US Dollar exchange rate. Effective from 1 March 2012, electricity tariffs for legal entities and individual entrepreneurs have been established as follows:

– for industrial and equated consumers with a connected capacity of 750 kVA and more – USD 11.4/kW (basic rate) and 10.6 Cents/kWh (additional charge);

– with a connected capacity below 750 kVA – 12.9 Cents/kWh;

– for heating and hot water supply during peak load periods and during other times of the day;

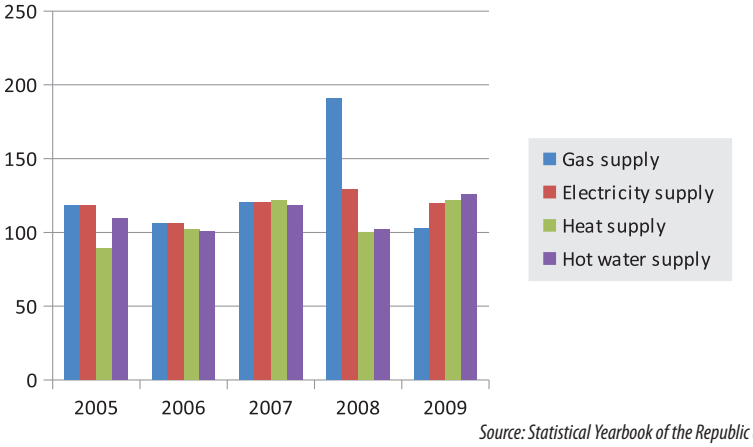
– 8.2 Cents/kWh and 45.9 Cents/kWh, respectively.

From 2006–2011, the cost of natural gas imported to Belarus increased by more than a factor of five; this caused an increase in energy prices and tariffs for consumers. In 2011, from January to September, on a year-to-year basis, prices for imported energy denominated in US Dollars increased by 17.4% on average, including for gas, by 36.5%, oil, by 10.2%, and oil products, by 9.3%.[3]

Following the increase in imported gas prices and changes in the economic environment during 2011, household tariffs for the supply of gas, electricity and heat have been repeatedly increased. Existing household tariffs are presented in Annex 4.

One of the shortcomings of the effective system of prices and tariffs for energy products to be addressed are cross-subsidies between individual groups of consumers (households and industry, in the first instance) and groups of energy resources and unjustified benefits and exemptions.

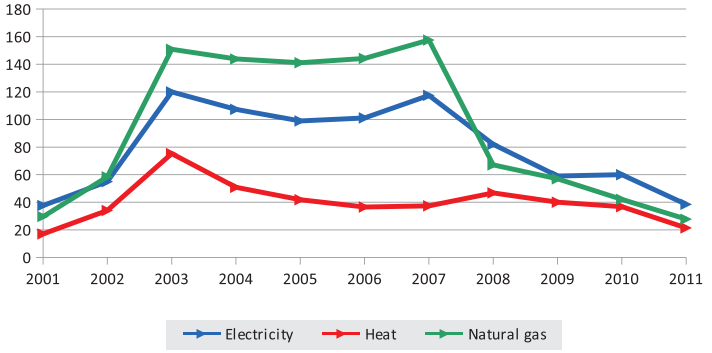
Figure 38: Indices of household energy supply prices (tariffs)



Source: Statistical Yearbook of the Republic of Belarus, 2010

[3] *Source: Main Trends in the Economy, Money and Credit Sphere in Belarus. Analytical Review, January-October, 2011, Minsk*

Figure 39: Cost recovery by tariffs for selected housing and utilities services for the population, %



Sources: Ministry of Economy PB; IMF, Republic of Belarus: Statistical Appendix

From 2010–2012, active measure were undertaken to address the problem of cross-subsidies. The Strategy sets out a gradual 100% elimination of cross-subsidies in tariffs for energy resources in Belarus. The plan is to phase out preferential prices (tariffs) for natural gas and energy for certain legal entities and individual entrepreneurs and provide for energy household tariffs, which would cover at least 60% of costs by 2015. The pass-through of losses related to the sale of heat to electricity tariffs will be terminated. The elimination of cross-subsidies for households will be carried out, taking into account the increase in the real incomes of the population, supported by targeted allowances to certain groups of citizens from national and local budgets.

Institutions

State regulation of activities in the sphere of energy, energy efficiency and renewable energy is implemented through decrees and directives authorised by the president of Belarus and resolutions by the government and the Ministry of Economy with active participation (through law-making activities at the National Assembly of RB) by ministries, departments and experts engaged in their preparation.

The Ministry of Energy of RB exercises state regulation of the electricity, gas and peat sectors and arranges the development of the main energy policy guidelines and their implementation, as well as proposals for improving the energy security of Belarus. For the purposes of developing the energy policy and strategy of Belarus, the Ministry of Energy arranges respective activities and engages scientists and qualified specialists in its institution — the Research and Design Republican Unitary Enterprise BelTEI — and respective institutes of the National Academy of Sciences of Belarus (NASB).

Belenergo SPA incorporates six republican (oblast) energy supplying companies (RUEs of Oblenergo), construction/installation/adjustment companies and other organisations. The main areas of Belenergo's activities include the operation of the Belarusian energy system, generation, transmission, distribution and sale of electricity and heat, operational dispatch management, maintenance of power plants, power and heat supply networks and organisation of activities for the purposes of energy system development (demand forecasting, investments, rehabilitation, construction, etc.).

Beltopgas SPA incorporates seven distribution companies (unitary state enterprises), which supply gas to Minsk and six regions of Belarus.

ENERGY EFFICIENCY POLICY

Strategic and Regulatory Framework

The main strategic documents that set forth the state policy on energy efficiency and energy saving are as follows.

- The Programme of Social and Economic Development of RB for 2011–2015 approved by Decree No. 136 of the President of RB, dated 11 April 2011;
- Directive No. 3,
- The Concept approved by Decree No. 433 of the President of RB, dated 17 September 2007;
- The Strategy approved by Resolution No. 1180 of the Council of Ministers of RB, dated 9 August 2010;
- The National Energy Saving Programme for 2011–2015 approved by Resolution No. 1882 of the Council of Ministers of RB, dated 24 December 2010;
- The National Programme of Local and Renewable Energy Sources Development for 2011–2015 approved by Resolution No. 586 of the Council of Ministers of RB, dated 10 May 2011, and other special programmes aimed at energy efficiency improvement, use of local fuels and RES.

The Programme of Social and Economic Development of RB for 2011–2015 sets forth the following key areas of energy security improvement: energy saving policy for and improvement of the energy efficiency of the economy, introduction of advanced energy efficiency technologies and promotion of alternative energy with the increasing use of local energy sources. The main indicators of the republic's social and economic development for 2011–2015 include a 29%–32% reduction in the energy intensity of GDP by 2015 from the 2010 level and a reduction of at least 50% from the 2005 level.

Directive No. 3 is of strategic importance for the intensification of efforts in the area of energy efficiency. It has provided the momentum for new energy saving programmes and measures and established specific objectives, assignments and responsibilities. The principal guidelines of the directive are as follows.

- Ensure the energy security and independence of the country
- Implement principal measures for the saving and thrifty use of fuel, energy and material resources in all spheres of production and in the housing and utilities sector
- Accelerate the technical retrofit and modernisation of production based on the introduction of energy and resources saving technologies and equipment
- Provide for the encouragement of fuel, energy and material resources saving
- Increase public awareness of the need for saving and thrift countrywide
- Set up a system of efficient control of the rational use of fuel, energy and material resources
- Improve the level of responsibility of top officials in governmental and other organisations for the inefficient use of energy and material resources and property.

The Concept establishes 12 indicators, including the energy intensity of GDP using PPP. The Concept sets forth the followings objectives.

- 2016 2020 – at least 5.2 Mtce. Reduction in the energy intensity of GDP: 31% in 2010, 50% in 2015 and 60% in 2020, from the 2005 level;
- provide for an overall increase in fuel and energy saving (under comparable conditions) in 2006 2010 of at least 7.55 Mtce and from 2011 2015 of at least 7.0 Mtce.

The plan is to achieve these objectives through the implementation of energy saving measures and to include the improvement of the economy's sectoral structure, introduction of advanced energy efficient technologies and equipment, improvement of economic and organisational mechanisms for encouraging energy saving, introduction of a system of monitoring and controlling energy consumption, energy audits in organisations and industries, improvement of energy efficiency by means of standardisation and expansion of scientific research.

The Strategy was developed for the period of 2011–2015 and until 2020. The Strategy specifies the parameters and mechanisms of the medium-term development in connection with new economic conditions, while keeping the long-term guidelines of the energy policy established in the Concept and Directive No. 3 unchanged. The Strategy is aimed at achieving the following indicators:

- 50% reduction in the energy intensity of GDP (from the 2005 level) by 2015 and 60% by 2020;
- up to 28–30% increase in the share of domestic energy resources in the boiler and furnace fuel mix in 2015 and up to 32–34% in 2020.

The Strategy determines the need to develop and adopt a number of laws of RB, including a new Law on Energy Saving, the Law on Electricity, the Law on State Regulation of Tariffs for Electricity and Heat and the Law on Heat Supply. In accordance with the Strategy, the key instrument of energy saving policy implementation is the development and fulfilment of the state targeted programmes. The regulatory framework of Belarus includes over 30 legislative instruments, which regulate public relations in the area of energy saving, including the international treaties of Belarus related to the implementation of the energy saving policy in the country (Annex 3). Currently, the Concept of a new RB draft Law on Energy Saving has been developed.

The structure of a regulatory framework for energy efficiency is presented in Figure 40.

Figure 40: Regulatory framework for energy efficiency and energy saving

<table>
<tr><td>Laws of RB
• On Energy Saving
• Administrative Offence Code
On Renewable Energy</td><td colspan="2">Decrees of the President of RB
On approval of:
The Concept</td><td>Directives of the President of RB
• Directive No. 3</td></tr>
<tr><td colspan="2">Resolutions of the Council of Ministers of RB
On approval of
• The Strategy of the Energy Potential Development in RB, No. 1180
• Concept of Construction Complex Development for 2010–2020, No. 1589
• Comprehensive Programme of Design, Construction and Refurbishment of Energy Efficient Residential Buildings in RB for 2009–2010 and until 2020, No. 706, etc.
• National Programme for Energy Saving 2011–2015
• National Programme for Development of the Belarus Energy System until 2016</td><td colspan="2">Other regulations
• Instruction on the calculation of targeted energy saving indicators
• Regulation of the procedure of development and approval of national, sectoral and regional energy saving programmes
• Instruction on the assessment of the efficient use of funds designated for energy saving measures
• Regulation on the procedure for conducting a state expert review of the energy efficiency of designs in RB
• Methodical recommendations on the preparation of feasibility studies for energy saving measures, etc.</td></tr>
</table>

Technical Norms and Standards

One of the priorities of Belarus' policy in the area of energy efficiency and renewable energy is to develop technical norms and standards.

From 2007–2010, within the framework of the Programme for Developing the System for Technical Regulation, Standardization and Conformity Attestation in the Field of Energy Saving a total of 129 technical regulations were developed. Over 80 of them were harmonised with international and European requirements.

Within the framework of implementing Directive No. 3, the State Committee for Standardization of RB prepared a list of state standards in the area of energy efficiency, which establishes the requirements for energy efficient equipment. The standards are part of a regulatory framework for the system of energy saving management. The major part of the system is the establishment of energy efficiency indicators (ratings) of energy consuming products.

Standard STB 1312-2002,'Energy Saving: Informing Consumers on Energy Efficiency of Household Electrical Appliances. General Requirements', established the requirements for consumer information on the energy efficiency indicators of household electrical appliances. The standard includes a recommended list of household electrical appliances subject to the recommended certification of energy efficiency ratings: refrigerators, automatic washers with water heaters, stoves and ovens, air-conditioners, accumulation heaters, washer/dryers, dish washers, microwave ovens, electrical lamps and gas-electric appliances.

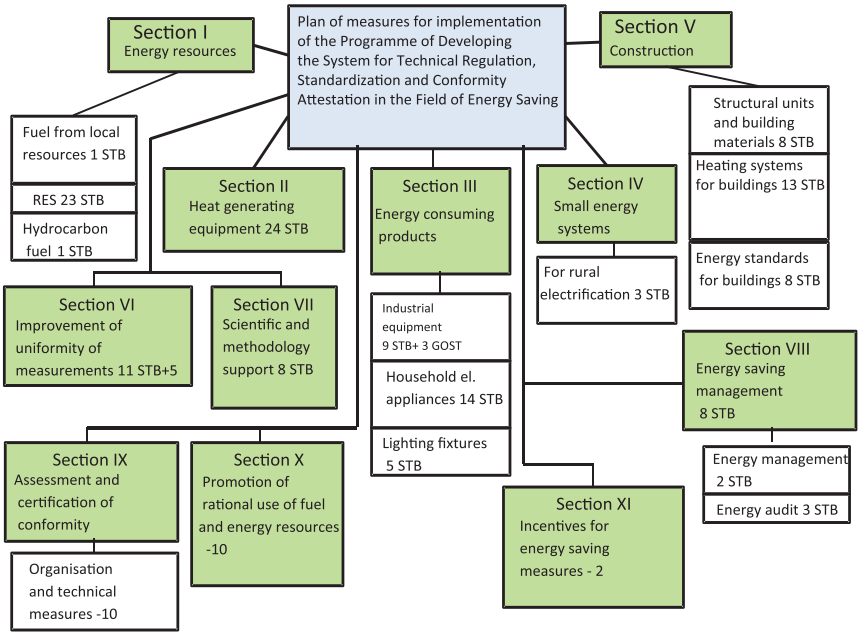
Certain limitations with respect to the energy efficiency level have been introduced on the supply of household electrical appliances to the Belarusian market. Thus, for washers, only automatic electrical washing machines of the energy classes A, B and C for household use and electrical refrigerators of the energy classes A++, A+, A and B for household use are allowed.

The Technical Regulation of the Customs Union on Informing Consumers on Energy Efficiency of Electrical Energy Consuming Appliances is being developed. This regulation will establish common requirements for Russia, Belarus and Kazakhstan with respect to energy efficiency for

the main product range of household electrical appliances. It is expected that the regulation will be harmonised with the respective EU regulations.

Currently, Belarus is implementing the Programme of Developing the System for Technical Regulation, Standardization and Conformity Attestation in the Field of Energy Saving for 2011–2015 (Figure 41), which provides for harmonisation with European and international standards. It includes the development of 136 state standards, to include 123 standards (88%) based on European and international standards and the implementation of 27 measures. It is planned to design new and revisit existing standards in the construction sector aimed at improving the energy efficiency of buildings and heat generating equipment. Special standards will be established, which are intended to introduce RES, local and alternative fuels and to develop the energy management and energy auditing of organisations.

Figure 41:Structure of the Programme of Developing the System for Technical Regulation, Standardization and Conformity Attestation in the Field of Energy Saving for 2011–2015



Energy Efficiency Measures

National Energy Saving Programmes

The strategy in the area of energy efficiency and energy saving in Belarus is implemented through national programmes, which establish a framework for the development of regional and sectoral programmes, as well as programmes for individual enterprises and organisations. From 1996 to 2010, three national energy saving programmes were successfully implemented. The fourth national programme is in the process of implementation at the present time.

The main results of the first National Energy Saving Programme for 1996-2000 included the development of the legislative and regulatory framework, institutional infrastructure, systems of energy saving management and of state support and economic mechanisms (concessional lending, tax concessions, subsidies and allowances for energy saving measures, innovation funds of ministries and departments, the Energy Saving National Fund, etc.) and system of continuous education in the area of energy saving, from kindergartens and the education of the population to the introduction of special training courses at higher educational institutions and of a new specialty in technical universities — 'Energy Efficient Technologies and Energy Management'.

The National Energy Saving Programme for 2001–2005 set forth the objective of providing for GDP growth without increasing the fuel and energy consumption. Actually, by the end of 2005, the GDP had increased by 42.5% from the 2000 level, while the total energy consumption had increased by only 6.5%. The level of fuel and energy saving for the period totalled 10.5 Mtce and energy intensity of GDP was reduced by 25.1%. The programme provided for the introduction of energy efficient technologies, main and auxiliary energy saving equipment, efficient heat exchangers and regulated electrical drives, establishment of automated regulation of fuel and energy consumption, transfer of loads from small boiler houses to CHPs, replacement of inefficient boilers and other equipment with more efficient ones, transfer of boilers to using local fuels and combustible production wastes, etc.

The Third National Energy Saving Programme for 2006–2010 included a package of measures aimed at improving energy supply security and reducing dependence on energy imports in connection with rising prices for imported oil and gas. Efforts were made to improve the efficiency of generation sources using conventional fuels, develop unconventional energy sources and RES, reduce losses in the transmission and distribution of energy, use secondary thermal energy resources, improve energy efficiency in the industry, construction, agriculture and public sectors, reduce energy costs in the housing and utilities sector, develop the economic motivation of producers and consumers of energy resources to improve energy efficiency, develop new energy efficient and import-substituting technologies, equipment and materials and implement international projects and agreements in the area of energy saving. The programme's implementation provided for a 25.3% reduction in the energy intensity of GDP from the 2005 level and the level of saving was about 7.8 Mtce.

The National Energy Saving Programme for 2011-2015 has a goal of 50% reduction in the energy intensity of GDP from the 2005 level by 2015. The plan is to improve energy efficiency through the implementation of state-of-the-art energy efficient technologies in all sectors of the national economy and individual technical processes. In the electricity sector it is planned to introduce gas-vapour, gas turbine and gas piston technologies with efficiency factors of at least 57%. At Belenergo SPA the decrease in the unit consumption of fuel for electricity generation

will be at least 10% by 2015. In the industry sector the focus will be on the modernisation of foundry engineering and thermal and electroplating processes based on automated furnaces with efficiency factors of at least 50%. In the housing and utilities sector the plan is to refurbish boiler houses, construct mini-CHPs using local fuels, modernise heating networks, introduce energy efficient lighting and construct biogas installations at sewage treatment plants. The plan is also to significantly improve energy efficiency in the construction sector. Thus, the share of energy efficient residential buildings constructed in the country will reach 60% in five years. In addition, the plan is that the modernisation of technological processes intended to reduce energy consumption will be implemented at enterprises producing building materials. An important source of GDP energy intensity reduction will be compliance with the requirements of technical regulations for the rational use of fuel and energy.

A target energy saving indicator (a relative change in the aggregated energy costs during a reporting period from the base line period) is established annually for organisations, republican governmental bodies, other governmental organisations subordinate to the Belarusian Government, oblasts' and Minsk's executive committees and administrative-territorial entities of oblasts.

Table 8 presents the results of implementing energy efficiency and energy saving programmes and indicators in RB from 2001–2010 and the objectives for 2011–2015.

