

BULGARIAN
ENERGY STRATEGY
BY 2020
DRAFT VERSION

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INTRODUCTION

The Energy Strategy of Bulgaria, adopted in 2002 aimed at solving the medium-term issues of transition to a financially stable and market-oriented energy sector through institutional, regulatory and structural reforms to ensure economically efficient, secure and environmentally-friendly energy supply.

The Energy Strategy is deemed to have been successfully put to practice, proof of which is the country's full European Union membership since 2007, which is partly due to the compliance achieved with EU energy requirements.

Bulgaria should draft a new Energy Strategy both due to the fact that the priorities of 2002 have been achieved, and also because of the dynamic changes in European energy policy reflected in our national views in terms of our new status as an EU Member State. At present, the EU is in the process of reviewing its current energy strategy and intense discussions are being held on the paper published by the Commission in January 2007 entitled «An Energy Policy for Europe» and the Third Energy Liberalisation Package (September 2007) and the «Energy/ Climate» package (January 2008) adopted as a follow-up. These set the basis for radical change in the sector to achieve the ambitious long-term objectives and require a considerably higher degree of linking between Community and national decisions.

This draft of the Bulgarian Energy Strategy by 2020 was based on the Concept (consultation document) published in August 2008, subjected to wide public debate. This preliminary stage significantly helped towards the further development of initial positions, the definition and ranging of national energy objectives.



SUMMARY

The world today is facing the combined challenges of climate change, increased fuel and energy import dependence and rising energy prices. Under these conditions, the European targets set in the Lisbon Strategy for growth and employment and the renewed EU Strategy for Sustainable Development seem more difficult to achieve. The new European energy policy, and the national policy in particular, aim to overcome these challenges to the benefit of all European citizens.

There are three priority aspects addressed in the European energy policy: reducing the negative climate changes, curbing the EU's dependence on imported energy resources and promoting economic growth and jobs, thus ensuring secure and accessible energy for consumers. It is now clearly understood that these priorities cannot be achieved without establishing a real Internal Energy Market.

SUSTAINABLE DEVELOPMENT

Sustainable development implies meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. This means affordable energy services that are not exhaustible and that contribute to the social and economic development, while complying with environmental requirements.

Experience, especially over the past several years, shows that conventional energy generation is not sustainable. The world has entered an energy era of continuously growing demand for energy sources and the resulting environmental pollution, increased greenhouse gas emissions and depletion of limited natural resources: if current trends persist, before 2050 the total greenhouse gas emissions in the world will double compared to the pre-industrial level; it is expected that natural gas, oil, coal and nuclear fuel resources will be depleted in 64, 42, 155 and 85 years, respectively.

Therefore sustainable environmentally-friendly energy development, and more specifically the reduction of greenhouse gas emissions, is the pivotal issue of energy policy. Such sustainable development may be achieved through:

- Using less energy, which means improved energy efficiency in energy generation and consumption
- Using cleaner energy, which means an improved energy mix by increasing the share of low-carbon energy
- Accelerated technological progress, including the introduction of new energy technologies (clean coal)

which will, at the same time, contribute to limiting the Community's dependence on imported energy resources.

COMPETITIVENESS AND COMPETITIVE ENERGY MARKETS

European energy markets are not yet functioning in a sufficiently effective way. As a result, European consumers - and the economy as a whole - haven't been able to fully benefit from the advantages of a free market in the form of lower prices and options to choose between service suppliers.

New energy legislation is about to be adopted, dealing with the rules of organisation and functioning of the internal electricity and natural gas markets; a proposal to that effect was made by the European Commission in September 2007 in the Third Energy Liberalisation Package. Changes in legislation aim to solve the market weaknesses identified in a number of areas such as independence of the system operators, regulatory supervision and cooperation, transparency and data storage requirements, access to LNG storages and facilities, relations with third countries.



The successful establishment of a competitive market depends on the comprehensive and coordinated efforts of institutions and companies at the national and Community level, a central role being that of the regulator.

ENERGY SECURITY

Security-related risks can be managed through the diversification of energy resources by type, source, suppliers and routes, while taking into account the regional and global trends in energy markets. Seen from this point of view, the energy supplies diversification will contribute to creating competition among the main energy suppliers and the price stabilisation of primary energy sources.

Enhanced partnership and cooperation in the energy sector with the EU's and SEE's main suppliers such as Russia, the Middle East, North Africa and the Caspian Region; with the main consumer countries such as the USA, Japan, China, India, and especially the dialogue with the transiting countries such as Ukraine, Belarus, Turkey and the South Caucasian countries is a key prerequisite for ensuring the balance of demand and consumption under clear and stable transit rules.

The Second Strategic Energy Review, expected to be adopted in January 2009 (presented by the European Commission on 13.11.2008), is placing special emphasis on energy security and energy solidarity, in support of the achievement of the EU's targets by 2020, as described below.

EUROPEAN TARGETS 2020

The priorities outlined are linked to long-term quantitative targets that should be achieved at a Community level. The Community targets will be achieved through efforts at the national level, oriented to meeting the pre-allocated national targets based on fair criteria, taking into account the degree of economic development of each Member State, the forecasted economic growth and the actual degree of national achievements with a view to gradual cohesion at the Community level.

In January 2008, the European Commission agreed on a large-scale package of proposals for fulfilling the European Council engagements in combating climate change and encouraging the use of renewable energy - the Climate & Energy Package.

REDUCTION OF GREENHOUSE GAS EMISSIONS

The common EU target is to reduce the emissions of noxious greenhouse gases by 20% until 2020 over the base year 1990 (or 14% as compared to 2005). The emission reduction can reach up to 30% in 2020 under the condition that a new global agreement on climate change is negotiated.

The total emissions reduction by 2020 will be achieved through:

- A 10% decrease compared to 2005 of emissions from installations, which are not included in the EU Emission Trading Scheme (ETS) (buildings, transport, agriculture and waste).
- 21% decrease compared to 2005 of emissions from installations covered by the EU Emission Trading Scheme (ETS) (all large industrial and energy sources of emissions, as well as the aviation sector).

Starting in 2013, the EU Emission Trading Scheme will be transformed, and the system of National Allocation Plans will be replaced by a new single EU wide emissions cap. At the EU level, every year a certain amount of allowances will be issued for the emissions from installations covered by the EU Emission Trading Scheme; these will be reduced under linear schedule. Installations will be obliged to present a sum of allowances equal to their annual emissions. The remaining installations (including the high-efficiency CHPs) will be given free allowances (80% of the total required amount in 2013), which

will be reduced to zero in 2020. Certain exceptions will be made in sectors that are especially vulnerable to the competition of producers from countries where there are no such limitations.

Auctions for emission allowances are foreseen for Member States. The auctions will be arranged in a non-discriminatory way and will be held by Member States following harmonized rules. Auctions will be open for all - any EU installation operator may participate and purchase allowances in any Member State. The revenues from such auctions will be collected in Member States' national budgets. No less than 20% of these revenues will be used to combat climate change and encourage the use of renewables, as well as for the introduction of clean coal technology (Carbon Capture and Storage Technologies) and mitigation of the social consequences resulting from increased energy costs.

INCREASING OF RES SHARE IN GROSS FINAL CONSUMPTION OF ENERGY

The use of renewable energy sources reduces import dependency, improves the security of supplies, provides fulfillment of environmental obligations and CO₂ emissions reduction, puts less pressure on the trade balance and promotes employment. For that reason the EU's second key target is to increase the share of renewables to 20% of gross final consumption of energy by 2020.

The RES share in EU's gross final consumption of energy is 8.5% in the reference year 2005, which means that an 11.5 % Community average increase is needed to achieve the 20% target by 2020. To meet this target, the Commission proposes individual, legally binding targets for each Member State.

Flexible mechanisms are envisaged so that the single European RES target can be achieved at the lowest cost. For the purpose, scheme options are being considered that would allow Member States to develop RES at reasonable prices and have the opportunity to sell their surplus to the countries in which this generation is more expensive, thus contributing to the achievement of the single EU target at least costs.

ENERGY EFFICIENCY IMPROVEMENT

On 19 October, 2006, the Commission approved its «Energy Efficiency Action Plan: Realising the Potential». It contains measures aiming to reach the target of 20% reduction of gross domestic energy consumption by 2020.

The key energy saving measures (outside the Emission Trading Scheme) in the generation, transport and consumption of energy include:

- Improving the efficiency in the generation of electricity and heat energy
- Reducing the losses in energy transmission and distribution Stepping up the use of fuel efficient vehicles for transport and more intensive use of public transport
- Introducing stricter standards and better labelling for appliances and devices;
- Timely upgrading of the energy saving characteristics of existing buildings and introducing stricter energy standards for new buildings
- Consistent taxation policy to achieve more efficient use of energy

These measures aim to achieve the fuller use of the energy-saving potential. According to Commission estimates, the full energy-saving potential of EU-27 for households, transport, services and industry (not covered by the Emissions Trading Scheme) varies between 25% and 30%.

NATIONAL TARGETS

In its proposals for setting national targets, the Commission uses an approach that takes into account the GDP level per capita in the respective Member State, the progress achieved, and the economic



growth forecasts. Member States with per-capita GDP lower than the average EU value get reduced targets at the expense of those Member States whose per-capita GDP is higher than the EU-27 average.

REDUCTION OF GREENHOUSE GAS EMISSIONS

For Bulgarian sectors not covered by the Emission Trading Scheme, an increase of 20% over 2007 values is proposed for emissions by 2020, which is the highest for EU-27 (Member States are given targets varying in the -20% to +20% range).

Having in mind the reform in the EU Emission Trading Scheme, national targets are not defined for sectors covered by the Scheme. 90% of the single European allowances for emissions trading will be proportionally allocated between the Member States, and the remaining 10% of that total quantity will be reallocated to Member States with lower income levels per capita and higher economic growth prospects.

Concerns in our country with respect to changes proposed by the Commission in the Emission Trading Scheme are related to the Bulgarian coal-fuel power plants that from 2013 will have to purchase/pay the allowances for all the emissions emitted. This will considerably increase their production costs.