Energy Generation Sector

Table 8: Results and objectives for energy saving and energy efficiency in Belarus

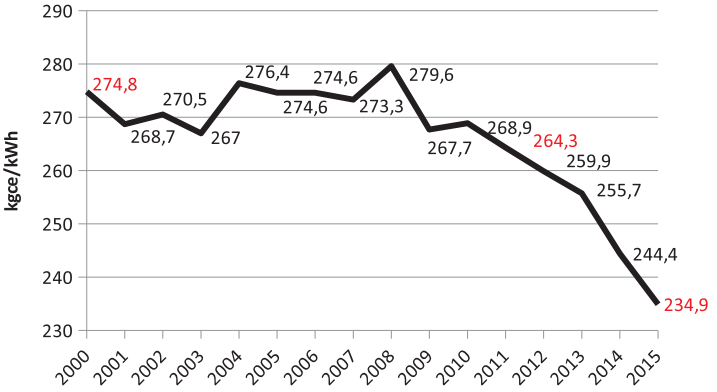
Results				Objectives, including for 2012	
	Period	Objective	Actual	2011-2015	Objective
Reduction in energy intensity GDP, %	2001-2005 2006-2010	20-25 26-30.4	25.1 25.3	29-32	3-4
GDP, %	2001-2005 2006-2010	135-140 146-155	143.4 141.9	162-168	105-105.5
Percentage of local fuels in boiler and furnace fuel mix, %	2001-2005 2006-2010	20.5	20.7	30	25
Saving of fuel and energy, Mtce	2001-2005 2006-2010	5.53-7.17 7.55	6.1 7.77	7.1-8.9	1.42-1.65

Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

In the process of implementing the State Comprehensive Programme of Modernization of Fixed Production Assets of the Belarusian Energy System, much has been achieved to improve the efficiency and reliability of energy supplies to Belarusian consumers. A total of 747 MW electricity capacities, including 450 MW of Belenergo SPA, have been put into operation. To provide for power output by newly commissioned energy sources and to improve the reliability of energy supplies to consumers, Belenergo SPA has fulfilled the expectations for the required scope of works to construct and refurbish 14,840 km of power grids and 865 km of heat transmission networks. The level of fuel and energy saving at Belenergo SPA totalled 1,575 ktce and the depreciation of fixed assets decreased from 60.7% as of 1 January 2005 to 48% as of 1 January 2011.

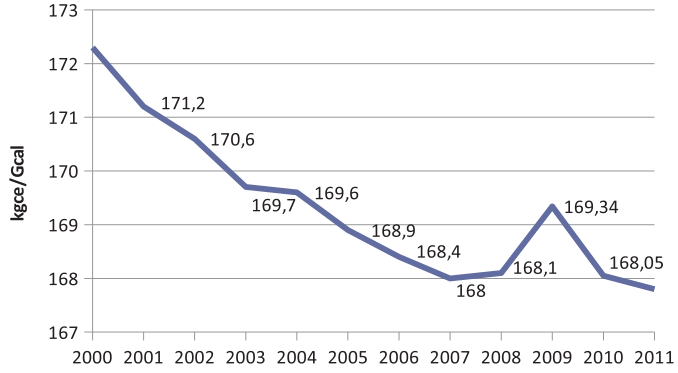
From 2005–2011, the unit consumption of fuel for the purposes of electricity and heat delivery into the Belarusian energy system reduced by 10.3 gr.ce/kWh and 1.1 kg.ce/Gcal, respectively (figures 42 and 43), due to the implementation of major energy efficiency projects on the deployment of highly efficient gas-vapour power units and co-generation plants: 230 MW at Minsk CHP-3, 12 MW at Brest CHP, 26 MW at Zhlobin mini-CHP, 2.7 MW at Pruzhany mini-CHP, etc. The share of electricity generated by CHPs is 39%. The plan is to reduce the fuel unit consumption for electricity generation by 2015 (under conditions comparable to those in 2010) by 25–30 gr.ce/kWh.

Figure 42: Changes in unit consumption of fuel for the delivery of electricity into the Belarusian energy system, 2005–2011, kg.ce/kWh



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

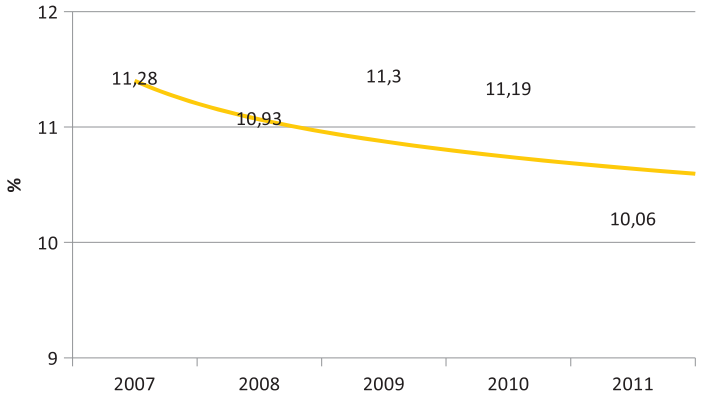
Figure 43: Unit costs of heat delivery Tinto the Belarusian energy system, 2005–2011, kg.ce/Gcal



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Consistent efforts are being made to reduce losses in the power and heat supply networks of the Belarusian energy system. The current losses of electricity in the power grids equal 10%, which includes 2% commercial losses. The reported losses of electricity during 2007–2011 are presented in Figure 52.

Figure 44: Reported electricity losses in the grids of the Belarusian energy system, 2007–2011, %



Source: Ministry of Energy of the Republic of Belarus

For the period until 2016, the plan is to reduce the costs of the transmission and distribution of electricity through the construction and modernisation of power grid facilities and a 2% reduction in electricity losses in grids (under conditions comparable to those in 2010). The planned modernisation of heat supply networks will provide for a 2% reduction in the technological consumption of heat for heat delivery through transmission and distribution networks (under conditions comparable to those in 2010).

Cogeneration

The introduction of co-generation sources is an important area of state energy policy in Belarus. The republic is committed to developing an energy generation sector based on state-of-the-art co-generation technologies, including large power plants within the energy system, as well as small and mini-power plants, in particular by using local fuels and RES.

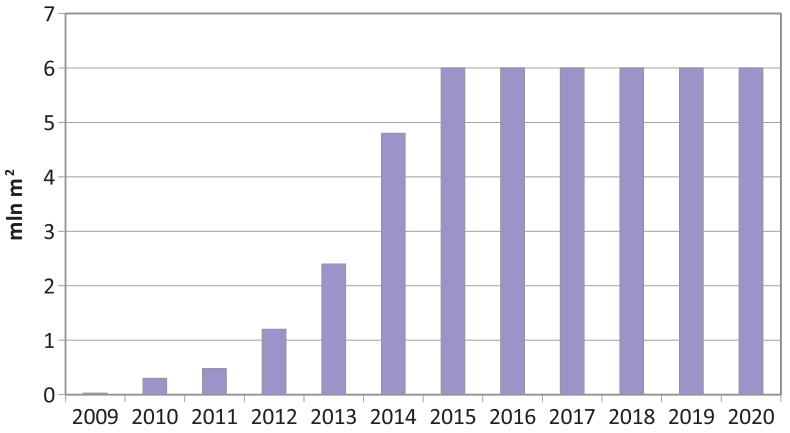
The State Programme of Construction of Generation Facilities Using Local Fuels Sources for 2010–2015 provides for the construction of energy sources to increase the share of the co-generation of heat and electricity with the use of local fuels. The implementation of the programme will make it possible to put into operation 161 energy sources based on local fuels with a total electricity capacity of 39.45–47.45 MW and a thermal capacity of 1,025.7 MW. The resulting saving (substitution by local fuels) of imported fuel and energy will exceed 486 ktce.

Residential Sector

Belarus has established the state system of technical regulations and standards in construction. Thermal energy passports for buildings have been introduced, and are included in the package of design and certification/acceptance documents. Energy efficiency classification of buildings has been introduced.

Belarus has implemented the Comprehensive Programme of Design, Construction and Refurbishment of Energy Efficient Residential Buildings in the Republic of Belarus for 2009–2010 and until 2020 and has commenced the construction of energy efficient buildings throughout the country. In 2009, the total floor area of energy efficient housing reached 28 th. m^2, and 300 th. m^2 in 2010 and 476 th. m^2 in 2011. In 2012, the plan is to construct 1.2 million m^2 of energy efficient housing (Figure 45). The Concept of the Construction Sector Development in Belarus for 2011–2020 allows for an increase in this indicator of up to 6 million m^2 by 2015 (about 60% of the total floor area of constructed buildings). By 2020 100% of housing constructed in the country will be energy efficient.

Figure 45: Results and objectives for the construction of energy efficient residential buildings



Source: Republican Unitary Enterprise 'Institute NIPTIS named after S.S. Ataev', 2012

Examples of energy efficient buildings constructed in various cities in Belarus are presented in Annex 5. The transition to mass-scale construction of energy efficient residential buildings will provide annual energy savings of 18,48 tce for a 1000 m^2 rehabilitated area.

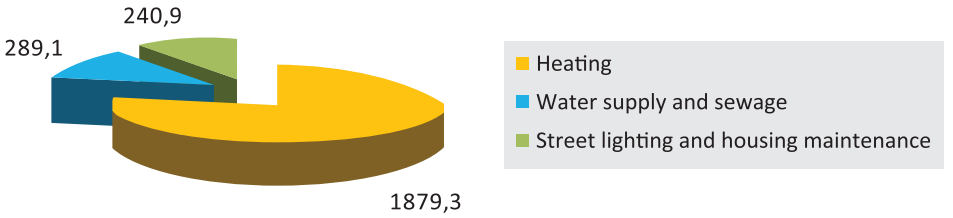
The thermal rehabilitation and modernisation of residential buildings has been recognised as the key area of energy saving in Belarus and since the early 2000s the respective measures have been implemented. The government has implemented and financed thermal rehabilitation measures for residential buildings. Annually, 450 th. m^2 are modernised, including under the regions' and Minsk's energy saving programmes. In addition, thermal modernisation, up to 500 th m^2, is part of the rehabilitation of general buildings. Gradually, work is being transferred from building-level modernisation to the comprehensive rehabilitation of micro districts and zones of energy efficient housing are being created.

The objectives of developing legislation on housing management and maintenance have been established and are being fulfilled. In the very near future a new housing code will be adopted. The draft Main Guidelines of Housing Policy of RB provide for the introduction of obligatory energy passports for housing in operation.

Today, the main services for housing management and maintenance are provided by organisations in the Ministry of Housing and Utilities of Belarus. The structure of fuel and energy consumption by main subsectors of the housing and utilities sector and the share of costs for fuel and energy in the housing and utility services are presented in figures 46 and 47 (2011).

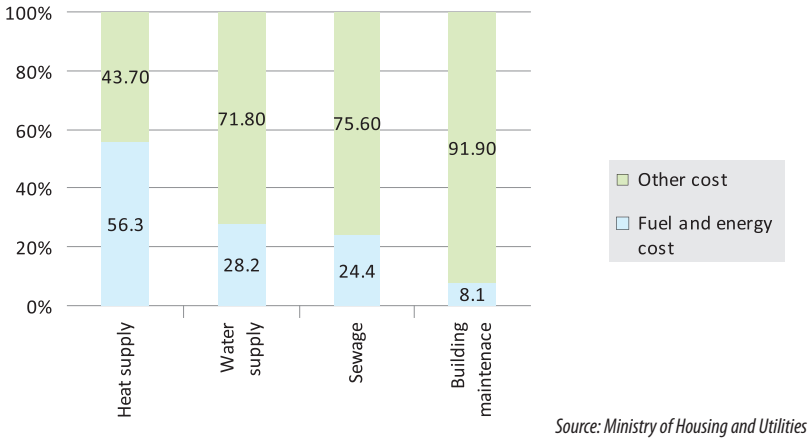
The economic benefits of the energy saving measures in the housing and utilities sector during 2006–2010, with a financing level of BYR 2,438.7 billion, totalled 1,313 ktce (or BYR 415 billion annually); the expected economic benefits of the energy saving measures it is planned will be implemented during 2011–2015 will be at least 885 ktce (Table 9).

Figure 46: Consumption of fuel and energy by the main subsectors of the housing and utilities sector, ktce



Source: Ministry of Housing and Utilities of RB, 2012

Figure 47: Share of fuel and energy in the housing and utility services costs, %



Source: Ministry of Housing and Utilities of RB, 2012

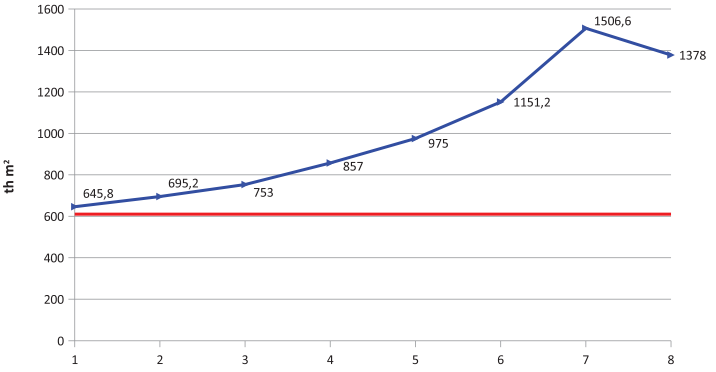
Table 9: Main energy saving measures in the housing and utilities sector

Measures	Unit	Level of measures	
		2006-2010	2011-2015
Transformation of boiler houses into mini-CHPs	MW	43	30.5
Replacement of heating networks	km	3 544	3 576
Replacement of inefficient boilers	pcs	428	500
Replacement of obsolete heat exchangers	pcs	1 002	1 500
Replacement of pumping equipment and introduction of variable-frequency drives	pcs	6 026	7 500
Thermal modernization of building envelopes	Th. m^2	2 123	2 500
2011-2015 - commissioning of 92 major energy sources using local fuel with total capacity of 532.8 MW			

Source: Ministry of Housing and Utilities of RB, 2012

From 2004–2010, the use of local fuels by housing and utilities sector organisations increased by 18.9%. From 2006–2010, the total electricity capacity of 39 co-generation plants put into operation at boiler houses in the housing and utilities sector equalled 45.19 MW. The thermal modernisation of residential buildings implemented by the housing and utilities organisations in the process of capital repairs allows heat consumption per residential building to be reduced from 250 kWh/m^2 to 120–150 kWh/m^2 and a fuel economy of up to 43% to be achieved. In general, the implementation of the package of energy saving measures provided for a 13% reduction in heat consumption by households (or 1,747.9 th. Gcal) in 2010 from the 2005 level. Over the last decade, housing and utilities sector organisations have increasingly replaced heat supply networks (124 km in 2001 and 766 km in 2010) (Figure 48); and the level of heat losses was reduced from 26% in 2001 to 18.4% in 2011.

Figure 48: Commissioning of housing after refurbishment, 2003–2010



Source: Ministry of Housing and Utilities of RB, 2012

The following targets were established for organisations in the housing and utilities sector for the period until 2015.

- Reduce heat losses in transmission networks to 12–13%;
- Reduce unit consumption of electricity for water extraction, delivery and treatment by at least 15%;
- Provide for a 54.5% share at least of the local fuel sources in the total consumption;
- Improve the level of combined heat and electricity generation at mini-CHPs by 66%;
- Complete the installation of automated lighting systems in the common areas of residential buildings;
- Decommission all inefficient lighting appliances.

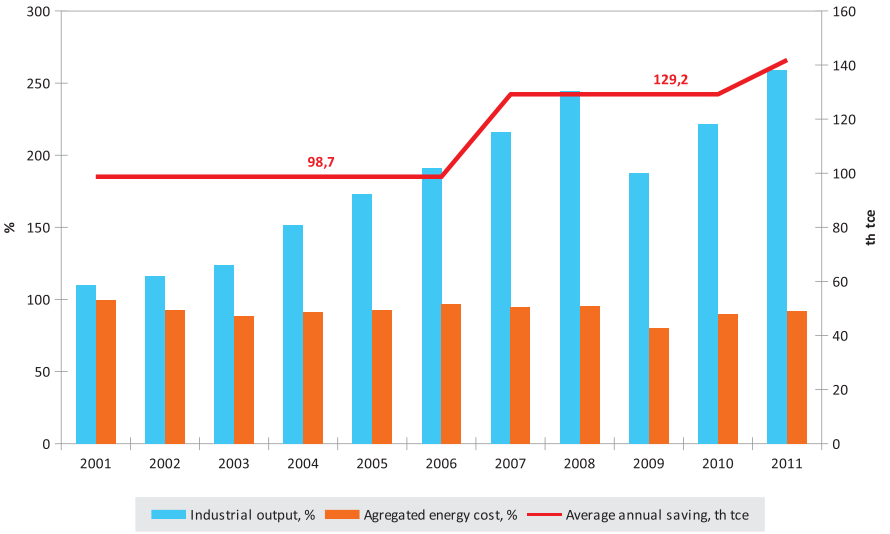
Annex 5 presents the structure of sources and main areas of investments in energy saving measures in the housing and utilities sector of Belarus in 2010 and the results of the main energy saving measures in the housing and utilities sector.

Industry Sector

From 2001–2011, the industrial output in Belarus increased by a factor of 2.4 with a 7.2% reduction in the total energy consumption. Based on the implementation of energy saving and energy

efficiency measures, the average annual saving of fuel and energy resources increased from 98.7 ktce from 2001–2005 to 129.2 ktce from 2006–2010 and reached 141.9 ktce in 2011 (Figure 49). From 2006–2011, considerable efforts were made to achieve a 5.8% increase in the share of local fuels and secondary energy resources in the boiler and furnace fuel mix in the industry sector.

Figure 49: Industrial production trends and aggregated energy costs



Source: Department of Energy Efficiency, the State Committee for Standardization of the Republic of Belarus, 2012

The national energy saving programme for 2011–2015 provides for a further 15–20% reduction in specific energy consumption for industrial production through the implementation of a number of energy efficient measures.

In 2011, the structure of the fuel and energy mix (per direct total energy costs) of organisations subordinate to the Ministry of Industry was as follows: fuel – 32%, electricity – 60.7% and heat – 7.3%. The following tasks are being fulfilled in the current year 2012.

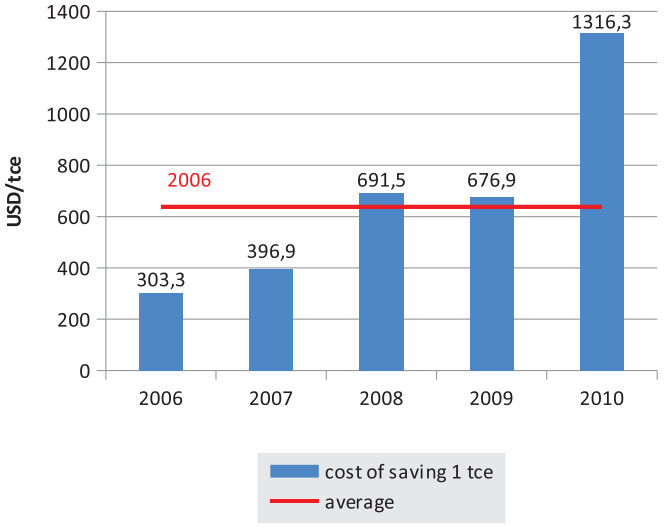
- Providing for the saving of energy resources through the modernisation of thermal, foundry engineering, electroplating and other energy intensive processes;
- Reducing unit energy consumption for industrial production;
- Introducing power generating equipment with a capacity of 6.6 MWe.

We should note the increase in the costs per 1 tce of energy saved (Figure 50), which is connected to the transfer from low- and medium-cost organisational measures to high-cost measures implemented at enterprises in Belarus' industrial sector. Energy saving and energy efficiency measures are being implemented under the programme of the technical retrofit and modernisation of production processes based on energy efficient technologies and equipment.

The effect of implementing energy efficient measures at the major enterprises of the republic, RUE Bobruisk Plant of Tractor Parts and Units and enterprises of the state concern Belneftekhim, are presented in figures 51 and 52.

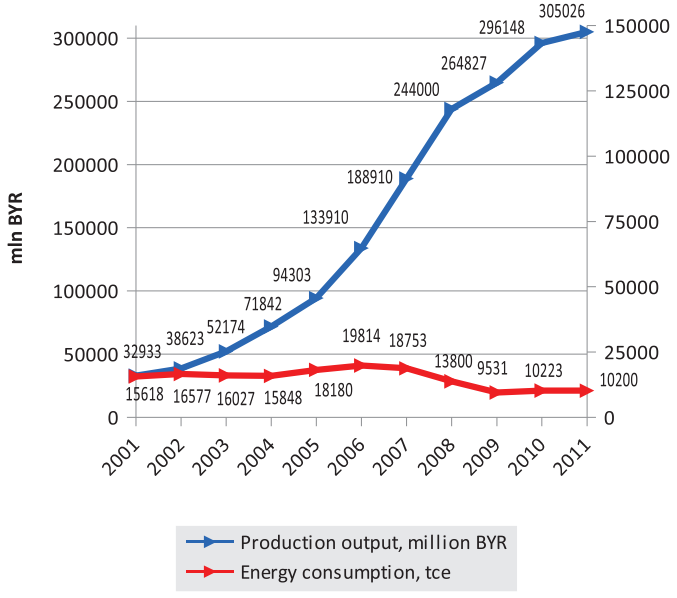
Examples of the benefits from the implementation of energy efficient measures at other enterprises in Belarus are presented in Annex 6.

Figure 50: Increase in the cost of 1 tce of energy saved in industry, USD/tce 2011



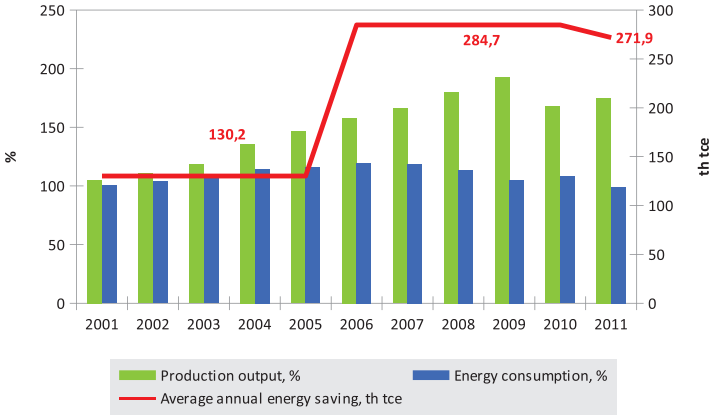
Source:Ministry of Industry of RB, 2012

Figure 51: Effect of implementing energy efficient technologies and measures at RUE Bobruisk Plant of tractor parts and units



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 52: Effect of implementing energy efficient technologies and measures at the state concern of Belneftekhim



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Scientists in Belarus are carrying out research and development in the area of technology and equipment upgrading for the purposes of improving energy efficiency. Annex 7 presents for illustrative purposes a summary of the development of energy efficient furnaces by scientists at the A.V. Lykov Heat and Mass Transfer Institute of the National Academy of Sciences of Belarus.

Services Sector

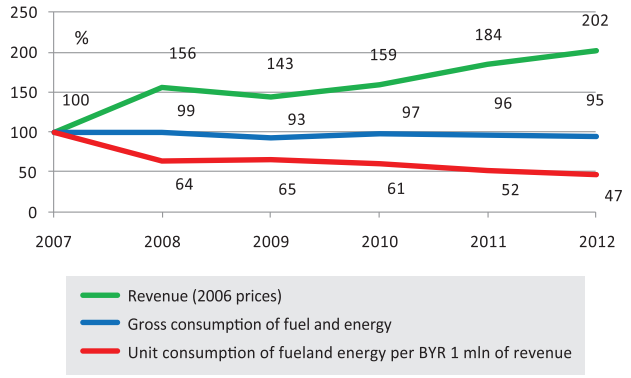
The main subsectors of the services sector are housing and utilities, transportation and ICT, health care and education, social security, etc. Sectoral and regional energy saving programmes determine the objectives for fuel and energy saving and the share of local fuel use, energy saving projects and measures at enterprises and organisations of respective ministries and departments.

The energy intensity per unit of GDP in the manufacturing sector is twice as large as that in the services sector, or even more than this. The share of services in the GDP structure should increase from 40.3–50%. In addition, the plan is to change the structure of exports to provide for an increase in services. This will allow the energy component of exports and the energy dependence of the country to be reduced.

Transport Sector

The enterprises of the Ministry of Transport and Communications of RB arranged systemic work on energy saving, the rational use of fuel and energy and increasing the use of local fuel sources in the boiler and furnace fuel mix. Figures 53 and 54 demonstrate the results of these activities as compared to the 2007 indicators.

Figure 53: Revenues and the gross and unit consumption of fuel and energy by organizations in the Ministry of Transport and Communications of RB



Source: Ministry of Transport and Communications of the Republic of Belarus, 2012

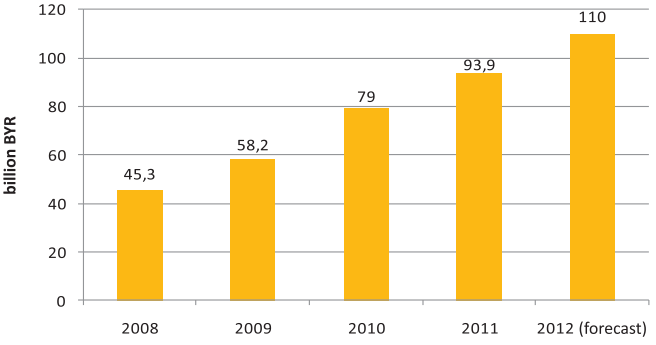
In general, the implementation of energy saving and energy efficient technologies from 2006–2010 resulted in a 6% reduction in the total consumption of fuel and energy in the sector, an 11% reduction in aggregated energy costs and a 47% reduction in the energy intensity of goods, works and services.

In 2011, fuel and energy saving reached 14.9 ktce and the share of local fuels in the boiler and furnace fuel mix reached 20.8%; the goal of 7% energy saving was achieved.

In general, the level of fuel and energy saving will reach at least 122 ktce and the share of local fuels in the energy balance will reach 27.8% in 2011–2015.

Today, the sector's enterprises have implemented low-cost energy saving measures and a transfer to innovative high-cost energy saving projects with significant payback periods. The dynamics of investments in energy saving measures in the transport sector, taking into account comparable conditions from 2008–2012, are presented in Figure 54.

Figure 54: Investments in energy saving measures in the transport sector



Source: Ministry of Transport and Communications of the Republic of Belarus, 2012

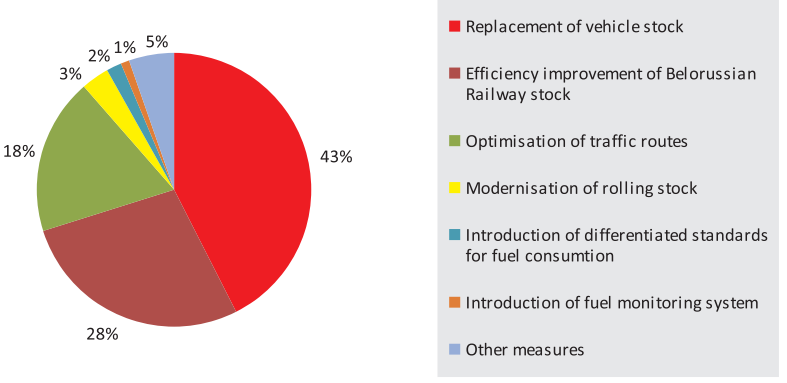
The consumption of oil products equals about 60% of the fuel and energy consumption by the transport sector enterprises. Starting in 2010, the Belarusian Government has established indicators of the reduction in the consumption of light oil products (LOP) for republican

governmental bodies. The 2012 indicators (ratio of LOP savings achieved through organisational and technical measures during the reporting period of the respective year to their actual consumption during the respective period of the previous year) are higher than those for 2011. The goals established for the Ministry of Transport are as follows: savings in terms of LOP in 2011 of at least 4% of the 2010 level and in 2012 of at least 10% of the 2011 level. For the purposes of achieving these goals the annual sectoral programme of LOP saving has been developed and is being implemented, and this includes 188 measures in a number of areas (Figure 55).

The sectoral programme includes the replacement of rolling stock and improvement of the fuel consumption monitoring system. Operating standards for fuel consumption have been developed and approved with respect to all vehicles. A package of measures on the optimisation of traffic routes has been implemented, online dispatch control systems are being introduced on a large scale and fuel consumption standards per traffic routes have been developed. The Belarusian Railway, as the main consumer of LOP, has implemented a programme of locomotive modernisation and equipment with new diesel units. Fuel consumption in the air transportation subsector has been reduced through putting advanced fuel efficient types of aircraft into operation.

A reduction in the emissions of polluting substances (carbon oxide, carbon deposit, hydrocarbons, sulphur dioxide and nitrous oxides) and greenhouse gases (GHGs) into the atmosphere (Figure 56) is an important result of the measures undertaken in the transport sector.

Figure 55: Structure of main areas of LOP saving by organisations in the Ministry of Transport and Communications of RB (ktce, %) 2010



Source: Ministry of Transport and Communications of the Republic of Belarus, 2012

Figure 56: Emission of polluting substances (th. tons) and GHGs (gr.) by transport sector

Source: Ministry of Transport and Communications of the Republic of Belarus, 2012

Education and Awareness Raising

Belarus has established a multi-level system of education in energy efficiency and energy saving: educational games in kindergartens, thematic lessons, competitions and energy marathons at secondary schools, the Fundamentals of Energy Saving speciality at institutions of higher education, the Energy Efficient Technologies and Energy Management speciality at four institutions of higher education in the republic and numerous professional development courses.

Systemic measures implemented in the country include international and national exhibitions, forums and conferences, awareness raising and educational workshops and training courses at the regional and sectoral levels, month and day campaigns on energy and energy efficiency, thematic campaigns, media tours, press conferences, online conferences on the rational use of energy resources and the best practices for introducing energy efficient technologies.

Permanent exhibitions have been arranged, as well as museums dedicated to energy saving being set up in a number of cities and educational institutions. There are a number of thematic publications: the research journal Energy Efficiency and educational books on the rational use of energy resources for children, as well as training and methodological papers and reference guides. Awareness raising and educational initiatives are being implemented through mass media and social advertising.

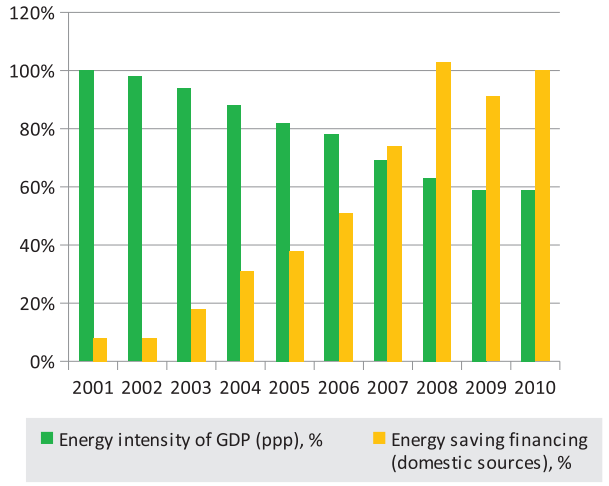
ENERGY EFFICIENCY FINANCING

State Budget

Since the 1990s, one of the areas covered in state energy saving and energy efficiency policy has been the planning and exploring of financing sources for energy saving measures and the use of domestic energy resources. The system of financial support for energy saving in the country is regulated by the government's Law on Budget and Resolutions on the implementation of the Law on Budget for respective years.

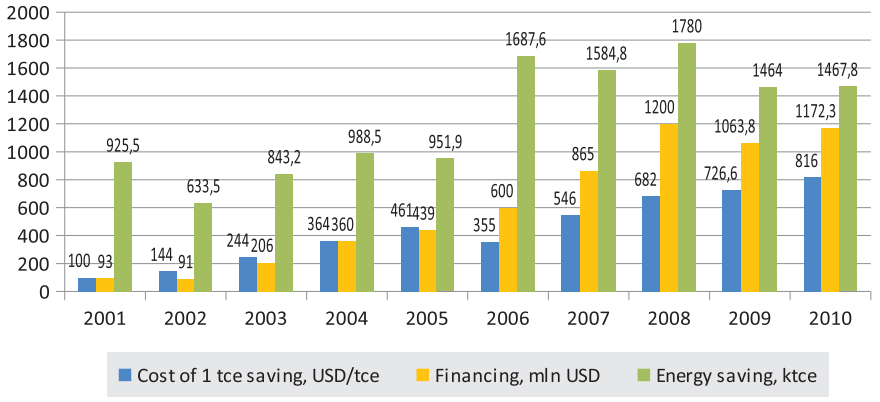
Investments in energy saving have increased annually (figures 57 and 58), given the importance of energy efficiency for the national economy and the need to transfer from low-cost organisational and economic measures to more expensive ones with longer payback periods. In 1996, investments totalled USD 47.7 million, in 2008 they were USD 1,199.9 million and in 2010 they were USD 1,172.3 million. While in 2001, about USD 100 were spent for each ton of saved fuel, in 2010 this indicator reached USD 816 (Figure 58).

Figure 57: Reduction in the energy intensity of GDP; financing of energy saving measures and use of domestic energy resources in Belarus



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 58: Financing of energy saving measures

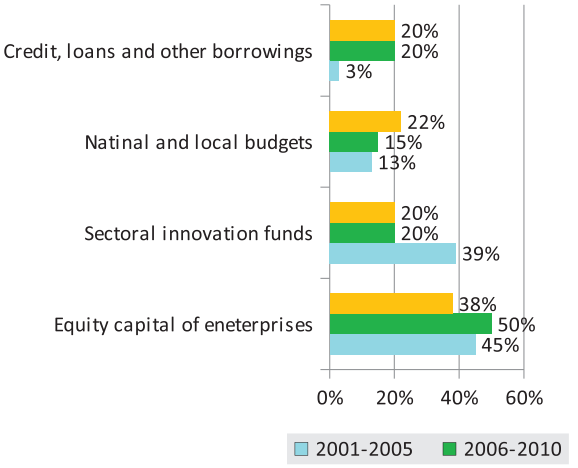


Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 59 shows the changes in the structure of financing measures implemented under the second and the third national programmes, as well as the planned financing for the currently implemented fourth programme.

From 1996–2000, energy saving measures were financed from the equity capital of enterprises (42–44 %), innovation funds (42–45%) and other sources (about 7%).

Figure 59: Changes in the structure of financing for energy saving measures and the use of domestic fuel and energy

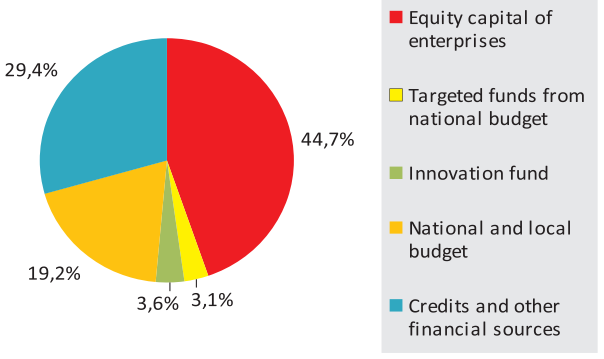


Source: National energy saving programmes for 2001–2005, 2006–2010 and 2011–2015

From 2001–2005, the main sources of financing included state funding sources (national and local budgets – 13%, the innovation fund of the Ministry of Energy for energy saving purposes – 14.9% and sectoral innovation funds – 24.3%) and the equity capital of enterprises (44.7%). Loans and borrowings accounted for only 3.1%.

From 2006–2010, the equity capital of enterprises was the main source of financing for energy efficient projects and accounted for 45%. The share of state sources was reduced to 35%, and the borrowings increased to 20% of the total financing.

Figure 60: Structure of financing for energy saving measures and the use of domestic fuel and energy, 2010



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

In 2010, loans and borrowings accounted for about one third of the total financing for energy saving measures and the use of domestic fuel and energy, while the state funding sources were about 25%.

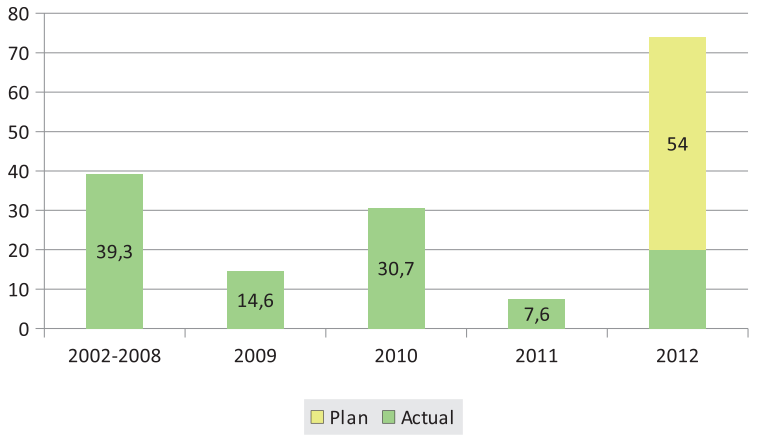
The structure of financing planned under the National Energy Saving Programme for 2011–2015 provides for an increase in credits, loans and other borrowings up to 20%. The financing of the regional energy saving programmes will be provided from local budgets (six oblasts in Belarus and the capital, Minsk) to total USD 1,299.2 million.

The Strategy determines the level of financing required for energy saving and the promotion of local fuels for the periods of 2016–2010 and 2011–2020, which were USD 8,300 million and USD 16,963 million, respectively. The development and implementation of the state targeted programmes will remain an important instrument for accomplishing the Strategy. These programmes will be financed through state support and private and private-public partnership, and will include the use of foreign borrowings from international financial institutions and national banks and banking institutions.

International Co-operation and Projects

In the area of energy saving RB is actively co-operating with international organisations, financial institutions and funds, such as the World Bank, the Global Environmental Facility (GEF), the UN Economic Commission for Europe (UN ECE) and the UN Development Programme (UNDP).

Figure 61: Use of World Bank loans for all projects, USD million



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belaru, 2012s

Together with other CIS and Eastern Europe countries, RB is participating in the international Energy Efficiency 21 Project (the UN ECE), which is aimed at improving energy efficiency, developing an respective infrastructure and using the energy saving potential in member countries. The Financing Energy Efficiency and RES Investments for Climate Change Mitigation Project is being implemented under Energy Efficiency 21 Project.