Therefore, it is our country's position that the approach of allowances allocation for electricity generators during the period from 2013 to 2020 should be the same as the one for industrial installations, i.e. free allowances can be foreseen, which will present 80% of the total allowances for 2013, and will be decreased every year.

As regards district heating plants, those of them that generate heat energy using high-efficiency co-generation methods will get "free" allowances so that they can be equally treated as the generators of heat energy from installations in other sectors. Every year after 2013 the total quantity of allocated "free" allowances for these installations will be decreased according to the common linear schedule.

INCREASING OF RES SHARE IN GROSS FINAL CONSUMPTION OF ENERGY

According to figures for the reference year 2005 (Eurostat), RES energy in the country amounts to 1 million toe, of which biomass (70%), electricity from HPPs (24%) and other RES in final energy consumption (6%). It equals 9,4% of gross final consumption of energy in 2005 and the electricity generation from HPP has been brought to normal with a view to neutralizing the weather conditions.

The target for Bulgaria, as proposed by the Commission, is that 16% of the gross final consumption of energy in the country in 2020 should come from RES; the country is expected to provide the lowest additional increase (6,6%) as compared to the other Member States.

The national target will be met by increasing power generation from RES, the final consumption of renewable energy for heating and cooling and the use of biofuels in transport.

Certain favourable opportunities are in place for achieving the national target for RES by using the existing potential, namely:

- Setting up the appropriate systems to promote the use of biomass, small HPPs and wind power will guarantee the achievement of the national target.
- It allows for the national target to be achieved and for the generation of electricity amounting to 1.4 m. toe/per year. The current system of promotion will allow for 40% of the total potential to be realized. The additional encouragement of micro and small HPPs and biomass and continuing the current conditions promoting wind energy will allow for 80% of the total potential to be realized, which is equal to 1.12 Mtoe.

- In addition, biomass (straw and wood) is a resource that may have significant contribution in the implementation of the sectoral target for heating and cooling from renewable energy
- The three RES by means of which the target can be met, are as follows: wind, biomass and HPPs
- The biggest technical potential (4.1 Mtoe) is present for photovoltaic solar installations, but at the same time, this is the most costly option. Existing preferential prices do not allow for more than 10% of it to be realised, and future incentives must be flexible and proportionate to the impact on price levels for electricity
- In the medium-term, hydro resources (small and large HPPs) will continue to play a dominant role in the generation of electricity from renewables

The quantities of renewable energy needed to achieve the national target in 2020 primarily depend on achievements in the field of energy efficiency in final energy consumption, the transmission/distribution of electric and heat energy and in the consumption of electricity for power plants' own needs. These are the three components of the denominator in the formula calculating the national target.

In achieving the target for 50-percent improvement of energy efficiency by 2020 in combination with efficient mechanisms to promote renewables, the actual quantities RES may considerably exceed those needed to ensure that the national target is met. This will allow the country to sell the excess in accordance with the flexible mechanisms and the implementation of joint projects that will be approved at EU level. Inadequate progress in the field of energy efficiency will impede and render more costly the implementation of the target.

ENERGY EFFICIENCY IMPROVEMENT

The national economy is considerably more energy-intensive as compared to EU – 27. Therefore the national targets in this aspect are more ambitious, namely: it is envisaged that the energy intensity of GDP in Bulgaria be reduced by 50% before 2020 while the EU-wide target is a 20% reduction for the same indicator.

The main areas of energy saving potential are as follows:

- Energy saving at final consumption, including households, transport, industry and services
- Energy saving in the processes of energy generation and transformation, including development of the gas distribution network, reducing the transmission and distribution losses, improving the efficiency of thermal power plants, increasing the share of energy generated from high-efficiency co-generation

ANALYSIS OF THE STATUS AND OF THE NATIONAL POTENTIAL

Strategic decisions arise from the analysis of the status and of the national potential, aimed at the three priorities in energy policy, namely – security of supplies, sustainable development and competitiveness. The main findings of the analysis are:

ENERGY SECURITY

Bulgaria gets over 70 % of its total consumption from imports. The statistical indicator for energy dependency is considerably lower – 46.6%, due to the methodology used by Eurostat that recognises nuclear energy as a local source. Dependency on the import of natural gas and crude oil is practically complete and is traditionally only directed at the Russian Federation. Proven reserves of lignite coal are sufficient to ensure electric generation for 50-55 years. Renewable energy sources are estimated



at about 6 Mtoe/year, which, given the current rate of energy consumption, amounts to about 15%. Natural gas reserves are quite modest but still of some interest as a local source that may, to a certain extent, limit the price increase for imported natural gas. As a whole, the primary energy balance of the country is well-structured from the point of view of diversity and location of energy resources used. This provides for a reasonable level of security of supplies and a relative price stability that guarantees economic competitiveness.

Advantages

- (1) Coal in Bulgaria is the only local compact energy resource for electricity generation and it is the source of energy independence and long-term employment.
- (2) Nuclear energy is the source of reliable and emission-free generation of electricity and has considerable contribution to meeting the power needs of the country's economy and population.
- (3) The national energy mix is risk-free and practically independent of the fluctuations and unforeseeable price changes for liquid fuels and natural gas. Electric power generation in the country fully meets and exceeds domestic demand, as a result of which Bulgaria is a leading exporter of electricity for the SEE region. The national transmission and cross border power grid is well developed. Distribution networks within the territory of Bulgaria have been in the process of serious development and re-configuration over the past years.
- (4) District heating is a well-developed environmentally friendly and economical form of heating in larger cities. The combined generation of heat and electricity increases the efficiency and cuts the generation costs for both types of products.
- (5) A well-developed primary gas transmission infrastructure is in place in the country, providing considerable unused capacity. In order to further develop the gas distribution network, regional and municipal gas distribution licenses have been issued which cover the greater part of the country's territory. An underground gas storage facility is in place in the country - "Chiren", specially established to compensate for the seasonal fluctuations in consumption and provide an emergency, operational and strategic reserve.
- (6) Bulgaria features a strategic geographical location that provides the country with considerable opportunities to diversify its sources and routes of gas and oil supplies. The national intentions and efforts are aimed at securing that the future gas pipeline routes from Russia, the Caspian, the Middle East and North Africa pass through the country's territory in the North -West and West direction.

Disadvantages

- (1) Local coal is of low-calorific value, with high content of sulphur, dust and nitrogen oxides, and power generation from coal is a main source of greenhouse gas emissions. Environmental restrictions will cause many coal-burning power stations to severely limit their operations or close down completely.
- (2) Power generation facilities in Bulgaria are considerably old. After the decommissioning of units 1-4 of Kozloduy NPP, the export capacity has been reduced, the ground was set for potential increase in the share of imported energy carriers in the power mix and the increased emission intensity.
- (3) Efforts to achieve the national target for renewables will generate additional costs for the power generation system arising from their priority connection to the transmission and distribution grid. The development of wind power generation will require facilities needed to offset the disbalance in the power generation system.



- (4) The maintenance and development of the power grid is impeded due to the insufficient and delayed rate of investment and the lack of mandatory development plans.
- (5) The deteriorating financial performance of district heating companies and the critically low collectibility of payments create problems for the security of supply for heat energy and its future development.
- (6) Natural gas is supplied to Bulgaria using a single pipeline with no free capacity, and from a single supplier – the Russian Federation. There are no interconnections between Bulgaria and neighbouring countries. There are no working mechanisms at the EU level for solidarity actions in case gas supplies are limited or cut for Member States, nor a coordinated external EU energy policy to third countries.

Potential

- (1) The significance of local coal for energy security is incontestable. The Bulgarian energy policy will follow technological developments towards generation efficiency and clean coal technology and will introduce state-of-the art technology in line with European requirements and the country's economic capabilities.
- (2) The large projects planned or already started for new power generation facilities, as well as the construction of infrastructure for their connection to the national power grid will guarantee that domestic demand is met and improve the country's position as a net exporter of electricity.
- (3) The introduction of new requirements to ensure the independence of transmission system operators (within the framework of the Third Energy Liberalisation Package) will create the potential to guarantee an adequate level of investments in the power grid and the speedier integration between national grids.
- (4) The major challenge that district heating companies face – the low rate of collectibility of customers' bills, is not insurmountable. One of the tools for improving the collection of receivables (mostly from household consumers) should be the introduction of modern and proven practices such as outsourcing bill collection to specialised collection companies, factoring etc. In this way, apart from the direct effect – higher collectibility – and other positive results will also be achieved: According to the analysis drawn up in 2008, by 2020 it is expected that power from cogeneration sources will double in volume, and its share in the total consumption of electricity will increase from 10% to 15%.
- (5) The EU's interest in joining European countries with Caspian natural gas pipelines running through Bulgaria are fully in line with national interests. Options are in place to establish inter-network connections with Turkey, Greece, Serbia and Romania, and these may be put in operation faster and at lower cost as compared to larger transit projects. The construction and use of terminals for regasification of liquefied natural gas is a widely used alternative for gas pipelines, providing the diversification of sources and routes.

SUSTAINABLE DEVELOPMENT

The tasks to be addressed by European Community, including Bulgaria, are defined as follows:

- Develop competitive renewable and other low carbon energy sources and energy carriers, in particular alternative fuels for transport
- Limit the energy consumption in Europe
- Make global effort to reverse climate change and improve air quality

Advantages

(1) As a result of the policies that are already in place, over the past years sustainable economic growth is ensured by using practically unchanging volumes of energy. (1) With the adoption in 2004 of the Energy Efficiency Act and its amendments in 2008, Bulgaria achieved a satisfactory level of harmonization of the national legislation with the acquis. As part of public-private partnership efforts, the Bulgarian Energy Efficiency Fund was set up and is successfully operating. The modernisation of the national district heating system has started; the same applies to the development of the gas distribution network that may in, to a considerable degree, contribute towards the realisation of the significant energy saving potential.