The achievements under the project the Use of Biomass for Heating and Hot Water Supply in Belarus include the establishment of the revolving fund for bioenergy, the development of the geographical information system, the construction of five biomass-based pilot projects (boiler houses and mini-CHPs) and a wood fuel supplier pilot project.

The major goal of the project Eliminating Barriers to Improvement of Energy Efficiency of the Public Sector Enterprises in Belarus was to reduce GHG emissions by 23,500 tons per annum in CO2 equivalent based on the respective reduction in fossil fuel consumption. The project was aimed at improving incentives for investments in energy saving measures by public (budgetary) entities and the efficiency of using financial resources for energy efficient projects in the public sector. Under the project the International Energy Centre was established to attract internal and external investments in long-term energy efficiency projects (over five years) and provide advisory services on energy efficiency improvement.

The project implemented jointly by RB and the International Bank for Reconstruction and Development (IBRD) –— Modernization of Social Sector Infrastructure in RB (2002–2008) — included measures for the modernisation of lighting and heating systems, winterisation of building envelopes and replacement of windows, rehabilitation of boiler houses and optimisation of the heat supply of social sector facilities. The IBRD loan funds totalled USD 22.6 million and co-financing from Belarus exceeded USD 18 million. The Japanese Government provided grant financing for the project. The funds from the Japanese grant were spent on the construction of a 5-MW wood fuel-based boiler at the boiler house in the settlement of Borovlyany and the development of the Belarusian standard for emissions from wood fuel-based boiler houses. The IBRD greatly appreciated the results of the project's implementation and upon the proposal of Belarus extended an additional loan of USD 15 million for the implementation of similar measures at the social sector facilities.

Under the project Improvement of Energy Efficiency in the Republic of Belarus (2009-2014), to be financed from the IBRD loan of USD 125 million, the plan is to refurbish six energy facilities by developing modern energy efficient CHPs, including four boiler houses in the housing and utilities sector and two major energy facilities for RUE Minskenergo and RUE Mogilevenergo. The project will provide for the mitigation of imported fuel and energy price increases. The expected social benefits of the project include an improvement in the quality and reliability of the heat and electricity supply for all groups of consumers, including households and social sector facilities.

The goal of the project Support to Implementation of the Comprehensive Energy Policy (technical assistance from EU) is to develop and improve the legislative framework of the electricity sector and energy efficiency, provide for energy efficiency improvement in the electricity and construction sectors, transfer state-of-the-art technologies and best practices in the area of energy saving and RES and train Belarusian specialists. The project will include two pilot demonstrations: the thermal modernisation of a school and the construction of a biogas installation.

A comprehensive new project — Improvement of Energy Efficiency of Residential Buildings (2011–2015) — provides for the development of regulations, standards and incentives for the construction of energy efficient buildings and housing rehabilitation, training and pilot projects for energy efficient residential buildings.

Belarus participates in the implementation of the EU INOGATE Project — ESIB (Energy Saving Initiative in the Building Sector in the Eastern European and Central Asian countries). The main goal of this project is to provide assistance to the governments of 11 member states in their efforts to improve energy efficiency in the construction and operation of buildings (residential, public and commercial) through an exchange of experience with EU member states and the introduction of new technologies and best practices.

Information on the major international technical assistance projects implemented and under implementation is presented in Table 10.

Table 10: International technical assistance projects

Project	Results	Amount of financing, USD million	Years
I. Cooperation with the World Bank (Figure 61)			
I-1. Modernization of the Social Sector Infrastructure in Belarus	Under the first loan activities were carried out at 674 facilities, including rehabilitation of 26 boiler houses; modernization of heating sub-stations at 488 facilities; installation of 139,000 energy efficient lighting fixtures at 232 facilities; installation of energy efficient multiple-glazing windows at 22 facilities; thermal rehabilitation of building envelopes at 6 facilities. Under the additional loan activities were carried out at 72 facilities, including rehabilitation of 10 boiler houses; installation of energy efficient lighting fixtures at 30 facilities; thermal rehabilitation of building envelopes and installation of energy efficient multiple-glazing windows at 32 facilities. Fuel and energy saving under the project totals 16.9 ktce per annum. Total reduction in CO2 emissions is estimated at 28.5 th. tons annually.	22.6 15 (additional loan)	2002-2008 2008-2010
I-2. Climate Change Mitigation (grant from the Japanese Government)	Construction of 5 MW wood fuel-based boiler module at the boiler house in the settlement Borovlyany (Figure 76). Development of Belarusian standard for emissions from boiler houses using wood fuel (STB 16.26.2-2006. Environmental Protection. Atmosphere. Polluting Agent Emission Standards for Biomass-Based Boiler Units).	1	2002-2008
I-3. Rehabilitation of Regions Affected by the Accident at Chernobyl NPP	The 'Improvement of Energy Efficiency' Component of the first loan involved measures fulfilled at 351 facilities, including rehabilitation of 13 boiler houses; putting into operation of 8 cogeneration plants; establishment of energy efficient lighting systems at 224 facilities; thermal rehabilitation of building envelopes and installation of energy efficient multiple-glazing windows at 106 facilities. Under the 'Gasification' Component total of 3,135 residential buildings were provided with gas supply and 179.9 km of gas pipelines were laid in 14 localities. Fuel and energy saving under the project exceeds 39 ktce per annum. Total reduction in CO2 emissions is estimated at 70 th. tons annually. The 'Improvement of Energy Efficiency' Component under the additional loan provides for rehabilitation and modernization of 92 facilities; the 'Gasification' Component involves provision with gas supply of over 1,500 residential buildings. Annual fuel and energy saving under the project will be 19,881 ktce. Total reduction in CO2 emissions is estimated at 4.4 th. tons annually.	50 30 (additional loan)	2007-2010 2011-2013

I-4. Improvement of Energy Efficiency RB	Annual fuel and energy saving under the project will be 86.3 ktce, including 75.3 ktce at facilities of the Ministry of Energy and 11 ktce at housing and utilities sector facilities. Total reduction in CO2 emissions is estimated at 137 th. tons annually.	125	2009-2014
II. Cooperation with the UN Development Programme, the Global Environmental Facility and the UN Economic Commission for Europe			
II-1. Use of Biomass for Heating and Hot Water Supply in Belarus	A number of projects were implemented at enterprises Mostodrev, Orekhovsk, Vitebskenergo and Vileyka. The Revolving Fund for Bioenergy was established.	3,129	2003-2008
II-2. Project Eliminating Barriers to Improvement of Energy Efficiency of the Public Sector Enterprises in Belarus	Energy saving measures were implemented at four state-owned enterprises: OJSC Krasnoselskstroymaterialy (Krasnoselsk): transformation of boiler house into mini-CHPs with installed capacity of 4.86 MW; JSC Ceramics (the city of Vitebsk): introduction of 2.8 MW gas piston power plant capacity; Enterprises Ivatsevichskoye ZhKKh (the city of Ivatsevichi): replacement of pumps at a boiler house and water intake structure, introduction of pumps with variable frequency drive at water intake structure; Integrated mill Beryozastroymaterialy (the city of Beryoza): introduction of 1.0 MW gas piston power plant, insulation of furnace and installation of energy efficient burners. The International Energy Center was established.	1,4	2007-2010
III. International technical assistance from EU			
III-1. Support to Implementation of the Comprehensive Energy Policy	Expected results: Component A: Refers to the energy sector in general – EUR 1 million. Component B Support to implementation of the policy aimed at efficient use of energy and energy saving Component C. Support to development of RES includes the following tasks: Component D. Preparation of pilot projects and support to projects implementation.	6	2011-2012

Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

ORGANISATION OF ENERGY EFFICIENCY ACTIVITIES

The institutional framework for the implementation of energy efficiency and RES programmes (Figure 62) reflects the concept of the centralised planning of activities. State regulation of activities in the sphere of energy efficiency and renewable energy is provided through the decrees and directives of the president of RB and the resolutions of the government and the Ministry of Economy with active participation, through law making, of the National Assembly of RB, ministries, departments and experts carrying out their preparation.

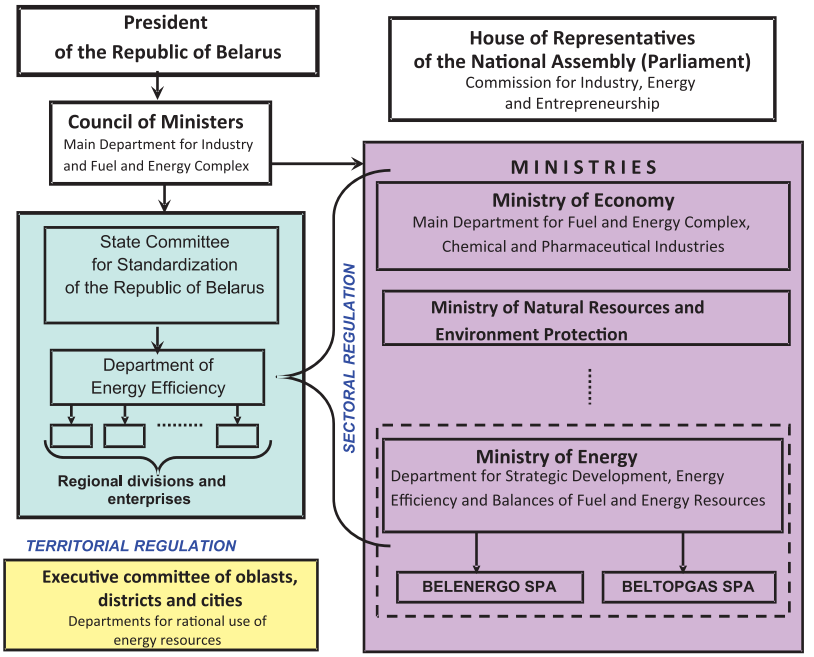
The Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus is the main institution that develops and implements the state policy on energy efficiency and renewable energy, monitors the policy implementation and provides for state control of the rational use of fuel, electricity and heat.

The Department of Energy Efficiency prepares special assignments (programmes, target indicators and projects) under the national energy efficiency and RES programmes and projects for their further approval by the Council of Ministers. The Council of Ministers, in its turn, establishes special target indicators and obligations for all ministries and departments (sectoral regulation), all oblasts' executive committees and Minsk's executive committee (territorial regulation).

There are departments and committees responsible for the implementation of energy saving programmes in each ministry and regional government body. The business plans of individual enterprises must include the goal of and objectives for energy efficiency and these should ensure the fulfilment of their specific tasks.

There is a system of performance monitoring and reporting to the Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus. The Department of Energy Efficiency performs the monitoring of assignments and target indicators, checks performance indicators reported by responsible subdivisions and units in ministries, departments, executive committees (in oblasts, districts and cities) and enterprises and further reports the results to the Council of Ministers.

Figure 62: Institutional framework for energy efficiency and RES in Belarus



Source: Final report of Belarus under UNECE Financing Energy Efficiency Investments for Climate Change Mitigation Project, 2009–2010, Energy Efficiency 21 Project

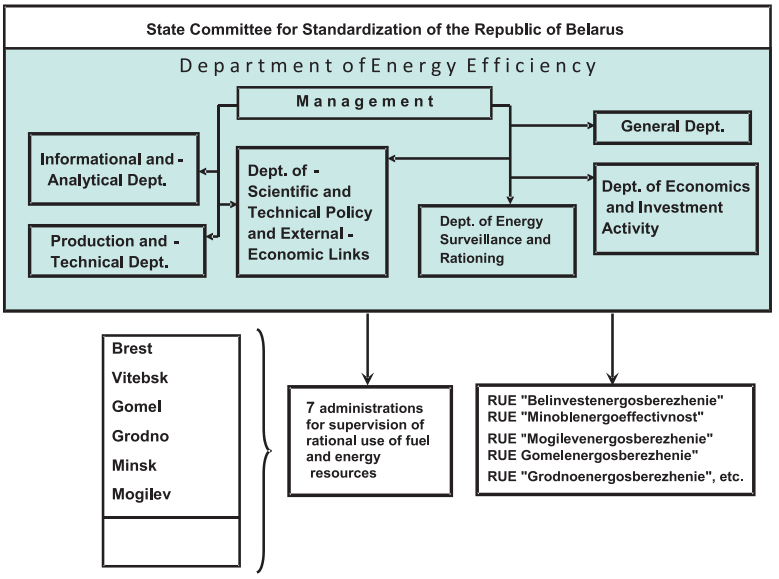
The Ministry of Economy is a coordinator of other ministries' activities related to the implementation of all energy efficiency and RES programmes and projects. The Department of Energy Efficiency of the State Committee for Standardization and the Ministry of Economy (Main Department for Fuel and Energy Complex, Chemical and Pharmaceutical Industries) are responsible to the government and the president of RB for activities in the area of energy efficiency and renewable energy.

The Department for Strategic Development, Energy Efficiency and Balances of Fuel and Energy Resources within the Ministry of Energy supervises activities related to energy efficiency, mainly on the supply side, and the development of medium and small HPPs. Belenergo SPA and Beltopgas SPA, which are subordinate to the Ministry of Energy, have subdivisions responsible for compliance with the energy efficiency and renewable energy policy.

Figure 63 presents the organisational structure of the Department of Energy Efficiency and its subordinate organisations. The department has structural units responsible for the co-ordination of activities within their competence related to energy efficiency and RES in Belarus. In addition, the department reviews requests and proposals from enterprises in various sectors, local governments and other organisations related to investment projects on energy efficiency and RES. When approved, these projects are included in respective programmes. There are 163 members of staff in the Department of Energy Efficiency and its regional entities (including 35 in the central office) and the payroll is BYR 3,700 billion. Each local administration (executive committees of oblasts and Minsk) includes two to three specialists in energy efficiency and energy saving.

The Department of Energy Efficiency includes several administrations for supervising the rational use of fuel and energy resources in the oblasts (Brest, Vitebsk, Gomel, Grodno, Minsk and Mogilev) and the city of Minsk for the purposes of the organisation and control of energy efficiency and RES related activities on behalf of the department and executive committees in the oblasts, districts and cities within the framework of territorial regulation.

Figure 63: Organizational structure of the Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus



Source: Final report of Belarus under UNECE Financing Energy Efficiency Investments for Climate Change Mitigation Project, 2009–2010, Energy Efficiency 21 Project

RENEWABLE ENERGY POLICY

RES Related Goals and Programmes

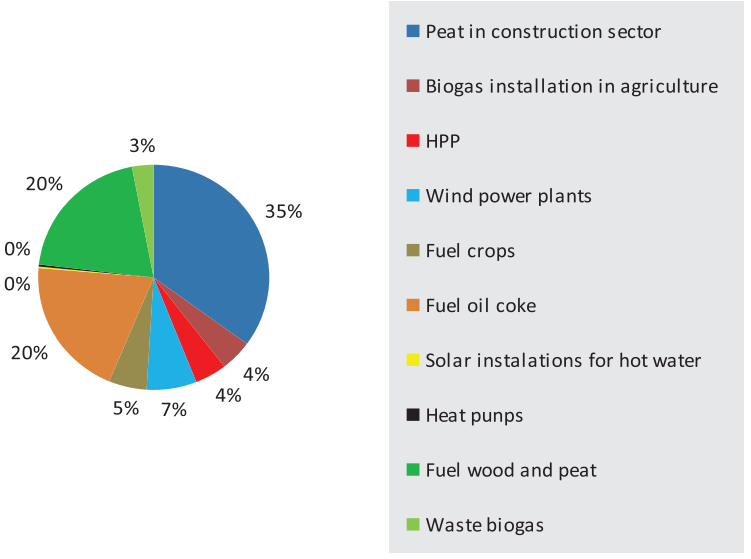
Strategic documents, which determine the energy policy of Belarus and the state programmes, highlight the importance of RES and local energy sources development for the security of the energy supply. In 2015, due to the increasing use of local fuels and RES, the share of domestic energy resources in the boiler and furnace fuel mix should be not less than 30%, and in 2020 not less than 32%. The National Programme of Local and Renewable Energy Sources Development for 2011–2015 summarised and specified all programme documents on local fuels and RES use and set forth areas of activities and indicated the specific measures required to achieve the necessary results (Table 11). The programme will provide for an increase in the use of local fuel and energy, including RES, which should reach 2,767 ktce by 2015; the structure is presented in Figure 64.

Table11: Areas of use of local fuels and renewable energy in Belarus, 2011–2015

Area	2011-2015
Putting into operation of wood fuel and peat based energy sources, MWe/MWt	49/1063
Deployment of biogas plants, MWe	90
Construction of new and rehabilitation of existing HPPs, MW	102
Construction of WPPs, MW	460
Introduction of solar water heaters and solar plants, units	172
Introduction of heat pumps for use of secondary energy resources of low potential and geothermal energy, MW	8,9

Source: National Programme of Local and Renewable Energy Sources Development for 2011–2015

Figure 64: Structure of local fuel and energy sources use, including RES, until 2015



Source: National Programme of Local and Renewable Energy Sources Development for 2011–2015

The State Programme of HPPs Construction in RB for 2011–2015 provides for the construction and rehabilitation of 33 power plants with a total capacity of 102.1 MW (20, up to 100 kW; nine, from 100 kW to 10 MW, and four over 10 MW).

The implementation of the State Programme of Constructing Generation Facilities Using Local Fuels Sources for 2010–2015 will provide for 161 local fuel-based energy sources with a total capacity of 39.45–47.45 MWe and 1,025.7 MWt to be put into operation. The State Programme of Forestry Development in RB for 2011–2015 sets forth the level of investments and measures for the development of an infrastructure for the production of wood fuel.

The implementation of the Programme of Constructing Biogas-Based Generation Facilities for 2010–2012 will provide for 38 biogas installations with a total capacity of 37.9 MW to be put into operation; this will allow the generation of about 314 million kWh of electricity, thus replacing imported natural gas of more than 105 th tce.

Potential of RES

The potential of RES and an economically feasible level of RES use in Belarus has been studied and stated in the National Programme of Local and Renewable Energy Sources Development for 2011–2015.

Wood fuel resources: the area of forest resources in Belarus is 9,248 th. hectares (38% of the territory). The total reserves of standing timber are estimated to be 1.56 bcm, including mature and over-mature wood of 196.7 mcm and an average annual accretion of 25 mcm. The potential wood fuel resources available for the production of wood fuel include firewood, forest harvest residue, industrial wood residue and plantations of fast-growing grey alder.

Hydro energy resources: the potential capacity of all stream flows in Belarus totals 850 MW, including 529 MW that is technically feasible and 250 MW that is economically feasible.

Wind energy potential: a total of 1,840 sites for the location of WPPs have been identified in Belarus, with a theoretical energy potential of 1,600 MW and an electricity generation potential of 2.4 billion kWh. According to hydro meteorological surveys, the average annual speed of wind at 10–12 m is 3–4 m/sec. The plan is to construct, by 2015, WPPs with a total capacity of 440–460 MW. Furthermore, the plan is to improve the level of wind energy potential use for farms, greenhouses and other agricultural facilities..

Plant-growing waste and biomass: using plant-growing waste for fuel purposes is principally a new practice. The total estimated potential of plant-growing waste in the country is anything up to 1.46 Mtce annually. By 2020, the level of using plant-growing waste for fuel purposes may reach 140–200 ktce.

Belarus has significant potential in terms of the use of technologies for the production of ethanol fuel and biodiesel from rape, soybeans and sugar beet. The total estimated potential is anything up to 1 Mtce annually.

Solar energy: the average annual level of solar radiation in Belarus, taking into account night hours and claudage, equals 2.8 kWh/sq. m daily (243 kcal per 1 sq. centimetre) and has a conversion efficiency of 12% or 0.3 kWh/sq. m daily. The main areas of solar energy use are solar water heaters in agriculture and in the household sector.

Biogas and municipal wastes: the testing of biogas installations for the production of gas from waste from livestock breeding complexes has confirmed their efficiency. The potential production of marketable biogas from all sources is estimated to be 160 ktce per annum. The total potential of biogas production at farms; cattle and pig breeding enterprises and poultry enterprises is estimated to be 3,602.9 million, 332.2 million and 223.4 mcm per annum, respectively.

In Belarus there are 160 landfills for municipal solid waste with an actual waste disposal capacity of 206.6 mcm. The energy potential of these wastes is estimated to be 470 ktce/year. The efficiency of waste bioprocessing for gas production is 20–25%. The plan is to implement pilot projects using the organic content of municipal waste and wastewater sludge by 2015. A total of 10 landfills are potentially usable for the operation of a co-generation module with a capacity of 200 kWe.

The total potential of biogas production (for fuel purposes) from effluent from 2,450 sewerage pump stations in Belarus is about 66.4 mcm and the estimated installed capacity of co-generation plant is about 22 MWe. For the period until 2020, a total of 19 landfills are potentially usable and these have a total expected biogas output of 56.2 mcm per annum with an installed capacity of a co-generation plant of 19 MWe.

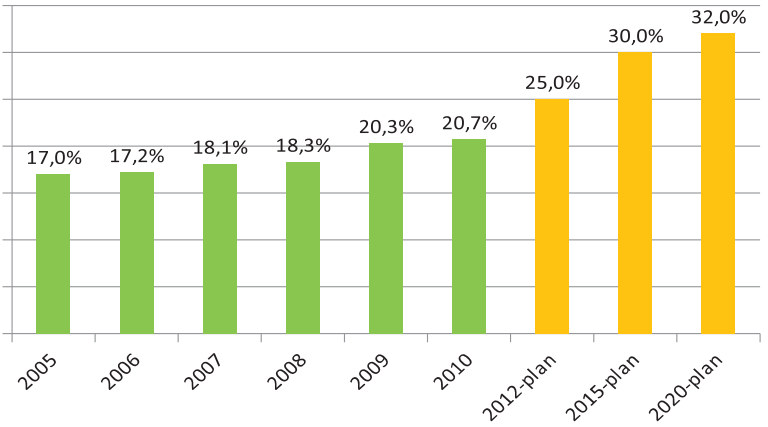
Geothermal energy and heat pumps: Pripyat Trough and Podlaska-Brest Depression are characterised by the most favourable conditions for the use of thermal waters; their potential in terms of geothermal energy is estimated to be 3–6 tce/sq. m of the surface. The development of geothermal energy requires geological exploration in order to prepare promising sites. The temperature of subsurface waters is 80˚C or higher; the deeper the occurrences of thermal waters the higher is the salinity of the brines. This requires special technological concepts developed by Belarusian scientists. Meanwhile, in Belarus it is more economically feasible to use thermal waters from more shallow boreholes with low mineralisation.

The application of heat pumps for the use of low potential secondary energy resources and geothermal energy is feasible for the heating and heat supply of facilities not included in the system of district heating and hot water supply.

Current Penetration of RES

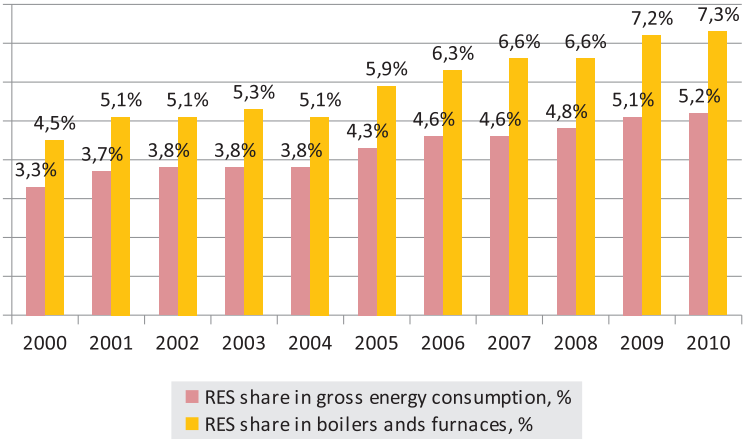
The development of RES, together with energy efficiency, is part of the general national policy of Belarus in the area of energy supply, energy saving and energy security, as well as environmental protection and climate change mitigation. From 2005–2010, the share of domestic energy resources, including RES, in the fuel and energy consumption for heat and electricity generation (boiler and furnace fuel) increased by 3.7%. This indicator is expected to increase between 2010 and 2015 and 2015 and 2020 by 9.3% and 2%, respectively, and provide for a 32% share in the boiler and furnace fuel mix by 2020 (Figure 65).

Figure 65: Consumption of domestic energy resources, including RES, in the fuel and energy mix for heat and electricity production



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Figure 66: Consumption of RES in gross energy consumption and in the fuel and energy mix for heat and electricity generation

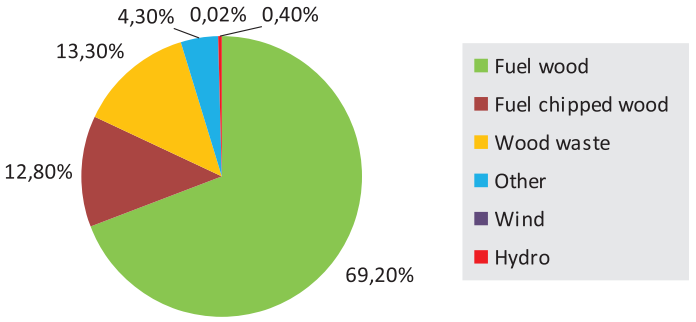


Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

From 2000–2010, the share of RES consumption in gross energy consumption and in the boiler and furnace fuel mix equalled 1.9% and 2.8%, respectively (Figure 66).

Biomass, biogas, municipal waste, wind and hydro energy are the main RES that are currently economically feasible for use in Belarus. The structure of the RES balance as of 2010 is presented in Figure 67. Belarus is carrying out exploration and practical work to expand the range of RES and introduce advanced technologies.

Figure 67: Balance of RES in Belarus, 2010



Source: Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012

Biomass energy: wood and wood waste are the main resources of biomass currently used in Belarus. Recently, eight mini-CHPs have been constructed in the country, and these are owned by enterprises in the Ministry of Energy, Bellesbumprom Concern (Mostovskaya) and local government bodies (Petrikovskaya). Over 3,000 wood fuel boilers are in operation to supply heat to detached houses, office buildings in rural localities, schools and other children's institutions. In recent years foreign investors have started investing in the equity capital of joint ventures for the production of biomass for electricity and heat generation. There are about 15 enterprises in the republic that produce fuel pellets for wood fuel, and they have an annual production capacity of 107 th. tons. Belarus is developing the infrastructure and arranging the production of state-of-the-art equipment for the production, processing and delivery of wood fuel to consumers.

RB has initiated the construction of waste processing plants, installations for the extraction and utilisation of landfill gas for energy purposes and biogas installations at sewage treatment plants. A plant for processing municipal solid waste and generating heat and electricity will be developed in Minsk. A number of plants have been constructed and are under construction for the disposal of municipal solid waste and wastewater sludge in the cities of Brest, Grodno (loan from the World Bank) and Novopoltsk. The EBRD has financed the feasibility study for the construction of biogas installations at sewage treatment plants in the cities of Baranovici and Slonim; it is planned that a credit line will be opened.

Hydro energy: since the early 1990s, Belarus has carried out the renovation and rehabilitation of existing and small and mini-HPPs and constructed new ones. Currently, Belarus has over 45 HPPs with a total capacity of 16.1 MW, including within the interconnected power grid (enterprises of the Ministry of Energy); small HPPs have a total installed capacity of 9.4 MW with an electricity output of about 28 million kWh/year, within the Minskvodokanal enterprise, and seven small HPPs have an electricity output of about 12 million kWh/year.

Wind energy: from 2000–2002, the first pilot WPPs with a capacity of 0.25 MW and 0.60 MW were put into operation. In April 2011, a 1.5-MW WPP was put into operation (RUE Grodnoenergo in the Novogrudok District), which provided an average annual output of electricity of about 3.8 million kWh. In general, as of 2011, the total installed capacity of WPPs in Belarus equalled 3.47 MW.

Solar energy: areas of solar energy use in Belarus have been determined, taking into account climatic conditions and including solar water heaters and solar plants for the purposes of the intensification of drying processes and water heating for agricultural production and in households. In 2010, a domestically manufactured solar water heater with a thermal capacity of 160-kW was put into operation in Soligorsk District.

Geothermal energy resources: over 200 heat pumps with a total capacity of about 16.5 MW are being operated for the purposes of supplying heat in various sectors of Belarus' economy. For example, heat pumps with a total capacity of 1.6 MW and an aggregate heat output of 1.7 th. Gcal have been installed at 13 facilities in the Minskvodokanal enterprise. The first geothermal plant with a thermal capacity of 1–1.5 MW is being constructed, which will supply heat to greenhouse facilities in the suburbs of Brest.

Main Measures of Support for Renewable Energy

The Law of RB on Renewable Energy Sources, dated 27 December 2010, regulates relationships in the sphere of RES use for the generation of electricity, its further consumption and other utilisation, as well as the manufacturing of RES-based installations.

The Law determines the measures of state support for RES.

- Pricing policy aimed at encouraging the use of RES and energy generated from RES;
- Encouragement of investment activities, including providing for favourable conditions for national and foreign investors;
- Promotion of efficient technologies and renewable energy installations;
- Guaranteed connection to state power grids;
- Tax concessions in accordance with the legislations;
- Exemption from custom duties for imported technological equipment intended for the production, receipt, conversion, accumulation and transmission of electricity from RES may be provided under international treaties of Belarus.

Resolution of the Ministry of Economy of RB No. 100 on Tariffs for RES Electricity and Recognizing as Void of Certain Resolutions of the Ministry of Economy of RB, dated 30 June 2011, set forth multiplying ratios differentiated by the type of RES. Tariffs for RES-based electricity generated by legal entities not incorporated in Belenergo SPA and individual entrepreneurs and sold to energy supplying organisations of Belenergo SPA are set at the level of electricity tariffs for industrial and equated consumers with a connected capacity up to 750 kVA; these are established and indexed according to changes in the exchange rate of the Belarusian Ruble against the US Dollar, with the application of the ratios presented in Table 15.

Table 12: Multiplying ratios applied to tariffs for RES-based electricity

Renewable energy	Operation of renewable energy installation	
	First 10 years after commissioning	Subsequent 10 years
Wind	1.3	0.85
Natural water flows		
Wood fuel and other biomass		
Biogas		
Geothermal and other energy sources not regarded as non –renewable		
Solar	3	

Source: Resolution of the Ministry of Economy of RB No. 100 On Tariffs for RES Electricity and Recognizing as Void of Certain Resolutions of the Ministry of Economy of RB

The connection of RES-based installations to state power grids is carried out under energy purchase contracts between producers of RES-based energy and state energy supplying organisations.

ENERGY RELATED ENVIRONMENTAL POLICY

Strategy, Principles and Priorities of the Environmental Policy of Belarus

The main goal of the environmental policy of RB is to provide environmentally safe conditions for people, the rational use and protection of natural resources and an elaboration of the legal and economic framework for environmental protection for the benefit of current and future generations. The specifics of environmental and economic planning and activities in Belarus consist of an interrelation of general environmental tasks and the mitigation of the consequences of the Chernobyl NPP accident.

The main areas of activities aimed at the implementation of the state environmental policy are as follows.

- Improvement of environmental legislation;
- Introduction of efficient economic methods of control and monitoring with respect to environmental management and protection;
- Establishment of a system of financing environmental measures;
- Improvement of the system of regulatory bodies and environmental monitoring;
- Training and ecological education of the population;
- International co-operation in and active use of international experience for addressing environmental challenges.

The main principles and strategic areas of environmental policy are determined by the Law of RB On Approval of the Main Guidelines of the Internal and Foreign Policy of RB (2005), the Law of RB On Protection of Environment (1992, as revised in 2002), the Concept of National Security of RB (2010), the National Strategy of Sustainable Social and Economic Development of RB for the Period until 2020 and international treaties of Belarus. The main pieces of environmentally related legislation are the Law of RB On Atmospheric Protection (2008), the Law on Protection of the Ozone Layer (2001), the Law of RB On Treatment of Wastes (2007).

Implementation of the Environmental Policy

The Strategy of Belarus in the area of environmental policy is pursued through the development and implementation of the following.

– State targeted strategies, programmes and action plans on the protection, restoration and rational use of certain components of the environment and natural ecosystems (the national action plans on the rational use of natural resources and protection of the environment in RB for 2001–2005 and 2006–2010, the National Programme of Climate Change Mitigation for 2008–2012, the Strategy of Reducing GHG Emission and Improving GHG Absorption by Sinks in RB for 2007–2012 and the National Strategy of Introducing Comprehensive Environmental Permits for 2009–2020);

– Programmes and action plans for the protection of the environment depending on the type of economic activity;

– State programmes of environmental protection research;

– Regional programmes and local action plans for the protection of environment.

The Ministry of Natural Resources and Environmental Protection of RB is a republican body responsible for the implementation of the state environmental policy.

For the purposes of assessing the results of the tasks fulfilled under the Strategy, a system of target indicators has been set up for the period lasting up until 2025, including the following targets for 2015 and 2025: 8.5 tons and 4.0–5.0 tons of contaminating agent emissions from fixed sources per BYR 1 billion of GDP, respectively; 96–98 th. tons and 110 th. tons of GHG emissions, respectively; and 35% and 70% indices of municipal waste use, respectively.

RB actively addresses the challenges of air quality control in a transboundary context, based in the first instance on the regulatory and technical documents of the European Union and using a comprehensive approach based on the scientific research data of the Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) programme and models of the impact of pollutant emissions on air quality.

International Co-operation and Commitments

Belarus has been party to about 20 international conventions on environmental protection. Over the last decade, more than 40 international treaties, both bilateral and multilateral, have been signed.

In 2009, for the purposes of meeting the commitments under the UN Framework Convention on Climate Change (UN FCCC) and the Kyoto Protocol (KP) to the convention, Belarus prepared the Fifth National Communication. The Proposal of Belarus on an amendment to Annex B of the KP was included in Decision 10/CMP.2 and approved by the second session of the Conference of the Parties acting as the Meeting of the Parties to the Kyoto Protocol, in Nairobi (October 2006). A target indicator on GHG emission reduction established for Belarus is 92% of the baseline year (1990). Belarus may obtain the right to participate in a joint implementation mechanism (JI) and international emissions trading (IET) only when it is included in Annex B. However, in parallel with negotiations on the amendment, Belarus developed all the necessary components for the implementation of the KP, as follows.

- National register of carbon units;
- National procedure for the preparation and approval of projects on the reduction of GHG emissions (joint implementation and voluntary market)
- National Action Plan and Emissions Reduction Strategy;
- Strategy for Belarus's participation in flexibility mechanisms under the KP;
- All necessary national reports including the report on the assessment of allowed emissions, National Communications;
- Groups of potential project developers and contacts with potential investors;
- Analysis of markets and ranges of carbon unit prices and assessments of the economic indicators of model projects in Belarus were conducted; recommendations were developed and model agreements for the purchase and sale of emission reduction units were prepared.

Under the international technical assistance project, Providing Conditions for Use of Flexibility Mechanisms under the Kyoto Protocol in Belarus (the donor was UNDP, 2006–2009), a web-site was developed that contains information on GHG emission reduction projects, methodological

aspects of the projects' development, regulations on project cycle procedures and carbon financing, etc.

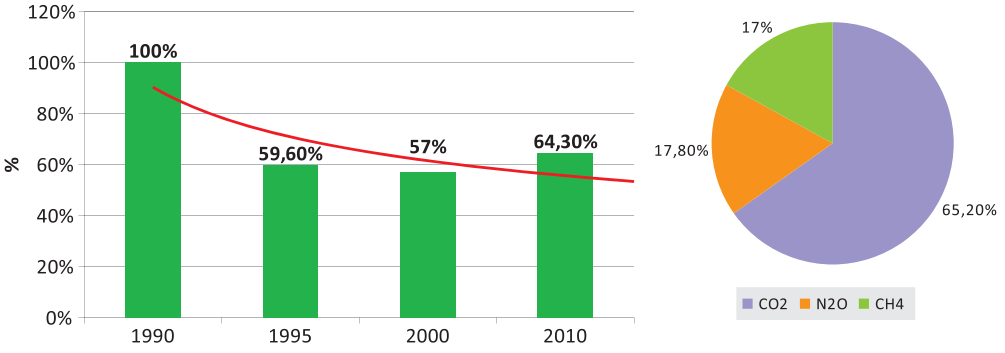
A portfolio of potential projects for implementation through flexibility mechanisms includes the construction of small and mini-CHPs, biogas installations and small HPPs and the management of waste and energy efficient buildings.

Emission of Polluting Agents and GHGs; Energy Efficiency and Introduction of RES

According to the chapter 'Ecological Effect' of the National Energy Saving Programme for 2011–2015, the combustion of fossil fuels is responsible for over 65% of the total GHG emissions and about 95% of CO2 emissions. Therefore, the programme's measures aimed at improving energy efficiency in energy production and consumption and reducing energy losses will allow compliance with the limits on GHG emissions established by international agreements on climate change mitigation and the formation of a basis for Belarus' activities on reducing the unit consumption of hydrocarbon fuel.

According to the Ministry of Natural Resources and Environmental Protection of RB, in general, the total emission of GHGs in CO2eq. in Belarus (without land use, land-use change and forestry (LULUCF)) equalled 89,444.38 th. tons. In 2010, GHG emissions were reduced by 35.7% from the 1990 level (139,179.26 th. tons) (Figure 68).

Figure 68: Level of GHG emissions from 1990–2010 and the structure of GHG emissions in 2010



Source: Ministry of Natural Resources and Environmental Protection of RB, 2012

From 1990–1995, GHG emissions sharply reduced by 40.4% due to a significant deterioration in economic development rates. From 1995–2000, a 4.4% reduction in emissions was caused by changes in the fuel and energy mix (an increase in natural gas share and reduction in consumption of heating oil and coal) and GDP structure (an increase in the share of the services sector and other sectors not related to GHG emissions), as well as energy saving efforts. The period of 2000–2010 is characterised by activities focused at improving the efficiency of fuel and energy use and the introduction of RES into the fuel and energy mix, which provided for the relative stabilisation of the GHG emission level against an insignificant increase in the gross consumption of fuel and energy and considerable GDP growth.