(2) With the adoption of the Act on Renewable and Alternative Energy Sources and Biofuels, the framework is set in place to develop RES, AES and biofuels and specific measures and incentives are being planned for some technologies in order to achieve the national targets by 2010 regarding the share of renewable energy in total inland electricity consumption and the share of liquid biofuels in the transport sector. The existing system of preferential purchase prices for electricity generated, differentiated according to the different RES technologies, created considerable investor interest, particularly in the field of wind energy.

(7) National programmes have been adopted for biomass and biofuel use in transport sector by 2020. The latter programme sets also the national targets on the share of biofuels in the transport sector by 2020. (5) Funds are successfully being utilised to implement projects in the field of renewables – both for electricity generation and for the decentralised generation of energy – from specialised credit lines provided by the Kozloduy International Fund and supported by the European Investment Bank.

(3) The presence of active policies in the field of efficient generation, transmission, distribution and consumption of energy and incentives for renewables in the country lead to direct reduction of greenhouse gas emission and significantly contribute to fighting climate change. All power generation operators participate in the EU Emission Trading Scheme since 01 January 2007. Their participation in the scheme stimulates investment in improving the efficiency of their generation.

Disadvantages

(1) In spite of the positive trend for improved national indicators on energy intensity, these continue to be far above both the EU average and above these of CEE Member States.

(2) The relatively higher investment outlay for some of RES technologies reduces investor interest on the one hand, and on the other, generates additional public expenses in the form of higher preferential prices for these technologies. Promoting the use of biofuels and biomass can result in adverse effects if it is not linked to clearly defined criteria for sustainability and restrictions arising from them. There aren't any available mechanisms to encourage heat and cooling energy generation from renewables.

(3) There is significant delay in the procedure of adopting the national allocation plans for emission quotas related to Bulgaria's participation in the European Emission Trading Scheme for 2007 and for the period 2008-2012. This makes it difficult for operators to plan their investment programmes and participation in the emission allowance market.

Potential

(1) To improve the efficiency of transformation processes and the transport of energy, two groups of measures will be undertaken: promote the direct use of natural gas, biomass, solar for heating, use of decentralised energy at the point of consumption; set up a regulatory environment that encourages



energy companies to invest in energy efficient technology. The functioning of power plants and the industry under the conditions of a single competitive energy market, on the one hand, and participation in the European Emission Trading Scheme, on the other, will encourage market-oriented investment in the field of energy saving and the introduction of new more efficient technologies. To improve the efficiency of final consumption, measures will be implemented as foreseen in Directive 2006/32/EC on energy end-use efficiency and services.

(2) Through a policy of utilizing the economically efficient potential of RES, combined with a targeted policy in the field of energy efficiency, the national target for renewables can be exceeded, which will contribute towards additional economic benefits for the country.

(3) With the changes in the Emission Trading Scheme from 2013, introducing an obligation for power plants to pay for greenhouse gas emitted, the country will have a considerable financial resource aimed to support measures in the field of energy efficiency, the development of RES, the introduction of new technologies (including clean coal) and the fight against energy poverty. In 2020, this resource is estimated EUR 1,600 M/annually in income to the national budget.

DEVELOPMENT OF THE NATIONAL ENERGY MARKET

Starting from 01 July 2007, the Bulgarian electricity and gas market has been fully liberalised. This means that each user of electricity and natural gas was given the legal right to choose a supplier and was provided with free and equal access to the energy transportation network to the place of end-use. Turning the complete liberalisation from a legal right into a practical option for every user requires effort, changes, and time. It depends on the active position of all market players to say when, how and to what extent the target will be met for efficiently working market mechanisms under conditions of competition and transparency.

Advantages

(1) With the adoption of the Energy and Energy Efficiency Act in 1999 the independent State Energy Regulatory Commission was established. Gradually SEWRC was given greater autonomy, competences and functions that are defined and clearly differentiated from those of the Energy Ministry. The regulator introduced standard regulatory methods that are gradually being improved. Also implemented are measures for consumer protection in the conditions of full liberalisation of the electricity and the gas markets, as well as a system for energy support to vulnerable customers.

(2) Also introduced was a market model in the electricity and the gas sector based on regulated access of a third party to the network. In compliance with EU and national energy legislation, the required restructuring of the energy companies was successfully completed within the set deadlines («NEC», «Bulgargaz» and the electricity distribution companies). In order to achieve the efficient management of energy companies under changing market conditions, well-established foreign energy companies are now successfully operating in the country. In September 2008, the «Bulgarian Energy Holding» («BEH» EAD), was set up, thus creating a national energy leader - one of the largest energy companies in the SEE Region.

Disadvantages

(1) Low regulated prices do not ensure sufficient income for energy companies to maintain and develop the energy sector. This creates risks to the security and quality of supply, thus impeding the meeting of environmental standards. At the same time, they are the reason for energy overspending, in the form of ungrounded growing expenses for energy use. Furthermore, the introduction of modern and efficiency-promoting methods of price regulation for Bulgarian energy companies is still in its initial stage.

(2) All prices in the internal market along the «generation– supply» to end - user chain, as well as the predominant part of generated/ sold electricity in the country are still subject to price regulation. The mandatory purchase and non-market prices for part of the electricity generated in the country arising from the implementation of Public Service Obligations limit the development opportunities for a competitive energy market. In spite of the favourable legal preconditions in place since 2003, no functioning "electric power exchange" has been organised in the country.

Potential

(1) The necessary increases of regulated prices can be controlled (by schedule) and limited to a growth lower than the GDP growth. Thus the goals for secure and good quality power supply will be achieved without hindering the economic growth and the welfare of citizens and the affordability of energy goods and services. Good practices in EU Member States as regards complex tariff systems and up-to-date regulatory methods can be successfully introduced in Bulgaria, too. In this way, two goals will be achieved: first, reducing the volume and facilitating the operation of the regulatory institution and, second, encouraging licensees to improve the efficiency of their activity.

(2) The higher requirements on consumers' awareness as concerns the network development plans and price projections will allow them to take adequate decisions and adapt promptly to planned changes. The new requirements for separation of transmission network operators to be introduced at the EU-wide level, will provide additional safeguards for their independence and respectively for the stable development of transmission networks and equality of access to them. This will ensure the more effective functioning of the market and lower prices in favor of consumers.

(3) The setting up of a power exchange and cooperation with the power exchanges functioning in the region is a prerequisite for stepping up competition. Market liquidity is defined both by the freely traded volumes of electricity, and by the number of participants on the wholesale market. Setting up an electric power exchange based on the integration of already functioning electricity exchanges in the region and the exchanges in Bulgaria will naturally create the liquidity conditions that are currently missing.

STRATEGIC DECISIONS

The strategic decisions defined arise from the analysis of the state of the energy industry and the assessment of its potential. They are aimed at achieving the national targets and guaranteeing that Bulgarian interests are protected. At the same time, Bulgaria's efforts, in her capacity as Member State, will contribute towards the easier transition to a more secure, more efficient and low-carbon EU economy.

Strategic decisions are grouped in two packages, as described below:

«BRIDGING THE GAPS» PACKAGE

The status analysis identifies differences with respect to the efficiency in generation, transport and use of energy, the market development and corporate management as compared to EU practices in the these areas. Bridging these gaps is a necessary precondition that would give our country a competitive position in the European market – in favour of both the economy and all citizens. Therefore the implementation of decisions included in this package is mandatory. The implementation is not influenced by external risks and circumstances – it fully depends on the mobilisation of internal resources and efforts at national level. This package includes the following strategic decisions:

(1) Energy efficiency improvement at rates higher than the EU average - achieve reduction by half the energy intensity of total domestic energy consumption by 2020

In this way, the following will be saved: energy – 22 Mtoe/year; expenses for energy imports – 6 bln EUR/year; emissions – 50 Mt/year.

(2) Guaranteed implementation of the national target for 16-percent share of RES in gross final consumption of energy - over 16-percent share of RES in the gross final consumption of energy

This will result in reducing: the import dependency for primary energy resources by over 5%; emission intensity of gross domestic energy consumption by over 10%.

(3) Introducing efficient tariff systems and regulatory methods for network companies

This will contribute to improving the security of supply at competitive prices for transmission and distribution of energy for industry and households.

(4) The efficient separation of the supply and generation activities from activities related to the management and operation of networks

By using efficient regulatory monitoring and corporate structures ensuring the independence of system operators, the free and equal access to network for all users will be achieved.

(5) Establishing a competitive electricity market as a way of achieving the priorities for competitiveness, energy security and sustainable development

The establishment of an electric power exchange will create favourable conditions for competition in the generation and supply of electricity.

(6) Guaranteeing the necessary natural gas supplies to meet domestic demand

The timely negotiation of quantities of natural gas for the domestic market – from the main supplier and/or from alternative routes and sources (inter-connections with neighbouring countries) – is a critical prerequisite for the security of natural gas supplies for the Bulgarian industry and population.

(7) Modernising the management of the companies integrated into the «Bulgarian Energy Holding» EAD

The efficiency and quality of energy services will be improved by attracting professional management, ensuring transparency and good management practices and optimising expenditures and introducing up-to-date mechanisms to attract investors.

(8) Price certainty for the Bulgarian industry and households

The regulated (according to a timetable) price increases based on the economic costs of energy companies and considered to GDP growth, as well as the timely notification of businesses and citizens on planned price changes will set favourable conditions for economic growth and citizens' well-being through reliable energy supply and affordable prices in the country

(9) Affordable energy for vulnerable Bulgarian citizens

The protection from energy poverty requires an integrated government policy with respect to the population's income and the application of flexible social protection systems.

«REALISING THE POTENTIAL» PACKAGE

The assessment shows the presence of a considerable potential related to the country's strategic geopolitical and geographical location, strong positions in the SEE region vis-à-vis the export and transit of energy, capacity for strengthening these positions by developing large-scale energy projects. The common EU policy stating as its priority the establishment of a single market and expanding it to a Pan-European energy community, represents a favourable environment for achieving Bulgaria's national intentions. Implementing the decisions included in this package depends on a number of global external factors such as liquid fuel and natural gas prices, the trend in energy demands, the coordination and co-operation among all players in the «suppliers – transit countries – users» chain, in the implementation of cross-border projects etc. After all, the choice of investors, their level of interest and financial situation will set both the direction and the extent of achievement as regards the realisation of existing potential. After all, the choice of investors, their level of interest and financial situation will set both the direction and the extent of achievement as regards the realisation of existing potential. Therefore dynamic changes in the external environment would require targeted and flexible efforts at national level that, in combination with a favourable external conditions, would result in the successful achievement of the country's ambitions and the implementation of the following **strategic decisions**:

(1) Priority development of large projects for generation of emissions-free electricity – by 2020, clean energy (nuclear+RES) will have a share of over 50% in the energy mix, thus reducing the carbon dioxide emissions from the generation of 1 MWh of electricity will be reduced almost by half

The construction of new nuclear plants, as well as the implementation of joint projects for renewables and large-scale hydro power plants will provide the country with an energy mix, that guarantees independence and is environmentally friendly, on the one hand, and on the other, contribute to exceeding the national RES target, which means financial benefits from the transfer of allowances to other Member States.

(2) Diversification of natural gas sources and routes

The successful implementation of the «Nabucco» and «South Stream» projects and the new projects for transit of natural gas through the country's territory, the construction of regional re-gasification terminal for liquefied natural gas and expanding the capacity for natural gas storage will guarantee the security of gas supply through the diversification of sources and supply routes, on the one hand, and on the other will secure a substantial revenues from natural gas transit which also brings potential for further enlargement of the gas network and transit business

(3) Positioning of «Bulgarian Energy Holding» as a leading energy Player in the SEE Region

Taking out the business and investment activity of the national „Bulgarian Energy Holding” outside the country's borders will contribute towards the higher reliability of energy supplies and more competitive energy prices for Bulgarian consumers.

(4) Active position of Bulgaria in forming and conducting the common regional policy and playing a key role in the future expansion of the European Energy Community

Bulgaria has both the potential and the interest to preserve its leading position in the shaping and implementation of a common regional policy mainly focused on the development and construction of suitable energy infrastructure that would physically allow for the functioning of a market for the entire Energy Community and its connection with the common EU energy market. At the same time, based on the experience so far, Bulgaria is in a position to play a key role in the future enlargement of the European Energy Community to a Pan-European Energy Community. Countries



from the Mediterranean, Black Sea and Caspian regions are strategically important for the security and diversification of energy supplies and the transport of energy resources to Bulgaria, the region and the EU.

(5) Bulgaria: the energy hub of the SEE Region

The ambitious goals for strengthening Bulgaria's positions as an important energy center on the Balkans will be materialized through the successful implementation of large energy projects. In this way, Bulgaria will strengthen its export positions and become a powerful transit center of electricity and natural gas in the region.

STRATEGIC DOCUMENTS

With the purpose of setting the right environment in support of the implementation of strategic decisions and establishing a harmonized link between the Energy Strategy and its follow-up activities, this section provides a set of strategic documents containing guidelines on the work to be done.

The mechanism of achieving long-term Community targets proposed by the Commission includes the development of strategic visions and the corresponding action plans for each Member State; follow-up monitoring and regular review of the stage of implementation of the national plans; corrective action, and respectively development of new plans for the next period.

(1) Energy forecasts and plans – the drafting of a Overall energy balance projection by 2030 is planned, forecast and development plan of the electricity system by 2030 and forecast and development gas supply's plan by 2030

(2) Strategic documents adopted in accordance with the regulations of current EU and national legislation, subject to updating, namely - National Long Term Energy Efficiency Programme by 2015, National Long Term Programme to Promote the Use of Renewable Energy Sources 2005-2015, National Long Term Programme for Biomass Use for the period 2008 - 2020, National Long Term Programme to Promote the Use of Biofuel for Transport 2008-2020, Three-year Energy Efficiency Action Plans (2008 – 2010; 2011 – 2013; 2014 – 2016), Spent Nuclear Fuel and Radioactive Waste Management Strategy

(3) Strategic documents developed due to key energy issues identified: the following a planned to be drafted: National Strategy for Energy Efficiency in Final Energy Consumption of the Republic of Bulgaria; Programme for efficient use of local energy resources; Programme for accelerated gasification in the country; Programme for stabilization and development of the heating sector; Programme for accelerated market development of the electricity sector; Programme for accelerated technological research and development; Programme for training and qualification of experts in energy sector and new technologies

(4) Strategic documents developed due to the adoption of new European energy legislation: forthcoming adoption of the currently drafted two legislative packages – the «Energy/Climate» package and the «Third Energy Liberalisation Package», will require the subsequent transposition of their provisions in the national legislation. At this stage, the strategic documents and legislative changes to arise from the new European energy policy, may be only partially identified, namely: amendment of key laws governing the energy sector – the Energy Act, the Energy Efficiency Act and the Act on Renewable and Alternative Energy Sources and Biofuels, as well as of other laws, regulating the legal environment in which the energy industry is operating; drafting of: The National Action Plan to achieve a 16% share of RES in the gross final consumption of energy by 2020, Ten-year development plan for the gas-transmission network; Ten-year development plan for the electricity transmission grid



The Energy Strategy by 2020 sets the foundations and represents the first significant step of the transition to high-efficient and low carbon energy systems. Initially at the EU, and later at the national level, a policy programme by 2030 is to be developed, as well as a vision for 2050. The practical introduction of revolutionary technological changes in the power industry, in order to achieve its decarbonisation, the elimination of the dependency on the transport of oil and oil products, the wide availability of low energy housing and intelligent electric networks can only be achieved if a co-ordinated timetable is in place for research and development, regulation, investment and infrastructure development. This requires intensive dialogue among Member States as well as dialogue at the national level – between institutions, the academic community and industrial experts.

I. PRIORITIES

Energy is the main driver behind any economic structure, but all countries are today facing the combined challenges of climate change, increased fuel and energy import dependence, and rising energy prices, namely [1]:

- **Climate change.** The energy sector emits about 80% of the total greenhouse gas volume in the EU; the current energy policy and transport policy will result in 5% annual increase, respectively 55-percent increase of the total emissions in 2030.
- **Growing energy dependence.** If the existing energy policy is continued, the total EU energy dependence will increase from 50% to 65%, the dependence on natural gas - from 57% to 84%, and the dependence on oil - from 82% to 93% in 2030.
- **The continuing price increase of the energy resources and their significant negative impact on the competitiveness of the European economy.** At oil prices of 100\$/barrel in 2030, the total import value for the EU-27 will be increased by 170 billion Euro or by 350 Euro annually for every European citizen.
- There is no **efficient internal market** of electricity and natural gas, which is of essential importance for provision of long-term investments in electricity generation during the next 25 years, amounting to 900 billion Euro.

Under these conditions, the European targets set in the Lisbon Strategy for growth and employment and the renewed EU Strategy for Sustainable Development seem more difficult to achieve. The new European energy policy and the national policy in particular, aim to overcome these challenges to the benefit of all European citizens.

There are three priority aspects addressed in the European energy policy: controlling the negative climate changes, curbing the EU's reliance on imported energy resources and promoting economic growth and jobs, thus ensuring secure and accessible energy for consumers. It is now clearly understood that these priorities cannot be achieved without establishing a real Internal Energy Market.

The key areas requiring efforts to achieve these priorities are identified below:

- Developing a fully competitive internal market for electricity and natural gas
- Security of supply and solidarity among Member States
- Diversification of the energy mix
- Improved energy efficiency and promotion of renewables to help combat climate change
- Innovations and development of new technologies
- Coordinated external energy policy

To achieve successful cohesion in the long - term of the Bulgarian economy to the EU one, our country is facing three interdependent challenges requiring additional efforts and specific measures, namely:

- Lower electricity prices for households and some of the lowest prices for industry within EU – 27 on the background of growing liquid fuel prices and the need for substantial investment, required both for the modernisation of national infrastructure and for meeting the new EU energy targets
- The highest energy intensity of the economy, measured as a ratio of energy consumption to GDP in EU – 27, which is a risk factor for national competitiveness

- The lowest national GDP per capita equal to 37.1% of the EU – 25 average for 2006 (purchasing power parity), creating major social limitations to the increase of energy prices and the provision of investment needed for the energy industry.

1. SUSTAINABLE DEVELOPMENT

Sustainable development implies meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. This means affordable energy services that are not exhaustible and that contribute to the social and economic development, while complying with environmental requirements.

Experience, especially over the past several years, shows that conventional energy generation is not sustainable. The world has entered an energy era of continuously growing demand for energy sources and the resulting environmental pollution, increased greenhouse gas emissions and depletion of limited natural resources: if current trends persist, before 2050 the total greenhouse gas emissions in the world will double compared to the pre-industrial level; it is expected that natural gas, oil, coal and nuclear fuel resources will be depleted in 64, 42, 155 and 85 years, respectively. [1]. The options provided by the current policy are relatively limited as regards the prevention of climate change, the depletion of conventional energy resources and the unpredictability of their prices. A major change in consumer behaviour is needed, as well as fast technological progress in a number of key areas, improved energy efficiency, increased share of renewable energy sources and a cleaner use of fossil fuels.

Therefore sustainable environmentally-friendly energy development, and more specifically the reduction of greenhouse gas emissions, is the pivotal issue of energy policy. Such sustainable development may be achieved through:

- Using less energy, which means improved energy efficiency in energy generation and consumption
- Using cleaner energy, which means an improved energy mix by increasing the share of low-carbon energy
- Accelerated technological progress, including the introduction of new energy technologies (clean coal)

which will, at the same time, contribute to limiting the Community's reliance on imported energy resources.

For EU Member States using coal for the generation of electricity, the targets related to controlling climate change are a more serious challenge – coal-burning power plants are a major greenhouse gas emitter, on the one hand, but have considerable contribution to the security of supplies, on the other.

2. COMPETITIVENESS AND COMPETITIVE ENERGY MARKETS

Combating climate change and ensuring the security of energy supplies are vital for the future prosperity of citizens and economic competitiveness. Achieving these priorities will require substantial initial economic outlay, but the long-term benefits to businesses and the population will be much greater.