The energy sector is responsible for the majority of GHG emissions. In 1990, GHG emissions in the sector totalled 102.24 Mt in CO2 equivalent, or 73,46% of the total emissions. In 2010, GHG emissions in the energy sector totalled 56.44 Mt in CO2eq. (63.1%), including in electric power

with 31.77 Mt in CO2eq. (35.5%), industry and construction with 8.14 Mt in CO2eq. (9.1%), transport with 5.28 Mt in CO2eq. (5.9%), agriculture with 22.58 Mt in CO2eq. (25.25%) and wastes with 6.18 Mt in CO2eq. (6.9%).

The National Programme of Local and Renewable Energy Sources Development for 2011–2015 contains an assessment of the potential reduction in GHG emissions by 2015 due to replacing organic fuel with RES (Table 13).

Table 13: Potential reduction in GHG emissions through the development of RES from 2011–2015, th. tons of CO_2 equivalent

Planned measures	Potential reduction, th. tons $CO_{2eq.}$
Use of biomass for fuel purposes (wood fuel, straw)	1152
Introduction of biogas technologies	1046
Construction of new and rehabilitation of existing HPPs	197
Construction of WPPs	318
Total	2713

Source: National Programme of Local and Renewable Energy Sources Development for 2011–2015

The aforesaid programmes provide for changes in the fuel and energy mix with respect to increasing the use of coal, peat and oil coke, which will result in higher levels of GHG emissions from energy and industrial installations in 2011–2015. However, the implementation of the planned measures for energy saving and the introduction of RES will mitigate this impact and reduce GHG emissions (by at least 11 Mt CO2eq.) to meet the international obligations of Belarus.

OVERALL ASSESSMENT OF THE PROGRESS

RB is a country with a growing economy. From 1997–2010, GDP increased by a factor of 2.4, while the level of energy consumption remained stable. The average annual growth rates equalled 7.0%. The main factor in the growth of Belarus's economy was the targeted and socially oriented economic policy of the state, including the state energy policy.

Energy saving and energy efficiency are key elements of the state energy policy of Belarus. From 1997–2010, the energy intensity of GDP was reduced by a factor of 2.3 at an average annual rate of 4.3%.

The country has developed a legislative framework, an institutional structure, support mechanisms (including financing), a system of target indicators and state programmes (national, sectoral and regional programmes, and the programmes of individual cities, enterprises and organisations) and has a monitoring system for their implementation.

Currently, the state energy saving policy is at a new stage of implementation and is aimed at the optimisation of the structure of the fuel and energy mix and modernisation of the economy. The strategic goal for 2015 is a 50% reduction in the energy intensity of GDP from the 2005 level and an increase in the share of local energy resources and RES in the boiler and furnace fuel mix.

The energy saving potential of low-cost organisational and economic measures has almost been used up. Today it is necessary to make significant investments in the modernisation of industry based on the introduction of energy efficient equipment and technologies and in the deployment of efficient energy production units, using local fuels and RES. The planned reform of the energy will provide favourable conditions for attracting investment in the energy sector.

Noticeable results include an intensive construction of mini-CHPs at enterprises and in communities throughout the country and a transfer to the mass-scale construction of energy efficient residential buildings. However, the development of legislation on implementing market mechanisms and improving the tariff setting system and the creation of conditions in which the state and businesses can co-operate remain the tasks of immediate importance in this respect.

A number of key laws are being developed currently (the Law on Electricity, Law on State Regulation of Tariffs for Electricity and Heat, Law on Heat Supply, a new version of the Law on Energy Saving, etc.); in addition, the plan is to implement reforms in the electricity sector.

The comprehensive development of local and renewable energy sources will be an important area of the energy strategy of RB for the coming periods. On 27 December 2010, the RB's Law on Renewable Energy Sources was adopted. Secondary legislation is being developed. The National Programme of Local and Renewable Energy Sources Development for 2011–2015 is in the process of implementation.

Energy Efficiency Legislation, Policies and Programmes

RB has determined the state strategy in the area of energy saving and RES and developed legislation on energy efficiency and energy saving (Annex 3). The currently effective Law on Energy Saving was adopted in 1998. The concept of a new draft of the law has been prepared; it predominantly contains the norms of direct effect. In 2010, the Law on Renewable Energy Sources was adopted.

The main instruments for implementing the policy and strategy are the programmes (national, sectoral and regional) that define the packages of specific measures, mechanisms of their implementation, scope and sources of financing, responsibility for their implementation and due dates.

One of the priorities of Belarus' policy on energy efficiency and renewable energy is the establishment of a system of technical norms and standards and their harmonisation with European and international standards. Standards and regulations will be developed for improvements in the energy efficiency of buildings, heat generation equipment, the utilisation of RES and local fuels; energy management and energy audits in organisations.

Institutional Infrastructure

An institutional infrastructure in the area of energy saving and RES in Belarus has been developed since the early 1990s. In 1993, the State Committee for Energy Saving and Energy Supervision was established, which was subsequently transformed into the Committee for Energy Efficiency and, in 2006, into the Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus.

The department develops and implements state policy on energy efficiency and RES, coordinates and monitors the policy implementation and provides for state control of the rational use of fuel, electricity and heat. Sectoral and regional governmental bodies have established departments and committees for the co-ordination and monitoring of energy saving programmes and measures the implementation.

Energy Reforms and Pricing

An energy supplier in Belarus may be any legal entity, irrespective of the form of incorporation and type of ownership, that sells electricity (generated or purchased) to consumers or owns or performs the economic management or operational control of power grids for the transmission of electricity to consumers or a source of electricity generation.

Pursuant to the Strategy and the prepared draft concept of the Law on Electricity a step-by-step reform of the electricity sector is planned. The reform provides for the unbundling of activities, development of market structures, harmonisation of legislation and development of wholesale and retail markets for electricity. This will support the harmonisation of Belarus' legislation and the compliance with obligations under international treaties. Basic provisions on electricity pricing and tariffs will be developed.

The government undertakes measures to improve tariff setting policy. In 2011, time-differentiated electricity tariffs for households and tariffs for electricity and heat for legal entities were determined. Efforts are being made to address cross-subsidies in tariffs for energy resources, which are to be phased out by 2015.

The system of tariffs for the sale of RES electricity (generated by individual entrepreneurs and legal entities not incorporated in Belenergo SPA) to energy supplying organisations of Belenergo SPA was adopted in 2006 and further developed in 2011.

Energy Efficiency Funding

The areas of Belarus' state policy on energy saving and energy efficiency include the planning and exploring of sources of financing for energy saving measures and RES.

Investments in energy saving increase annually. The structure of financing sources is changing. From 1996–2005, about 50% of investments were financed by state funds and about 40% from the equity capital of enterprises; however, from 2006–2010, equity capital remained the key source of financing. The share of state financing equalled one third and the share

of borrowings increased by up to 10% of the total financing. In 2010, loans and borrowings accounted for about one third of the total financing, while state funding sources accounted for about 25%. The structure of financing for energy saving purposes for 2011–2015 provides for an increase in the share of credits, loans and borrowings by up to 20%.

The plan is that from 2016–2010 and 2011–2020 the state targeted programmes will be financed through state support and private and private-public partnership and this will include foreign borrowings by attracting international financial institutions and national banks and banking institutions.

Renewable Energy, District Heating and Co-generation

Belarus has achieved a certain degree of progress in the development of a regulatory framework and provision of state support for renewable energy. The Law on Renewable Energy Sources, the National Programme of Local and Renewable Energy Sources Development for 2011-2015 and other regulations and targeted programmes have been adopted.

Belarus has developed heat supply systems. Large cities and industrial consumers are supplied with heat mainly on a centralised basis — from CHPs or district boiler houses — through external transmission or distribution heat supply networks. Generally, efficient state-of-the-art technologies (steam and gas turbines, gas-vapour cycle processes and waste heat boilers) are being used.

The country is implementing a programme of modernisation of the heat supply system (channelless laying of isolated pipes, introduction of heat pipeline control systems, automated systems of metering and regulation, quantitative/qualitative regulation, etc.).

The introduction of co-generation in Belarus is being carried out under the state programmes and initiatives of entrepreneurs and individual companies.

Forecasting and Monitoring

The state forecasting of social and economic development in Belarus is being carried out on a long-term, medium-term and short-term basis. The forecasts determine the areas, criteria, principles, goals and priorities for development with the establishment of the main forecasted indicators, targets and measures required for their achievement.

One of priorities of the National Strategy of Sustainable Social and Economic Development of RB for the period until 2020 is to reduce the energy intensity of GDP through the implementation of the technological, structural and organisational potential for energy saving.

A system of controlling the implementation of energy saving programmes and compliance with target indicators has been set up. The Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus (with its subordinated organisations) is the main institution to carry out the monitoring of the state policy on energy saving and RES and provides for the state control of the rational use of fuel, electricity and heat.

RECOMMENDATIONS

The following recommendations are offered to promote energy efficiency and RES in RB.

General Recommendations

- The Belarusian Government sets strategic goals in the area of energy efficiency and energy saving to ensure energy security and improve the living standards of the population and the competitiveness of the national economy. To achieve these goals the government should implement energy sector reform, which will provide for the use of market mechanisms and the potential for investments in energy efficient technologies and equipment.
- The government should assess the synergies of the national programmes in the area of energy efficiency, renewable energy and environmental protection in order to improve the results and the cost-effectiveness of the programmes.
- The government should continue reviewing the implementation of the state policy on energy efficiency and RES to identify deviations from the foreseen development in a timely manner and undertake corrective actions.
- The government should use the achieved results and further develop and expand the research and efforts to reduce end-use energy losses as well as to continue to provide financing for these measures.
- The government should encourage and stimulate co-operation between national scientific institutions and the international scientific and engineering community for the further development of advanced technologies and the implementation of pilot projects on energy efficiency and renewable energy.
- In order to increase the share of domestic energy resources the government should pay special attention to the promotion of RES. To ensure compatibility with international data, RES should be always accounted for and recorded separately from non-renewable domestic energy resources. Furthermore, it is necessary to establish individual target indicators for RES and other local energy sources.
- RB should consider using municipal solid waste at incineration plants for the purposes of generating electricity and/or heat. In order to minimise any harmful effects on the environment, these plants should meet strict emission standards.

Regulatory and Institutional Framework

- The government should actively proceed with the harmonisation of technical regulations on energy efficiency and RES with international and European legislation, which has been initiated in RB.
- The government should finalise the adoption of a new draft Law on Energy Saving in accordance with the declared time schedule.
- Upon the adoption of the new Law on Energy Saving, the government should provide for further development of secondary legislation and regulatory documents in different sectors in close co-operation with respective stakeholders.
- The government should improve the status of the Department of Energy Efficiency and establish it as a separate structure within the government.

- The government should ensure that sufficient human and financial resources are allocated to the Department of Energy Efficiency as the leading agency, as well as to all units within ministries and regional administrations responsible for the development and implementation of energy efficiency programmes.

Energy Reforms and Pricing

- The government should provide for the adoption of market oriented principles and a respective regulatory framework on the basis of international experience when developing energy sector legislation.
- The government should consistently pursue the policy of restructuring energy prices (tariffs) to remove cross-subsidies.
- The government should continue with planned activities on energy pricing reform to achieve the level of prices that reflects the costs of production.
- The government should review the possibility of the further long-term differentiation of the incentives for electricity generated from RES depending on the types of RES.

Energy Efficiency Funding

- The procedures for reviewing and approving financial support from donors should be revisited to ensure that no delays caused by the approval process lead to the cancellation of potential financing.
- The government should analyse and identify a system of measures aimed at the accelerated improvement of energy efficiency and the RES financing structure to increase the share of equity capital, private capital, loans and borrowings.
- The government should encourage the establishment and functioning of ESCOs and other market mechanisms for attracting investments in energy efficiency and to initiate an exchange of experience, training and pilot projects in co-operation with international organisations.
- The government should strengthen co-operation with commercial banks to establish and promote financial and credit products in the area of energy efficiency technologies and energy saving equipment.
- The government should guarantee that financial resources saved through energy efficiency measures are accumulated in the budgets of respective organisations undertaking such measures.

Specific Energy Efficiency Programmes and Measures

Industry

- The government should continue ambitious energy efficiency and energy saving programmes in industry.
- The government should provide for regular benchmarking analysis of similar production processes' energy efficiency and compare the unit consumption of energy resources for the production of goods in order to align with the best international practices.

Buildings

- The government should pay special attention to ensuring compliance with adopted building codes and rules.
- The government should continue to lead the way in the sphere of public buildings and the construction of new housing.

District heating

- The government should continue efforts to reduce losses within the district heating system

Electricity

- The government should continue efforts to improve energy efficiency in the electricity sector.
- The government should provide for the use of the best available energy efficient technologies at new power plants, including those based on the use of biomass.
- To facilitate the use of available biomass potential, the government should develop a logistic support system for biomass transportation to power plants.
- The government should continue to support investments in co-generation.

Renewable Energy

- Given the importance of escalating the use of domestic energy sources and RES in Belarus and the attention the government pays to these areas of the energy policy and the availability of special state programmes, we recommend that specify separate target indicators be differentiated and special systems of performance monitoring and record keeping of the results be set up.
- The government should improve the institutional framework in the renewable energy sector to provide for better organisation and co-ordination in implementing the strategic goals established.
- To provide for the implementation of the adopted Law on Renewable Energy Sources it is recommended that the development and adoption of secondary legislation be accelerated.
- The government should continue encouraging the use of biomass at CHPs to increase the share of RES in electricity and heat generation.

Monitoring

- For the purposes of improvement, it is recommended that a comparative analysis of the monitoring systems applied in the sphere of efficiency and renewable energy in RB be conducted against international practices.
- The government should assess and monitor the cost effectiveness of all energy efficiency plans and measures in order to develop a comprehensive data base for the optimisation of energy efficiency plans and programmes to maximise their benefits.

Information, Training and Awareness Raising

- The government should continue to support measures aimed at raising awareness of energy efficiency and educating public officials and the wider population at local, regional and national levels.

ANNEX 1: GENERAL ECONOMICS AND ENERGY DATA

Table 14: Energy balance, ktoe

Indicator	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total primary energy production	3.340	3.319	3.518	3.599	3.679	3.578	3.627	3.813	3.917	4.010	4.032	4.045
Import	62.909	24.760	28.391	27.764	30.411	32.248	36.236	37.705	40.572	39.459	41.702	39.571
Export	20.617	3.124	7.273	6.691	9.070	10.062	12.935	14.730	15.876	15.696	17.057	17.359
Net import	42.292	21.636	21.118	21.073	21.341	22.186	23.301	22.975	24.696	23.763	24.645	22.212
Total primary energy supply (TPES)	45.548	24.748	24.684	24.774	25.252	25.999	26.878	26.873	28.629	28.058	28.145	26.760
Total final consumption (TFC)	34.622	18.350	18.287	18.481	18.754	19.412	19.279	19.311	20.758	20.293	20.020	19.406

Source: IEA Energy Statistics, electronic version, 2011

Table15: Total primary energy supply structure (TPES), ktoe

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Coal	1.459	674	371	295	238	173	98	67	39	15	-26	-76
Peat	975	712	587	539	473	498	517	544	541	544	536	590
Oil and gas condensate	39.749	13.328	13.524	13.381	15.313	15.849	18.556	19.934	21.395	21.472	21.441	21.767
Oil products	-10.192	-2.462	-5.631	-5.643	-7.132	-7.520	-10.302	-12.226	-12.397	-13.160	-13.193	-12.202
Natural gas	12.541	11.487	14.255	14.449	14.711	15.312	16.607	16.938	17.246	17.348	17.688	14.688
Hydro	1.7	1.7	2.3	2.6	2.5	2.4	2.8	3.1	3.0	3.0	3.4	3.8
Solar/wind/ other	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1
Biofuel and waste	204	391	955	1.038	1.082	1.098	1.120	1.266	1.427	1.462	1.537	1.605
Electricity	811	616	620	711	564	587	280	347	375	374	158	385
Total primary energy supply (TPES)	45.548	24.748	24.684	24.774	25.252	25.999	26.878	26.873	28.629	28.058	28.145	26.760

Source: IEA Energy Statistics, electronic version, 2011

Table 16: TFC, ktoe

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Coal	1679	950	587	472	426	400	360	392	400	362	336	312
Peat	26	8	6	5	4	2	4	3	7	6	4	6
Oil products	15.608	5.465	5.368	5.196	5.689	6.069	5.888	5.630	6.642	6.479	6.218	5.488
Natural gas	4.452	3.127	3.369	3.442	3.580	3.814	3.998	4.154	4.411	4.562	4.692	4.603
Biofuel and waste	204	391	748	796	804	792	775	863	949	931	1.030	1.406
Electricity	3.414	2.177	2.303	2.296	2.268	2.297	2.343	2.380	2.448	2.468	2.530	2.381
Heat	9.239	6.233	5.906	6.274	5.984	6.037	5.913	5.888	5.906	5.483	5.208	5.211
Total final consumption	34.622	18.350	18.287	18.481	18.754	19.412	19.279	19.311	20.758	20.293	20.020	19.406

Source: IEA Energy Statistics, electronic version, 2011

Table17: Basic energy related indicators

Indicator	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Population (million)	10.19	10.19	10.01	9.97	9.93	9.87	9.82	9.78	9.73	9.70	9.68	9.66
GDP (billion 2000 USD)	14.36	9.38	12.74	13.34	14.01	15.00	16.72	18.02	19.92	21.88	24.35	24.70
GDP (billion 2000 USD PPP)	54.19	35.38	48.05	50.32	52.86	56.59	63.06	67.99	75.13	82.53	91.86	93.18
Energy intensity (TPES/ GDP) (toe per thousand 2000 US$ PPP)	0.84	0.70	0.51	0.49	0.48	0.46	0.43	0.40	0.38	0.34	0.31	0.29
Energy consumption/ capita (toe)	4.47	2.43	2.47	2.48	2.54	2.63	2.74	2.75	2.94	2.89	2.91	2.77
Electricity consumption/GDP (kWh/2000 USD) (кВт*ч/2000US$)	3.11	3.03	2.35	2.24	2.11	2.00	1.85	1.74	1.62	1.48	1.36	1.27
Electricity consumption/ capita (kWh)	4.381	2.790	2.989	2.997	2.983	3.039	3.144	3.208	3.322	3.345	3.427	3.245
Electricity and heat related CO2, emissions (Mt)	61.71	36.41	33.43	33.49	33.15	33.14	35.81	35.22	36.10	34.13	35.06	33.56

Source: IEA Energy Statistics, electronic version, 2011

Table18: Electricity generation , GWh

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Coal	0	0	0	0	0	0	0	0	0	0	0	2
Peat	0	0	0	0	4	4	4	4	4	8	10	13
Oil products	18.899	6.999	1.714	1.456	1.355	1.086	1.515	911	1.466	174	959	5.356
Natural gas	20.607	17.899	24.360	23.577	25.068	25.509	29.657	29.980	30.212	31.523	33.958	24.818
Hydro	20	20	27	30	29	28	33	36	35	35	39	44
Solar/wind/other	0	0	0	0	0	0	1	1	1	1	1	1
Biofuel and waste	0	0	0	0	0	0	0	29	93	88	81	142
Total	39.526	24.918	26.101	25.063	26.456	26.627	31.210	30.961	31.811	31.829	35.048	30.376