Investment in renewables, energy efficiency and new technologies will help job creation, economic growth, higher competitiveness and the development of rural regions.

Energy policy will continue to be based on the principle that the independently regulated and competitive energy market is the most effective and efficient path to achieving both long-term competitiveness and the priorities for energy security and sustainable development.

European energy markets are not yet functioning in a sufficiently effective way. As a result, European consumers - and the economy as a whole - have not been able to benefit fully from the advantages of a free market in the form of lower prices and options to choose between service suppliers.

The main characteristics of an efficient competitive market are as follows:

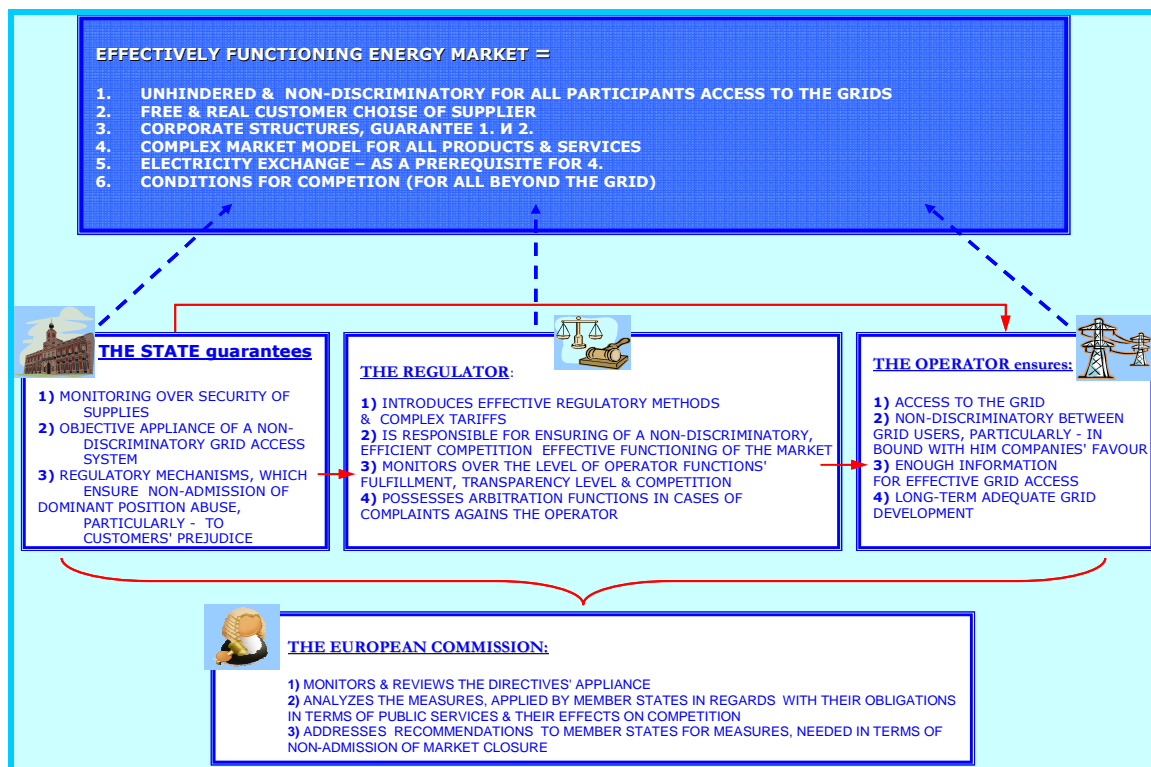
- Free choice of energy supplier by consumers
- Unhindered and equal access for all consumers to the energy transmission networks
- Corporate structures, guaranteeing the two characteristics mentioned above
- Conditions of competition for all elements outside the network, including power exchange and a comprehensive market model for all services and products.

The setting-up of an efficiently operating energy market with a potential for competition (generation and supply), will generate incentives for the companies to invest in new infrastructure and will encourage diversification. Enlarging the market by including non-EU countries (Pan-European Energy Community), in investment and in the necessary energy infrastructure, will eliminate the existing limitations and barriers to the energy flows, and will respectively improve the energy security.

New energy legislation is about to be adopted, dealing with the rules of organisation and functioning of the internal electricity and natural gas markets; a proposal to that effect was made by the European Commission in September 2007 in the form of Third Energy Liberalisation Package. Changes in legislation aim to solve the market weaknesses identified in a number of areas such as independence of the system operators, regulatory supervision and cooperation, transparency and data storage requirements, access to LNG storages and facilities, relations with third countries.

So far, the discussions on this package have been mainly focused on the possible corporate models that would ensure greater independence of the electricity and natural gas transmission system operators. The main "unbundling" model presented by the Commission - based on "ownership unbundling", was added by an alternative model developed by eight Member States, which in contrast to the EC proposal, doesn't require ownership changes, however foresees stricter rules on assets, staff and management. The alternative model envisages for the transmission system operator to be also the owner of transmission assets (including the appropriate license with the respective rights and responsibilities) and was developed based on the following principles: it should be easily applicable in practice; it is not based on the concept „measures leading to changes in ownership”; it is not established as a derogation accompanied by complex and cumbersome bureaucratic procedures related to the review and admission of the derogation at national and Community level but as an equal variant of the first model.

The successful establishment of a competitive market depends on the comprehensive and coordinated efforts of institutions and companies at the national and Community level, the mechanism of cooperation and the responsibilities being as follows:



The regulatory institution takes a central role in the process of developing a competitive market. It is for this reason that regulatory rules will have to be harmonised and the independence options of each national regulator will have to be established at the highest Community level. The powers and obligations of national energy regulators will be increased and extended with respect to the following:

- Encouraging adequate investments in the network
- Prevention of any kind of discrimination regarding third- party access to the networks
- Unbundling of system operators
- Market development monitoring
- Provision of transparency and sufficient information for market players

These new components add to regulatory body's standard functions related to the licensing of energy companies and price regulation for companies not operating under competitive conditions (as a rule - the network companies).

3. ENERGY SECURITY

Energy security means supply that meets the demand under the conditions of an environmentally sustainable setting, in a manner and at price levels that do not hinder economic development.

Security-related risks can be managed through the diversification of energy resources by type, source, suppliers and routes, while taking into account the regional and global trends in energy markets. Seen from this point of view, the energy supplies diversification will contribute to creating competition among the main energy suppliers and the price stabilisation of primary energy sources.

Enhanced partnership and cooperation in the energy sector with the EU's and SEE's main suppliers such as Russia, the Middle East, North Africa and the Caspian Region; with the main consumer countries such as the USA, Japan, China, India, and especially the dialogue with the transiting countries such as Ukraine, Belarus, Turkey and the South Caucasian countries is a key prerequisite for ensuring the balance of demand and consumption under clear and stable transit rules.



There is a significant connection between the internal energy market and the security of supplies. Security of supplies can be improved by:

- Setting up an efficiently operating energy market that, following the appropriate unbundling of energy activities with a potential for competition (generation and supply), will create incentives for the companies to invest in new infrastructure and will encourage diversification.
- Enlarging the European energy market by including countries from outside the EU. The Commission proposes the creation of a Pan-European Energy Community whose nucleus will be the Energy Community consisting of the EU and SEE countries. Major emphasis in this respect is given to the development of suitable energy infrastructure, the key role for which is that of the Trans-European Energy Networks programme (TEN-E) for investments in third non-EU countries. This will provide the physical prerequisites for the integration of European infrastructure to that of neighbouring countries and will remove existing limitations and barriers to energy flows, in this way improving the security of supplies

The establishment and implementation of a coordinated EU foreign energy policy is one of the important Commission proposals. This will contribute to the construction of the new energy infrastructure, and will guarantee the security of supplies and more profitable conditions with respect to prices and transit of energy resources to the European Union.

The Commission also proposes an approach for activities of solidarity aimed at a higher degree of supplies security, including three milestones:

- New investment in gas infrastructure, storage facilities and LNG terminals.
- Improving the mechanism for strategic reserves of liquid fuels and increasing the requirements to EU Member States in that respect.
- A priority plan for developing the interconnection of electricity grids and the introduction of common minimal and binding network security standards.

Special measures will be taken towards EU Member States depending on a single gas supplier, as is the case of Bulgaria.

In January 2009, the Second Strategic Energy Review will be adopted (presented by the European Commission on 13 November 2008), placing special emphasis on energy security and energy solidarity, in support of the achievement of the EU's targets by 2020, as described below.

II. TARGETS 2020

The priorities outlined are linked to long-term quantitative targets that should be achieved at a Community level. The Community targets will be achieved through efforts at the national level, oriented to meeting the pre-allocated national targets based on fair criteria, taking into account the stage of economic development of each Member State, the projected economic growth and the actual degree of national achievements with a view to gradual cohesion at the Community level.

The mechanism of achieving the long-term Community targets, which the EC will implement, includes the development of strategic visions and three-year General Action Plans for each Member State; follow-up monitoring and regular reviews of the degree of implementation of the national plans; corrective action, and respectively - development of new plans for the next period.

The so-called “plan approach” is expected to provide a harmonized relationship between the long-term targets and the specific obligatory actions for their achieving.

1. EUROPEAN TARGETS

In January 2008, the European Commission agreed on a large-scale package of proposals for fulfilling the European Council engagements in combating climate change and encouraging the use of renewable energy - the Climate & Energy Package.

The package contains a set of closely interrelated key policy proposals. These include:

- 1) Proposal regarding effort sharing to achieve the independent Community commitment to reduce greenhouse gas emissions in sectors not covered by the EU Emissions Trading Scheme (such as transport, buildings, services, smaller industrial installations, agriculture and waste);
- 2) Proposal for amendments to the EU Directive on emissions trading;
- 3) Proposal for a Directive encouraging the use of renewable energy sources in support of achieving the two above targets on emissions.

Part of the package are also a proposal for establishing the legal framework for carbon capture and storage (CCS), a communication on the demonstration of CCS and new aspects of state aid for environmental protection.

1.1. REDUCTION OF GREENHOUSE GAS EMISSIONS

EU-wide target and subtargets

The common EU target is to reduce the emissions of noxious greenhouse gases by 20% until 2020 over the base year 1990 (or 14% as compared to 2005). The emission reduction can reach up to 30% in 2020 under the condition that a new global agreement on climate change is negotiated.

The total emissions reduction by 2020 will be achieved through:

- 10% reduction compared to 2005 of the emissions from installations not covered by the EU Emission Trading Scheme (buildings, transport, agriculture and waste).
- 21% reduction compared to 2005 of the emissions from installations covered by the EU Emission Trading Scheme (all large-scale industrial and energy sources of emissions, as well as the aviation sector).

Replacing the system of National plans (caps) with a single EU wide emissions cap

According to the reform to the EU Emission Trading Scheme (ETS) proposed by the Commission, starting in 2013 the system of National Allocation Plans will be replaced by a new single EU wide emissions cap. At the EU level, every year a certain amount of allowances will be issued for the emissions from installations covered by the EU ETS; these will be reduced under linear schedule. Installations will be obliged to present a sum of allowances equal to their annual emissions. The remaining installations (including the high-efficiency CHPs) will be given free allowances (80% of the total required amount in 2013), which will be reduced to zero in 2020. Certain exceptions will be made in sectors that are especially vulnerable to the competition of producers from countries where there are no such limitations.

Auctions for emission allowances are foreseen for Member States. The auctions will be arranged in a non-discriminatory way and will be held by Member States following harmonized rules. Auctions will be open for all - any EU installation operator may participate and purchase allowances in any Member State. The revenues from such auctions will be collected in Member States' national budgets. No less than 20% of these revenues will be used to combat climate change and encourage the use of renewables, as well as for the introduction of clean coal technology (Carbon Capture and Storage Technologies) and mitigation of the social consequences resulting from increased energy costs.

Wider range of greenhouse gases and installations covered by the Emissions Trading Scheme

The Commission proposes to include more greenhouse gases (currently only CO₂ is covered) and expanding the coverage by including all major industrial sources of emissions. It is also envisaged that the aviation sector be covered by the ETS in compliance with the political agreement between the Council and the European Parliament. Smaller industrial installations emitting less than 10,000 tons of CO₂/year will be excluded from the scheme in condition that alternative measures are in place to reduce emissions.

Flexible mechanisms to meet the target

o In efforts' sharing at national level (solidarity mechanism)

Through the re-allocation of 10% of the total EU traded quantity of allowances based on GDP per capita, more revenues will be secured for the budgets of poorer countries in the Community, thus compensating for the higher costs to their economies resulting from accelerated economic growth forecasts.

o In achieving the national targets

- **The Emission Trading Scheme is a flexible instrument.** Installation operators are not explicitly obliged to purchase emission allowances – they will have to strike an individual balance between the purchase of allowances on the market and taking measures to reduce emissions, which will depend on the prices of allowances, on the one hand, and the cost of saving emissions, on the other.

- **Auctioning.** Auctioning will be used with the allocation to Member State of auction permits, with auctions open to all European operator in any Member State. Auctioning will generate substantial revenues to the budget of each Member State. These revenues will help the process of adapting to a low-carbon economy. The expanded scope of the Emissions Trading Scheme through the inclusion of new sectors and greenhouse gases will create the potential to meet the target at lower cost.

- **The carbon capture and storage technologies** preventing the leakage of greenhouse gases in the atmosphere will reduce the obligations to purchase permits for installations implementing such technologies.

- **The linkage with other emissions trading schemes** will further increase the opportunities to reduce emissions in a cost-effective manner.

- **Use of credits for „joint implementation” and „clean development mechanisms” projects.** EU operators will be given the choice to fulfill their obligations by investing in projects to reduce emissions outside the EU. The limits for use of such credits have already been allocated in national allocation plans for emission quotas in the period 2008 – 2012, and operators will be able to benefit from the unused part of this limit for the next phase. Options to use this type of mechanism by 2020 amount to about 1/3 of the required emission reduction for the EU. In the event of a future international agreement and in order to achieve the higher targets for emission reductions, a considerable further use of such credits will be arranged. As a whole, however, the use of credits lowers the price of permits. This reduces the incentive for innovative research into clean technologies in the EU, and respectively the benefits to clean ambient air.

○ **With regard to future risks**

- **Measures against the loss of competitiveness of European companies and „carbon leakage”.** European companies particularly those more vulnerable to international competition (mostly energy intensive industries) will be placed in an unfavorable market position as compared to competitors from countries that have no commitments to reduce emissions. By 30 June 2010, and every three years thereafter, the Commission will establish (through Comitology) which sectors are exposed to substantial „carbon leakage” (the relocation of companies from the EU to third countries) and will allocate "free" allowances to these (up to 100%). By June 2011, the Commission will have to prepare a situation report covering the sectors exposed to considerable risk from „carbon leakage”. Proposals will contain recommendations for a set of measures, including a higher rate (to 100%) „free-of-charge” allowances for industries most affected by international competition. In addition, the Commission will have to propose a "carbon equalisation" system to neutralise any distorting effects from imports from countries with less stringent climate laws.

- **Linking with other emissions trading systems.** Such linkage will depend on the form of the future international agreement and will be allowed following an evaluation of the trading system concerned, including the way it is administered, its independence from political decisions etc.

1.2. INCREASING OF RES SHARE IN GROSS FINAL CONSUMPTION OF ENERGY

The use of renewable energy sources reduces import dependency, improves the security of supplies, provides fulfillment of environmental obligations and CO₂ emissions reduction, puts less pressure on the trade balance and promotes employment. For that reason the EU's second key target is to increase the share of renewables to 20% of gross final consumption of energy by 2020.

The RES share in EU's gross final consumption of energy is 8.5% in the reference year 2005, which means that an 11.5 % Community average increase is needed to achieve the 20% target by 2020. To meet this target, the Commission proposes individual, legally binding targets for each Member State.

The RES target is defined as a correlation between the energy from RES and gross final consumption of energy, where:

- Energy from renewables is the sum of: electricity generation from RES; final energy consumption of heating and cooling from RES; biofuels used in the transport sector
- Gross final consumption of energy is defined as the sum of: final energy consumption (in the sectors of industry, transport, agriculture, services, households); distribution losses for heat and electricity; energy for own use by energy plants (power generation and heat generation)

The RES target also includes an obligatory target for at least 10% share of renewables (bio-fuels) in the EU transport sector, which should be achieved by 2020. Sustainable development is of major importance for achieving that target - criteria are being developed for the sustainable production of bio-fuels.

Flexible mechanisms are envisaged so that the single European RES target can be achieved at the lowest cost. For the purpose, scheme options are being considered that would allow Member States to develop RES at reasonable prices and have the opportunity to sell their surplus to the countries in which this generation is more expensive, thus contributing to the achievement of the single EU target at least costs.

1.3. IMPROVING ENERGY EFFICIENCY

On 19 October, 2006, the Commission approved its «Energy Efficiency Action Plan: Realising the Potential». It contains measures aiming to reach the target of cutting 20% of gross domestic energy consumption by 2020. If this target is met, this means, that in 2020, the EU will be using 13% less energy, thereby saving 100 billion EUR and 780 million tons of CO₂ every year. Understandably, this requires substantial efforts both in terms of additional investment, and in terms of changing consumers' behaviour.

The key energy saving measures (outside the Emission Trading Scheme) in the generation, transport and consumption of energy include:

- Improving the efficiency in the generation of electricity and heat energy
- Reducing the losses due to the transmission and distribution of energy
- Stepping up the use of fuel efficient vehicles for transport and more intensive use of public transport
- Introducing stricter standards and better labelling for appliances and devices;
- Timely upgrading of the energy saving characteristics of existing buildings and introducing stricter energy standards for new buildings
- Consistent taxation policy to achieve more efficient use of energy

These measures aim to achieve the fuller use of the energy-saving potential. According to Commission estimates[2], the full energy-saving potential of EU-27 for households, transport, services and industry (not covered by the Emissions Trading Scheme) varies between 25% and 30%. This potential can be realised by means of legislative and regulatory changes and improving consumers' awareness. The achievement of energy efficiency targets requires regulating of responsibilities at all levels – institutions, businesses and individual citizens.

Energy efficiency is measured by:

- GDP intensity, measured as a correlation between the gross domestic energy consumption and the GDP (gram oil equivalent/euro GDP). This indicator gives a global idea about the energy efficiency level and is most commonly used for international comparisons; for the EU-27 it is equal to 164.5 goe/euro GDP at price levels for 2005.
- GDP intensity measured as a correlation between the final energy consumption and the GDP (gram oil equivalent/euro GDP). This indicator gives an idea about the energy efficiency level at final consumption; for the EU-27 it is equal to 164.5 goe/euro GDP at price levels for 2005.
- Correlation between the final energy consumption and gross domestic energy consumption (%). This indicator gives an idea about the efficiency of the energy transformation processes; for EU-27 this indicator is 64.4% for 2005.

2. NATIONAL TARGETS

In its proposals for setting national targets, the Commission uses an approach that takes into account the GDP level per capita in the respective Member State, the progress achieved, and the economic growth forecasts. Member States with per-capita GDP lower than the average EU value get reduced targets at the expense of those Member States whose per-capita GDP is higher than the EU-27 average.

According to the Impact Assessment prepared by the Commission, the impact of the package as a whole on EU – 27 represents an increase of the Community's direct economic expenses of 0.45% of GDP in 2020.

For Bulgaria – as a result from the application of the solidarity approach in the distribution of national targets – direct economic **benefits** equal to 1.25% of GDP in 2020 are estimated.

Meeting the RES and GHG targets will result in higher energy costs for households in EU-27. The adjustment of national targets to GDP will mitigate this negative impact for Bulgaria - it is expected that annual energy expenses for households in 2020 will be increased by 10% instead of 19%, as would have been the increase in the case of proportionate allocation of targets among Member States (according to the Commission's Impact Assessment).