Source: IEA Energy Statistics, electronic version, 2011

Table 19: Heat generation, ktoe

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Coal	345	203	194	147	126	110	91	79	67	55	49	50
Peat	85	51	36	36	32	33	33	33	33	38	38	44
Oil products	6.036	2.299	1.170	1.179	1.082	887	682	576	601	293	309	1.090
Natural gas	3.717	4.471	5.112	5.528	5.379	5.692	5.830	5.948	5.966	5.753	5.442	4.661
Biofuel and waste	0	0	149	177	196	212	237	267	292	330	358	386
Total	10.183	7.023	6.663	7.067	6.816	6.934	6.873	6.902	6.959	6.469	6.197	6.230

Source: IEA Energy Statistics, electronic version, 2011

ANNEX 2:
SELECTED END-USE DATA TABLES

Table20: TFC by sector, ktoe

Sector	1990	1995	2000	2005	2006	2007	2008	2009
Residential	5.124	4.965	5.379	5.928	6.261	5.973	5.970	5.914
Industry	9.564	4.537	4.921	5.119	5.200	5.299	5.479	4.744
Commercial and public services	4.478	2.675	1.913	2.017	1.988	1.848	1.705	2.077
Transport	3.661	2.076	1.953	1.996	2.212	2.295	2.533	2.538
Agriculture/forestry	2.221	1.265	1.070	1.015	1.085	1.120	1.227	1.098
Non-energy use	9.320	2.762	3.011	3.222	3.989	3.723	3.052	3.031
Other	253	70	40	16	23	35	54	0
Total	34.621	18.350	18.287	19.311	20.758	20.293	20.020	19.406

Source: IEA Energy Statistics, electronic version, 2011

Table21: Final energy consumption in the residential sector , ktoe

Energy products	1990	1995	2000	2005	2006	2007	2008	2009
Coal	1.009	433	383	245	255	229	205	180
Peat	0.24	1.25	1.7	0.73	0.97	1.94	0.97	0.49
Oil products	696	659	657	1.003	1.254	1.214	1.378	1.158
Natural gas	752	916	1.003	1.165	1.190	1.199	1.198	1.295
Biofuel and waste	142	269	500	562	620	582	548	519
Electricity	300	419	479	512	493	517	544	556
Heat	2.225	2.268	2.355	2.440	2.449	2.230	2.097	2.207
Total	5.124	4.965	5.379	5.928	6.262	5.973	5.970	5.915

Source: IEA Energy Statistics, electronic version, 2011

Table22: Final energy consumption in services sector , ktoe

Energy products	1990	1995	2000	2005	2006	2007	2008	2009
Coal	573	467	134	72	69	56	52	55
Peat	0.49	0.49	1.22	0.73	0.97	3.4	3.89	2.92
Oil products	979	166	9.6	29	39	32	38	84
Natural gas	1.058	406	79	103	38	27	36	52
Biofuel and waste	57	115	91	130	146	155	154	182
Electricity	492	440	390	421	451	458	459	499
Heat	1.319	1.080	1.208	1.261	1.245	1.117	962	1.202
Total	4.478	2.675	1.913	2.017	1.989	1.848	1.705	2.077

Source: IEA Energy Statistics, electronic version, 2011

Table 23: Final energy consumption in industry sector , ktoe

Energy products	1990	1995	2000	2005	2006	2007	2008	2009
Coal	55	32	54	57	57	57	54	50
Peat	21	4.9	1.9	0.5	0.2	0	0	0
Oil products	1.791	646	269	205	201	206	206	127
Natural gas	611	413	1.200	1.545	1.544	1.684	1.782	1.633
Biofuel and waste	0	0	145	145	153	157	199	237
Electricity	1.941	913	1.110	1.144	1.197	1.214	1.249	1.061
Heat	5.145	2.528	2.141	2.023	2.048	1.980	1.989	1.636
Total	9.564	4.536	4.921	5.119	5.200	5.298	5.479	4.744

Source: IEA Energy Statistics, electronic version, 2011

Table24: Final energy consumption: non-energy use, ktoe

Energy products	1990	1995	2000	2005	2006	2007	2008	2009
Coal	0	0.6	8.4	8.2	10.1	9.4	15.4	15.6
Peat	0	0	1.5	1.5	0.2	0.5	0.2	0.5
Oil products	7.415	1.479	2.084	2.109	2.727	2.534	1.882	1.832
Natural gas	1.905	1.283	917	1.103	1.252	1.179	1.154	1.183
Total	9.320	2.762	3.011	3.222	3.989	3.723	3.052	3.031

Source: IEA Energy Statistics, electronic version, 2011

Table25: Final energy consumption in agriculture and forestry, ktoe

Energy products	1990	1995	2000	2005	2006	2007	2008	2009
Coal	30	8.5	1.3	2	2.3	2.4	2.5	3.5
Peat	3.9	1.5	0	0.7	1	0.7	0.5	0.5
Oil products	1.149	605	675	675	726	760	846	691
Natural gas	63	40	21	25	29	40	56	72
Biofuel and waste	5	7	12	27	29	37	38	39
Electricity	419	247	159	122	133	123	123	126
Heat	551	356	202	164	165	157	162	166
Total	2.221	1.265	1.070	1.015	1.085	1.120	1.228	1.098

Source: IEA Energy Statistics, electronic version, 2011

Table26: Energy consumption in industry by subsector , ktoe

Subsector	1990	1995	2000	2005	2006	2007	2008	2009
Iron and steel	213	120	219	253	267	273	295	269
Chemical and petrochemical	2.905	1.614	1.616	1.683	1.609	1.725	1.727	1.360
Non-ferrous metals	5.5	1.36	0.97	1.04	1.09	0.93	3.99	4.28
Mining and quarrying	0	0	0	0	0	0	0	13
Non-metallic minerals	1.276	677	993	1.143	1.240	1.290	1.378	1.281
Transport vehicles	6.28	1.98	3.61	3.87	4.56	4.64	5.07	6.92
Machinery	1.723	730	597	614	630	602	634	503
Food and tobacco	964	607	673	640	650	656	677	705
Paper, pulp and printing	57	41	52	62	62	61	60	40
Forestry	459	238	257	279	272	262	264	219
Construction	750	139	107	120	122	126	140	82
Textile and leather	554	189	179	163	160	143	152	135
Other	652	178	223	157	182	156	143	126
Total	9.564	4.536	4.921	5.119	5.200	5.299	5.479	4.744

Source: IEA Energy Statistics, electronic version, 2011

ANNEX 3: SYSTEM OF MAJOR POLICY DOCUMENTS AND ACTS RELATED TO ENERGY SAVING AND RES

Directive No. 3 of the President of the Republic of Belarus (dated 14 June 2007) *Saving and Thrift are the Key Factors of Economic Security of the State*;

Law of RB of 15 July 1998 *On Energy Saving;*

Law of RB of 27 December 2010 *On Renewable Energy Sources;*

Resolution of the Committee for Energy Efficiency within the Council of Ministers of the Republic of Belarus (RB) of 19 November 2002 No. 9 *On Approval of Regulation on Rationing Consumption of Fuel, Heat and Electricity in the Economy of Belarus*;

Resolution of the Council of Ministers of RB of 14 February 2003 No. 189 *On Approval of Regulation on Accumulation and Use by Budgetary Organisations of Funds Designated for Payment of Fuel, Energy Saved through Use of Energy Efficient Equipment and Materials;*

Resolution of the Council of Ministers of RB of 18 October 2004 No. 1301 *On Approval of Regulation on the Procedure of Expert Review of Energy Saving Programmes and Measures;*

Resolution of the Council of Ministers of RB of 29 July 2006 No. 964 *On Energy Audits at Organizations;*

Resolution of the Council of Ministers of RB of 31 August 2007 No. 1124 *On Incentives for Employees for Saving and Rational Use of Fuel, Energy and Materials;*

Resolution of the Council of Ministers of RB of 31 October 2007 No. 1421 *On Approval of the Programme of Technical Reequipment and Modernization Foundry Engineering, Thermal, Electroplating and Other Energy Intensive Processes for 2007–2010;*

Resolution of the Council of Ministers of RB of 23 January 2008 No. 94 *On Approval of the State Programme 'Peat" for 2008–2010 and until 2020;*

Resolution of the Council of Ministers of RB of 20 February 2008 No. 229 *On Approval of Regulation on a Procedure of Developing and Approving National, Sectoral and Regional Energy Saving Programmes;*

Resolution of the Council of Ministers of RB of 1 June 2009 No. 706 *On Approval of Comprehensive Programme of Design, Construction and Refurbishment of Energy Efficient Residential Buildings in the Republic of Belarus for 2009–2010 and until 2020;*

Resolution of the Council of Ministers of RB of 22 February 2010 No. 248 *On Measures for Improving the Efficiency of Fuel and Energy Resources Utilization until 2012;*

Resolution of the Council of Ministers of RB of 9 June 2010 No. 885 *On Approval of the Programme of Construction of Generation Facilities Using Biogas for 2010–2012;*

Resolution of the Council of Ministers of RB of 19 July 2010 No. 1076 *On Approval of the State Programme of Construction of Generation Facilities Using Local Fuels Sources for 2010–2015;*

Resolution of the Council of Ministers of RB of 9 August 2010 No. 1180 *On Approval of the Economic Potential Development Strategy of the Republic of Belarus;*

Resolution of the Council of Ministers of RB of 3 November 2010 No. 1626 *On Approval of the State Programme of Forestry Sector Development in the Republic of Belarus for 2011–2015;*

Resolution of the Council of Ministers of RB of 17 December 2010 No. 1838 *On Approval of the State Programme of Hydro Power Plants Construction in 2011–2015 in the Republic of Belarus;*

Resolution of the Council of Ministers of RB of 24 December 2010 No. 1882 *On Approval of the Republican Energy Saving Programme for 2011–2015;*

Resolution of the Council of Ministers of RB of 8 February 2011 No. 157 *On Approval of Measures on Implementation of Directive No. 3 of the President of the Republic of Belarus 'Saving and Thrift are the Key Factors of Economic Security of the State' for 2011–2015 and On Recognizing as Non Valid of a Number of Resolutions of the Council of Ministers of the Republic of Belarus.*

Resolution of the Council of Ministers of RB of 10 May 2011 No. 586 *On Approval of the National Programme of Local and Renewable Energy Sources Development for 2011–2015;*

Resolution of the Council of Ministers of RB of 25 May 2011 No. 663 *On Certain Issues of Electricity and Natural Gas Consumption in 2011.*

ANNEX 4: HOUSEHOLD TARIFFS[6] FOR ELECTRICITY AND HEAT

Electricity

The tariffs were approved by Resolution of the Council of Ministers of RB dated 4 February 2011 No. 138 (as amended by the Resolution of the Council of Ministers of RB dated 31 October 2011 No. 1459):

	Tariff, BYR[7] /kWh
1. Electricity in residential buildings (flats) equipped in due order with electric stoves	
1.1. One-tier tariff	202.6
1.2. Two-tier tariff differentiated based on time period of the day:	
Minimum load (from 22.00 to 17.00)	141.8
Maximum load (from 17.00 to 22.00)	405.2
2. Electricity for heat and hot water supply with connected capacity exceeding 5 kW:	
Minimum load (from 23.00 to 6.00)	238.5
Other part of the day	715.5
3. Electricity, other purposes than in sections 1 and 2 of the Annex:	
3.1. One-tier tariff	238.5
3.2. Two-tier tariff differentiated based on time period of the day	
Minimum load (from 22.00 to 17.00)	167.0
Maximum load (from 17.00 to 22.00)	477.0

Prices (tariffs) for housing and utilities services, which provide for full recovery of economically justified costs, were put into effect from 1 June 2012 by the Resolution of the Council of Ministers of RB dated 28 May 2012 No. 486:

	Price, BYR/kWh
Electricity:	
1. One-tier tariff	445.6
2. Two-tier tariff differentiated based on time period of the day	
Minimum load (from 22.00 to 17.00)	311.9
Maximum load (from 17.00 to 22.00)	**891.2**

Heat for heating and hot water supply

The tariff was approved by the Resolution of the Council of Ministers of RB dated 28 May 2012 No. 486, with effect from 1 June 2012 — BYR 60,140/Gcal.

[6] *Source: http://www.tarify.by/, 2012*

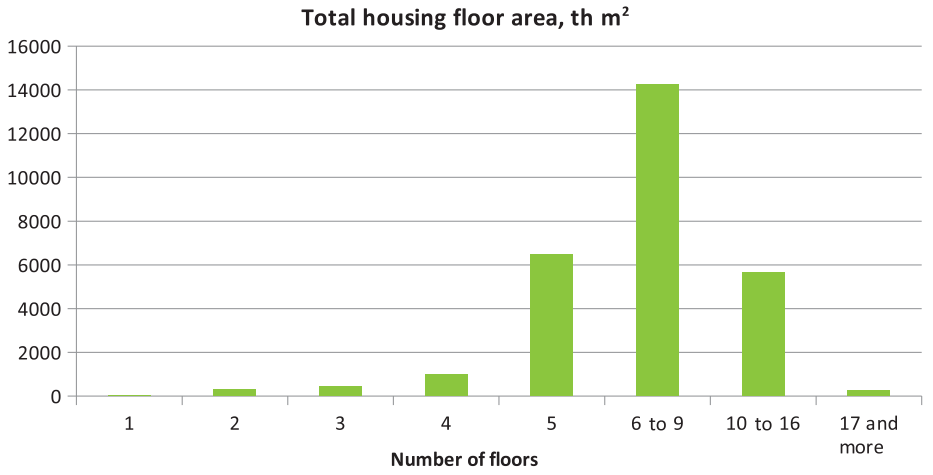
[7] *1 EUR = 10,065.20 BYR as of 20 July 2012, source http://www.xe.com*

ANNEX 5: ENERGY SAVING IN THE HOUSING AND UTILITIES SECTOR OF BELARUS

Belarus has established the requirements for energy efficiency in new buildings under construction and buildings being rehabilitated, including the values of their energy performance. The standard heat-transfer resistance of building envelopes should not be lower than the following values: outside walls of all types of building materials – 3,2 m^2 x°C/W; combined covering and attic floor covering – 6 m^2 x°C/W; and windows and balcony doors – 1 m^2 x°C/W. The designs of the envelopes of newly constructed buildings will provide for the annual unit consumption of heat for heating purposes and the ventilation of multi-storey buildings (high-rise and medium) not exceeding 60 kWh/m^2 p.a. with free ventilation and not exceeding 40 kWh/m^2 p.a. with heat recovery mechanical ventilation.

The structure of the housing stock maintained and operated by the enterprises of the Ministry of Housing and Utilities is presented in Figure 69. Tables 27 and 28 present the characteristics of multi-storey residential buildings in various years of construction and newly constructed energy efficient buildings.

Figure 69: Structure of housing stock maintained and operated by housing maintenance enterprises in the Ministry of Housing and Utilities of RB



Source: Republic Unitary Enterprise «Institute NIPTIS named after S.S. Ataev» , 2012

Table 27: Characteristics of multi-storey buildings in Belarus

Characteristics of multistory buildings	Heat resistance, m^2°C/W				Ventilation type	Unit consumption of heat
	Walls	Windows	Flooring	Roofing		
Before 1993	0.8-1	0.38	1	1	Natural	130
1993-2009	2-2.5	0.6	3	1.5	Natural	85
After 2009	3.2	1	6	2.5	Natural	60
Energy efficient	3.2	1	6	2.5	Mechanical ventilation with heat recovery	40

Source: Republic Unitary Enterprise «Institute NIPTIS named after S.S. Ataev», 2012

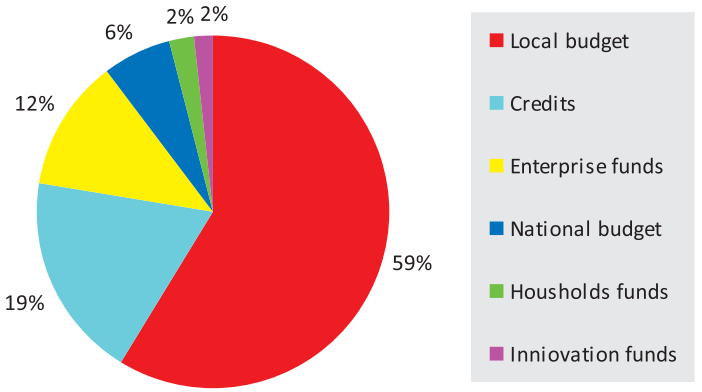
Table 28: Characteristics of constructed energy efficient buildings

Standard heat-transfer resistance (m^2 x oC/W) walls – 3.2; top storey flooring – 6; over basement – 2/5; windows – 1							
City	Wall design	Year of Construction	Number of floors	Number of flats	Heated area	Unit consumption of heat for heating. kWh/$м^2$ /year	
						Standard	Energy efficient
Vitebsk	Masonry material	2010	10	120	6.726	94.81	32.36
		2009	10	40	2.119		31.53
Gomel	Masonry material	2009	10	36	2.696	87.07	29.28
Grodno	Material	2009	9-11	68	4.456	82.55	30.40
Minsk	Reinforced concrete panels	2007	9	144	9.491	85.91	31.70

Source: *Republic Unitary Enterprise «Institute NIPTIS named after S.S. Ataev», 2012*

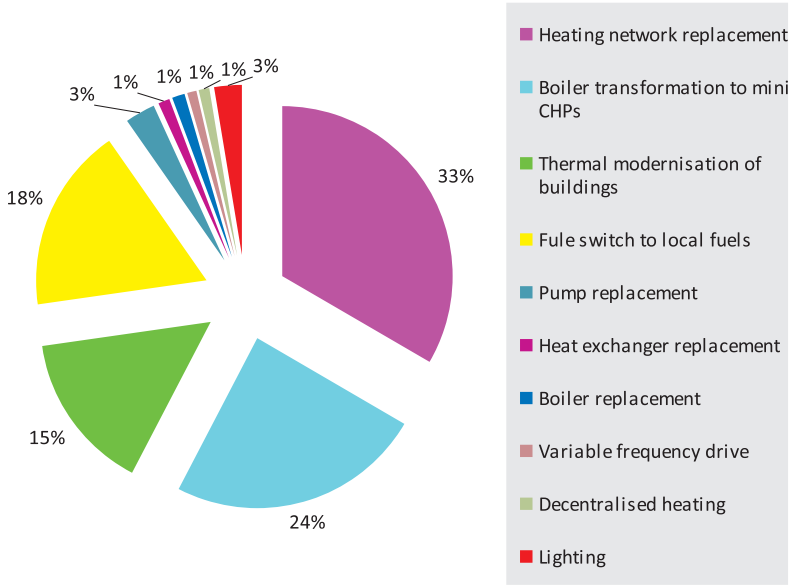
Figure 70: Energy efficient buildings of the 111-90 MAPID series in Minsk, the capital of Belarus

Figure 71: Sources of investments in energy saving in the housing and utilities sector in 2010, % of total expenditures



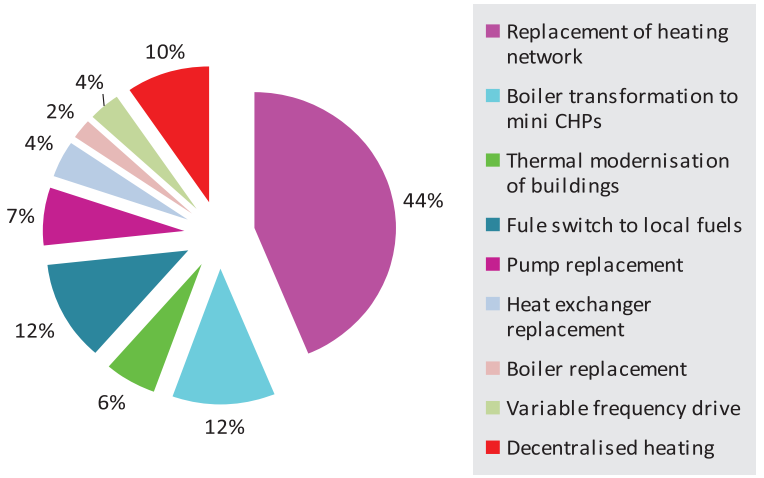
Source: Ministry of Housing and Utilities of RB, 2012

Figure 72: Areas of investments in energy saving measures in the housing and utilities sector, 2010, % of total costs



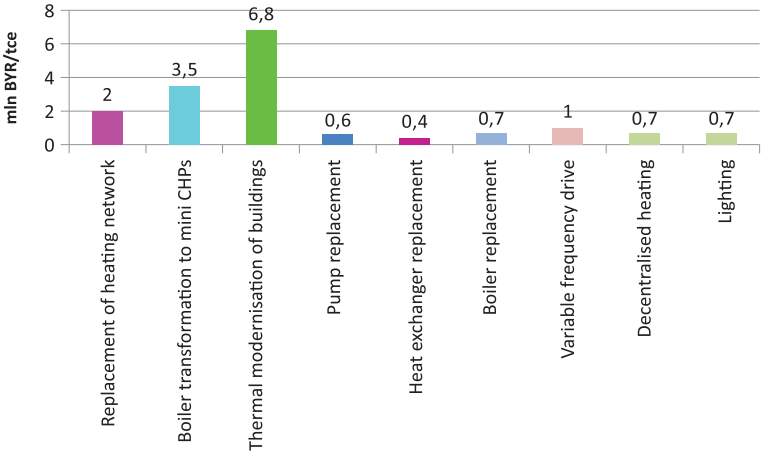
Source: Ministry of Housing and Utilities of RB, 2012

Figure 73: Annual economic benefit of energy saving measures in 2010, % of total energy saved



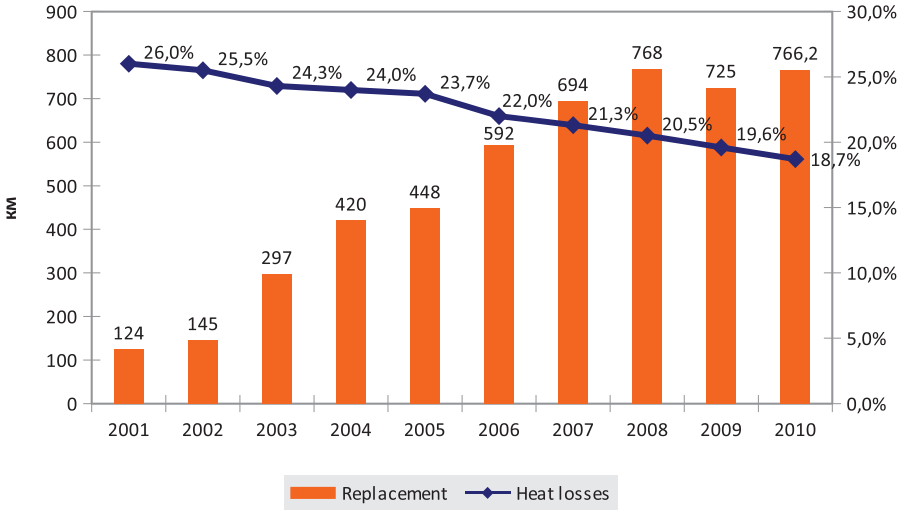
Source: Ministry of Housing and Utilities of RB, 2012

Figure 74: Unit cost of 1 tce of energy saved in the housing and utilities sector, BYR million in 2010



Source: Ministry of Housing and Utilities of RB, 2012

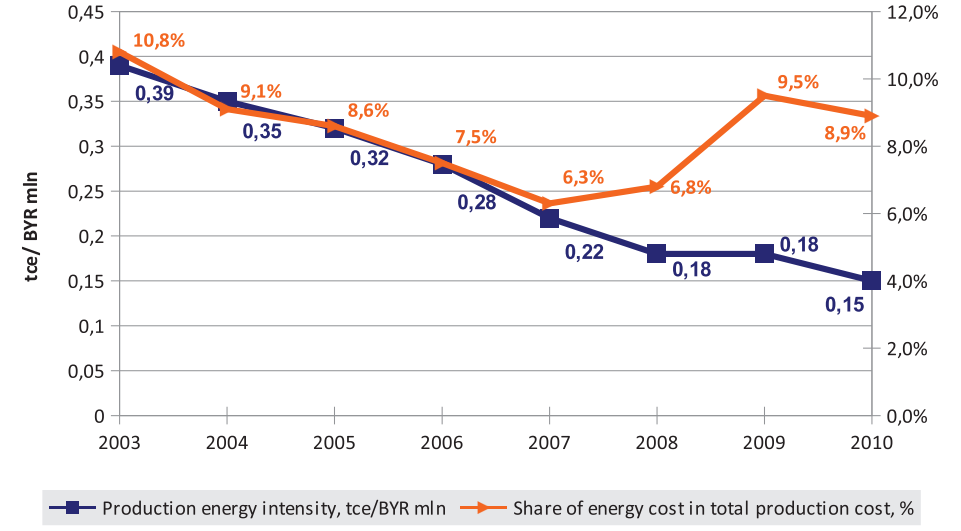
Figure 75: Replacement of heating networks of the housing and utilities sector enterprises in Belarus, 2001–2010

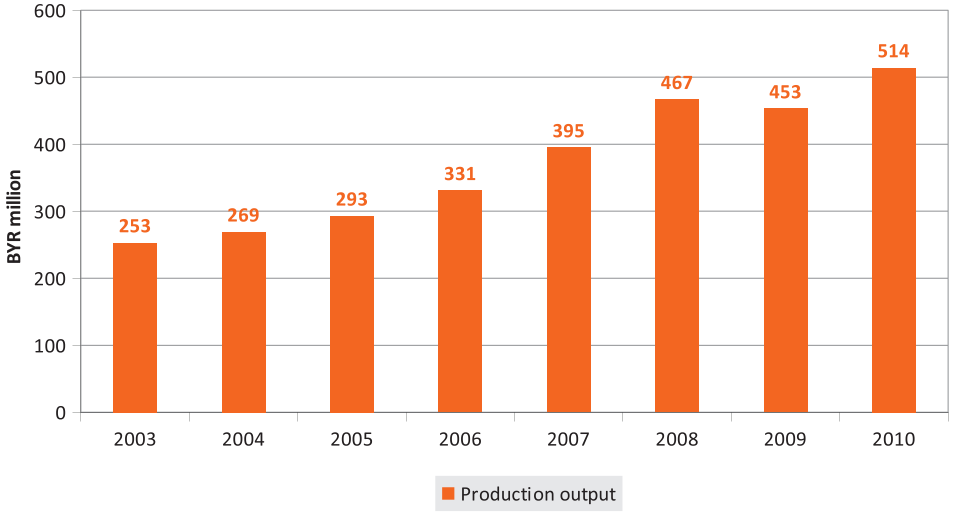


Source: Ministry of Housing and Utilities of RB, 2012

ANNEX 6: EXAMPLES OF THE RESULTS OF ENERGY EFFICIENT MEASURES IMPLEMENTED AT INDUSTRIAL ENTERPRISES IN BELARUS

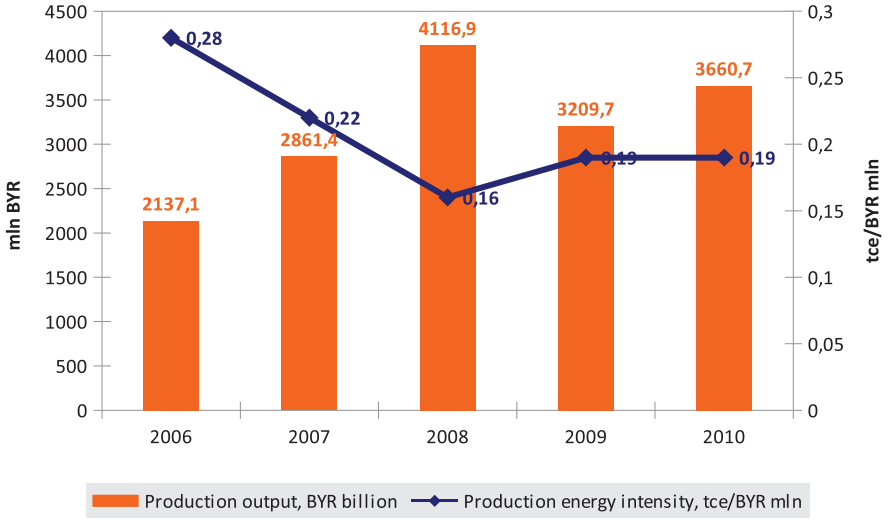
Figure 76: Energy efficiency indicators of OJSC Grodno Khimvolokno





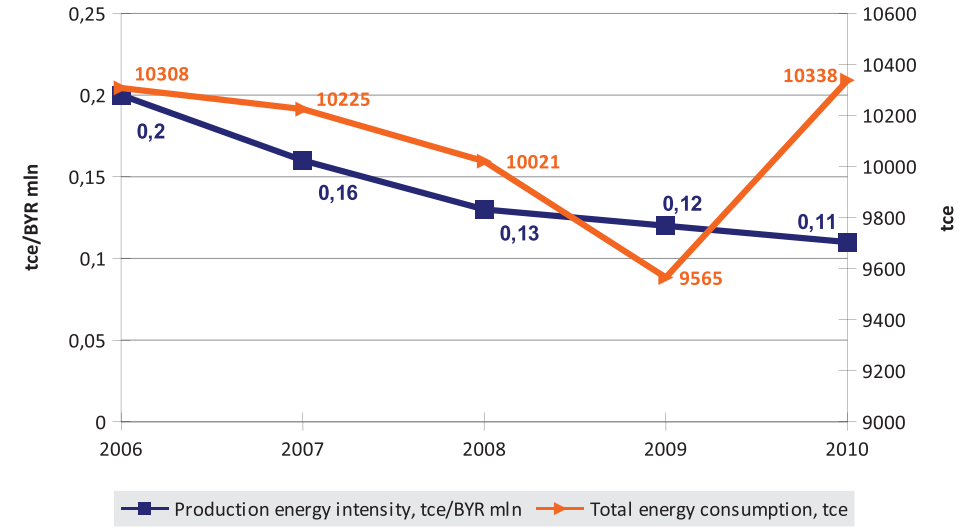
Source: Department of Energy Efficiency of the State Committee for Standardization of RB

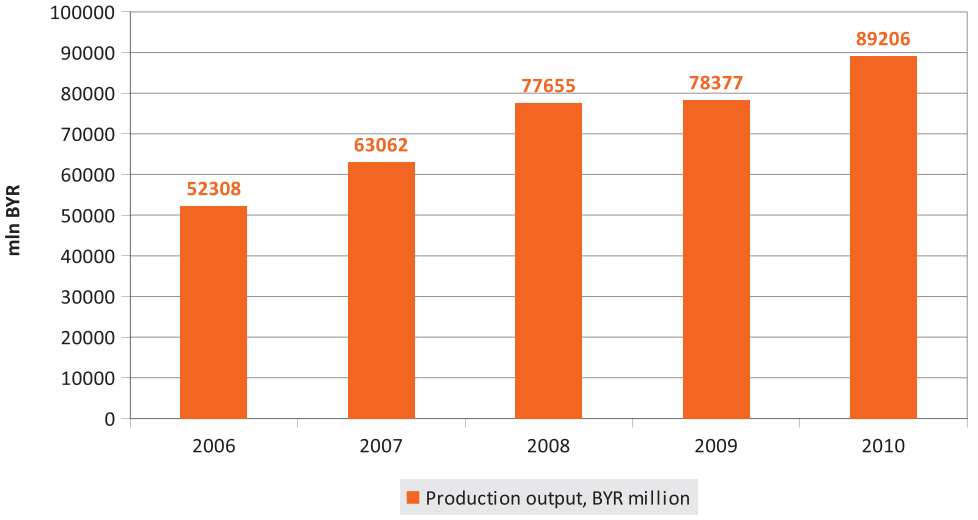
Figure 77: Energy efficiency indicators of RUE Byelorussian Steel Works



Source: Department of Energy Efficiency of the State Committee for Standardization of RB

Figure 78: Energy efficiency indicators of OJSC Ivatsevichidrev





Source: Department of Energy Efficiency of the State Committee for Standardization of RB

ANNEX 7: DEVELOPMENT OF ENERGY EFFICIENT FURNACES

Scientists at the A.V. Lykov Heat and Mass Transfer Institute of the National Academy of Sciences of Belarus conducted stock-taking and energy audits for the furnaces. The findings of the survey are as follows.

- While the total amount of thermal and heating equipment was 1,886 units, the ratio was one gas furnace per more than five electric furnaces.
- Breakdown of electric furnaces by year of commissioning. It was identified that an 'average' furnace was built in 1978 and the annual average rate of commissioning new equipment from 2001–2009 was 12 furnaces, or one furnace monthly; an 'average' gas furnace was built in 1970 and the annual average rate of commissioning new equipment from 2001–2009 was two furnaces.
- The average efficiency of surveyed gas furnaces was 10.5%, that is, 900 m^3 per each 1,000 m^3 of natural gas were wasted for nothing.

Based on energy audits, various factors associated with energy saving with respect to furnace equipment were identified: design, technological (thermal processing modes) and organizational/logistic factors. The researchers identified specific shortcomings in the furnace equipment (Figure 79) and developed designs for new furnaces and their elements (Figure 80) with the manufacturing, testing and bringing to commercial production of pilot models of the most popular standard sizes.

Special energy audits of electrothermal equipment (1,600 units) were conducted at Belarus' enterprises: chamber type furnaces, pit type furnaces, induction heaters, endothermic gas generators, salt-baths, etc.

New designs that have been proposed and implemented have achieved a substantial saving of electricity. For instance, 30-40% energy saving for fixed-bottom chamber type electric resistance furnaces and 50% for pit type electric resistance furnaces as compared to outdated analogues.

Figure 79: Old design of a furnace (temperature – 800˚C) and furnace door with an inadequate fit

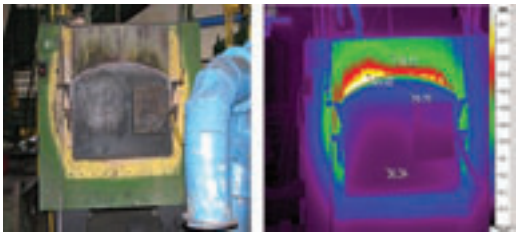
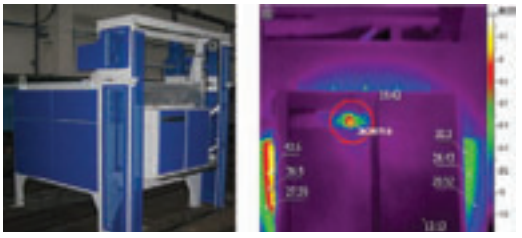


Figure 80: New design of a furnace (temperature – 1000˚C) and furnace door with a tight fit



ANNEX 8: ORGANISATIONS CONTACTED BY THE REVIEW TEAM

Ministry of Economy
Ministry of Energy of the Republic of Belarus
Ministry of Architecture and Construction of the Republic of Belarus
Ministry of Industry of the Republic of Belarus
Ministry of Transport and Communications of the Republic of Belarus
Ministry of Natural Resources and Environmental Protection of the Republic of Belarus
Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus
Delegation of the European Union to Belarus
World Bank Resident Mission in the Republic of Belarus
UNDP Resident Mission in the Republic of Belarus

Representatives of the following ministries and departments were also present at the meetings:
Ministry of Foreign Affairs of the Republic of Belarus,
Ministry of Housing and Utilities of the Republic of Belarus,
Ministry of Agriculture and Food,
State Military Industrial Committee
State Committee for Standardization,
Minsk City and regional executive committees
Minsk City Department for Supervision of Rational Use of Fuel and Energy Resources
Belneftekhim (Belarusian State Concern for Oil and Chemistry)
Belenergo SPA
Beltopgas
Belarusian Light Industry Concern 'Bellegprom'
Bellesbumprom Concern
BelNIIlit OJSC
Republican Association of Enterprises Industry BelAPP
National Academy of Sciences of Belarus (NASB)
Institute BelNIIS RUE
Institute NIISM State Enterprise
OJSC Avtorempromproekt
OJSC Minsk Wheel Tractor Plant
OJSC MEMZ (Minsk Electromechanical Plant)
State Scientific and Production Association AGAT
A.V. Lykov Heat and Mass Transfer Institute of the National Academy of Sciences of Belarus
Research and Design Technological Republican Unitary Enterprise
'Institute NIPTIS named after S.S. Ataev'
Economic Research Institute of the Ministry of Economy of the Republic of Belarus
Research and Design Republican Unitary Enterprise BelTEI
RUE Belinvestenergosberzhenie and others.

ANNEX 9: LIST OF ABBREVIATIONS

ASCAPS	automatic system for commercial accounting of power consumption
CIS	Commonwealth of Independent States
CHP	Combined heat and power
CM of RB	Council of Ministers of the Republic of Belarus
CPP	condensation power plant
ECT	Energy Charter Treaty,
EurAsEC	Eurasian Economic Community
GDP	gross domestic product
GHG	greenhouse gas
Gr.	gram
HFC	hydrofluorocarbons
HPP	hydro power plant
IEP	independent electricity producer
LOP	light oil products (gas, kerosene, diesel fuel, biodiesel and motor fuel)
Mtce	Mega ton oil equivalent
NPP	Nuclear Power Plant
OECD	Organization for Economic Cooperation and Development
PEEREA	Protocol on Energy Efficiency and Related Environmental Aspects
PFC	perfluorocarbons
POP	persistent organic pollutants
PPP	purchasing power parity
RB	the Republic of Belarus
RES	renewable energy sources
TFC	total final consumption
TPES	total primary energy supply
TPP	thermal power plant
VOC	volatile organic compounds
WPP	wind power plant

In-Depth Review of
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Boulevard de la Woluwe, 56 · B-1200 Brussels · Belgium
Tel.: +32-2-775-98-00 · Fax: +32-2-775-98-01
E-mail: info@encharter.org · www.encharter.org

ISBN 978-905948-119-0 (English PDF)

ISBN 978-905948-121-3 (English Paperback)
Depot D/2013/7850/1

ENERGY CHARTER SECRETARIAT
2013