2.1. REDUCTION OF GREENHOUSE GAS EMISSIONS

Current situation

The share of greenhouse gas emissions from all energy activities in the sectors of energy, industry, transport, agriculture and households represents 70%, and these from the energy sector equal 40% of the total of the greenhouse gas emissions in the country.

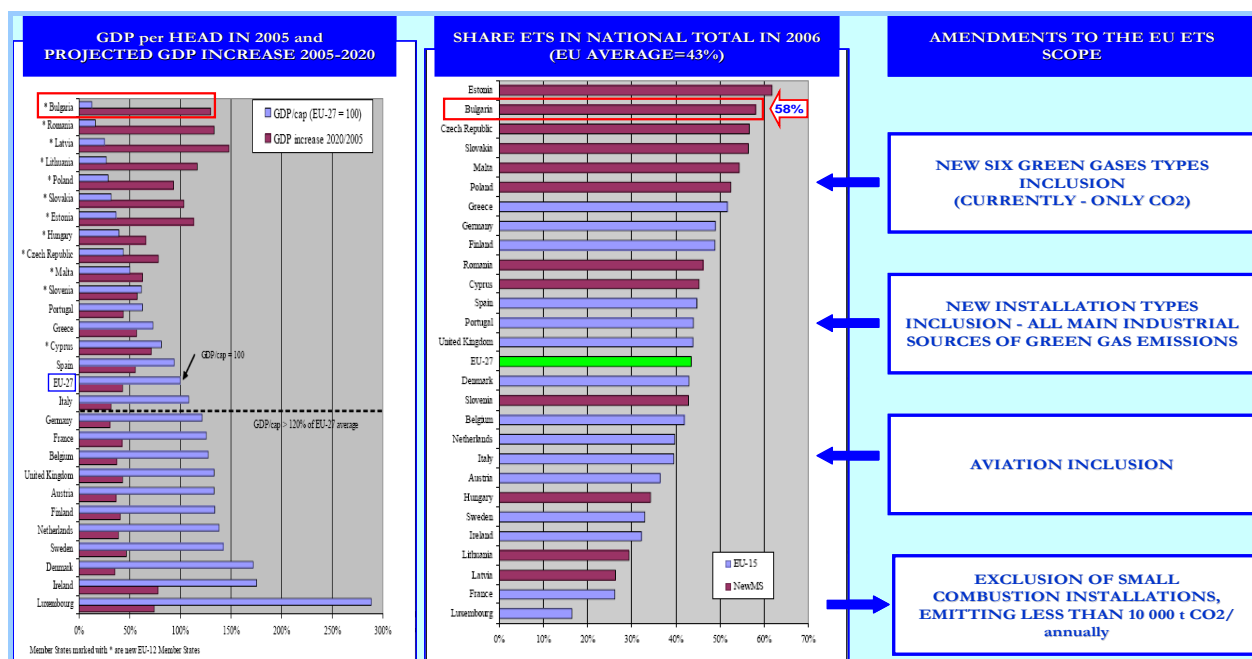
In the energy sector, the largest share of carbon dioxide emissions – 69% - belongs to power generation companies, followed by combined heat/electric generation plants – about 28%, a 3-percent share heat generation plants for the public sector. In the future, an increase can be expected in CO₂ emissions generated by electric power plants as a result of the decommissioning of nuclear facilities and the reorientation of part of energy consumption for heating to biomass and organic fuels.

All energy companies in the country fall within the scope of EU Directive 2003/87 and respectively are part of the Emissions Trading Scheme with emission quotas for greenhouse gases. The scheme operates by requiring from plants emitting large quantities greenhouse gases to purchase quotas in order to create incentives for the introduction of emission-reducing technologies.

The first period in which Bulgaria took part in Emissions Trading Scheme was one year and only covered 2007, and the second period is between 2008 and 2012. The scheme follows the “cap and trade” principle and by Commission Decision of 26 October 2007 Bulgaria was given certain emission quota caps that should be allocated to installations covered by the Emissions Trading Scheme (National Allocation Plans for emission allowances).

Under that approach, for the Bulgarian sectors not covered by the Emission Trading Scheme is proposed an increase of 20% over 2007 values is proposed for emissions by 2020, which is the highest for EU-27 (Member States are given targets varying in the -20% to +20% range).

Having in mind the reform in the EU Emission Trading Scheme, national targets are not defined for sectors covered by the Scheme. 90% of the single European allowances for emissions trading will be proportionally allocated between the Member States, and the remaining 10% of that total quantity will be reallocated to Member States with lower income levels per capita and higher economic growth prospects. Thus, Bulgaria will also get additional rights, presenting 53% above the allocated 90% (respectively- by 38% more than the base national emissions);



Concerns in our country with respect to changes proposed by the Commission in the Emission Trading Scheme are related to the **Bulgarian coal-fired thermal power plants** which from 2013 will have to purchase/pay the allowances for all the emissions emitted. This will considerably increase their production costs — at a price of 39 euro/ ton CO₂ [3], they will be doubled. Further market risks are also created by the fact that power plants in non-EU countries in the region will have more favourable competitive positions as their costs will not include environmental burdens of that kind.

Therefore, it is our country's position that the approach of allowances allocation for electricity generators during the period from 2013 to 2020 should be the same as the one for industrial installations, i.e. free allowances can be foreseen, which will present 80% of the total allowances for 2013, and will be decreased every year. This will contribute to the equal treatment of all the operators within the Emission Trading Scheme, including the electricity producers. Besides, this allocation method corresponds to the "polluter pays" principle and at the same time mitigates the possible negative impacts with respect to security of supplies for the EU Member States, including Bulgaria, relying to a great extent on the coal-fired power plants, respectively relying on indigenous coal production for meeting the domestic electricity demand.

As regards district heating plants, those of them that generate heat energy using high-efficiency co-generation methods will get "free" allowances so that they can be equally treated as the generators of heat energy from installations in other sectors. Every year after 2013 the total quantity of allocated "free" allowances for these installations will be decreased according to the common linear schedule.

2.2. INCREASE OF RES SHARE IN GROSS FINAL CONSUMPTION OF ENERGY

National target for increased share of RES in gross final consumption of energy by 2010

Under the current Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources, Bulgaria will have to achieve an 11-percent share of RES in the total inland consumption of electricity for 2010.

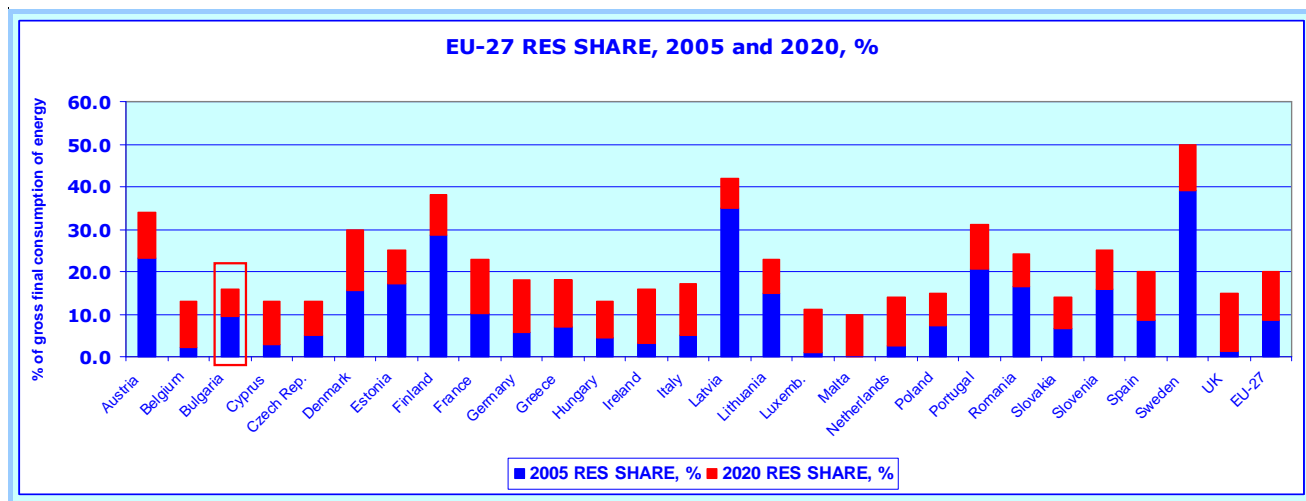
Currently power generation from RES is almost fully based on the use of the country's hydro potential (used through large HPPs property of NEC EAD). The commissioning in 2010 of Tsankov Kamak HPP with installed capacity of 80 MW and annual generation of 158 GWh is expected to increase hydro generation.

It is expected that the share of RES electricity in 2010 will reach 11.6 % of total inland consumption in the country, i.e. the target will be met.



According to figures for the reference year 2005 (Eurostat), RES energy in the country amounts to 1 million toe, of which biomass (70%), electricity from HPP (24%) and other RES in final energy consumption (6%). It equals 9,4% of gross final consumption of energy in 2005 and the electricity generation from HPP has been normalized with a view to neutralizing the weather conditions.

The target for Bulgaria, as proposed by the Commission, is that 16% of the gross final consumption of energy in the country in 2020 should come from RES; the country is expected to provide the lowest additional increase (6,6%) as compared to the other Member States.



The national target will be met by increasing power generation from RES, the final consumption of renewable energy for heating and cooling and the use of biofuels in transport. Of the sectoral targets, only the one requiring 10% use of biofuels in the transport sector is binding. The ten-percent share of biofuels in the transport sector is in line both with the legally binding target in the new EU Directive, and with the National Long Term Programme to Promote the Use of Biofuel for Transport 2008- – 2020.

Certain favourable opportunities are in place for achieving the national target for RES by using the existing potential [4], namely:

- The technical potential for biomass, small HPPs and wind for electricity amounts to 1.4 Mtoe/year. The current system of promotion will allow for 40% of the total potential to be realized. The additional encouragement of micro and small HPPs and biomass and continuing the current conditions promoting wind energy will allow for 80% of the total potential to be realised, which is equal to 1.12 Mtoe.
- In addition, biomass (straw and wood) is a resource that may have significant contribution in the implementation of the sectoral target for heating and cooling from renewable energy
- The three RES by means of which the target can be met, are as follows: wind, biomass and HPPs
- The biggest technical potential (4.1 Mtoe) is present for photovoltaic solar installations, but at the same time this is the most costly option. Existing preferential prices do not allow for more than 10% of it to be realised, and future incentives must be flexible and proportionate to the impact on price levels for electricity
- In the medium-term, hydro resources (small and large HPPs) will continue to play a dominant role in the generation of electricity from renewables

The quantities of renewable energy needed to achieve the national target in 2020 primarily depend on achievements in the field of energy efficiency in final energy consumption, the

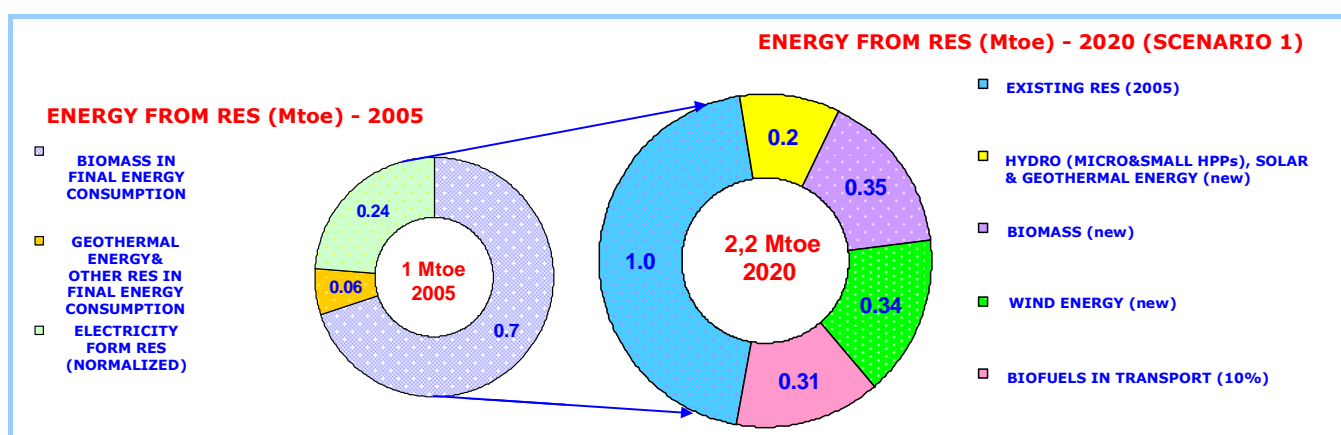


transmission/distribution of electricity and heat and in the consumption of electricity for power plants' own needs. These are the three components of the denominator in the formula calculating the national target.

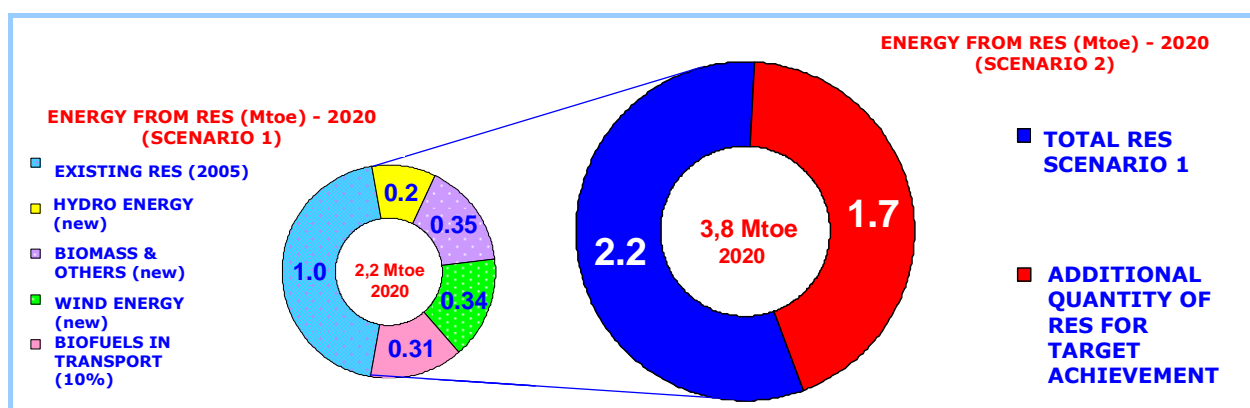
The connection between the energy efficiency and RES targets can be illustrated through a calculation of the necessary quantities of RES to ensure the national target under two scenarios: Scenario 1 – Energy Efficient and Scenario 2 – Energy Intensive.

Scenario 1 reflects the necessary quantities of RES in 2020 in achieving the national strategic target for 50-percent increase in energy efficiency for the same period. Under a policy of active measures and incentives for improving energy efficiency, the total final consumption of energy in 2020 will increase by 31% as compared to the baseline 2005 at national GDP growth of 130% for the same period. Under this scenario, the RES national target in quantitative terms represents 2.2 Mtoe, respectively the additional quantities over 2005 are in the amount of 1.2 Mtoe. In structural terms, the new RES include:

- An obligatory 10-percent target for biofuels in transport
- Use of biomass – direct and for energy generation
- Generation from wind power
- Hydro (micro and small HPPs), solar and geothermal energy



Scenario 2 shows the necessary quantities of energy from RES in case increase of total energy consumption with GDP growth (5.5% average per year) by 2020. It also illustrates the benefits coming from achieving the national strategic target for 50-percent increase in energy efficiency by 2020. The necessary quantity of energy from RES to ensure the national target is increased to 3.8 Mtoe, which is 1.6 Mtoe (or 73%) more as compared to the values for Scenario 1.



In achieving the target for 50-percent improvement of energy efficiency by 2020 in combination with efficient mechanisms to promote renewables, the actual quantities RES may considerably exceed those needed to ensure that the national target is met. This will allow the country to sell the excess in accordance with the flexible mechanisms and the implementation of joint projects that will be approved at EU level. Inadequate progress in the field of energy efficiency will impede and render more costly the implementation of the target.

2.3. ENERGY EFFICIENCY IMPROVEMENT

The EU-wide target for improved energy efficiency is not bound to its allocation at a national level. At the same time (according to Eurostat figures for 2005 and at comparative prices for 2005):

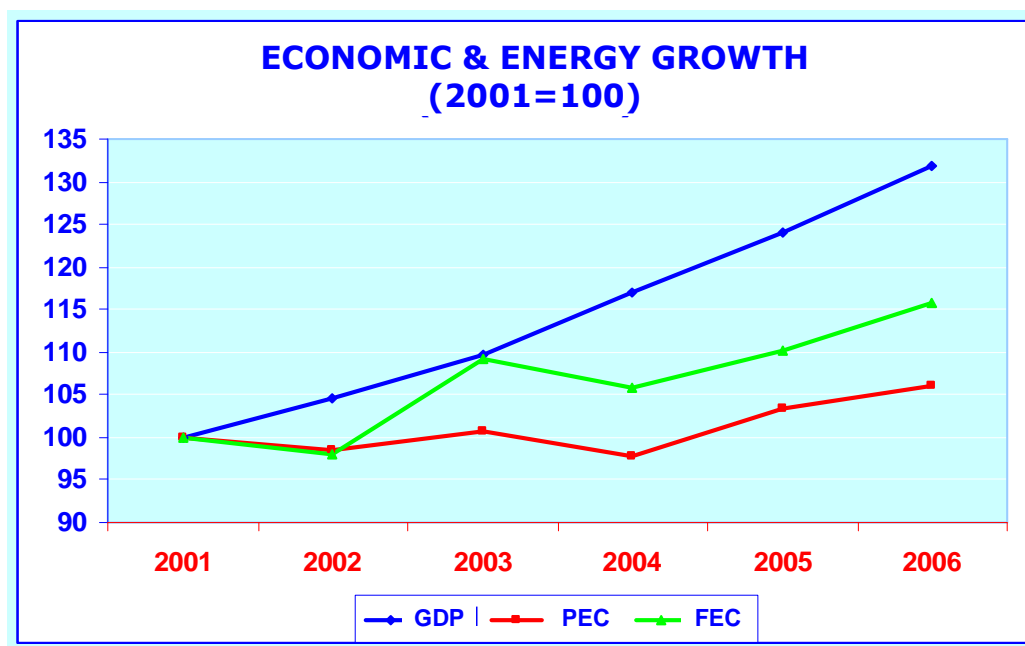
- The national economy is 5,6 times more energy-intensive compared to the EU-27, respectively - 927,1 goe/euro GDP compared to 165,4 goe/euro GDP (estimated by the gross domestic energy consumption).
- The national economy is over 4 times more energy-intensive compared to the EU-27, respectively — 452,4 goe/euro GDP compared to 106,6 goe/euro GDP (estimated by the final energy consumption).
- The ratio between final energy consumption and the total domestic energy consumption, which for Bulgaria and EU-27 is respectively 48.7% and 64.4% (for 2005); i.e., while in Bulgaria the energy transformation losses (generation and transmission to end consumers) are more than half of the energy used, in the EU-27 such losses are about one third of it.

The above differences are considerably smaller after adjustments reflecting the purchasing power of the national currency. Nevertheless the difference is substantial - 100% and 50% higher national energy intensity measured respectively for total and final energy consumption.

Having in mind the significant differences identified, it cannot be expected that the Bulgarian energy sector and the national economy as a whole can be successfully positioned on the European market without considerable efforts in the field of energy efficiency - both at transformation (generation and transportation) and energy consumption. Taking into account the European target for 20% energy efficiency improvement, our national targets in this aspect will be more ambitious, namely reducing GDP energy intensity of Bulgaria two times by 2020 compared to 2005, at 4,4 % average annual reduction.

The sustainable economic growth observed in recent years has been accompanied by a trend towards energy intensity reducing as a result of the energy policy that is being conducted and the restructuring of national economy. In the period 1999 — 2007 GDP grew at an average of 5,3% per year, while the gross domestic energy consumption increased by 2,4% and the electricity consumption - by 0,9 %. As a result, energy intensity measured through gross inland energy consumption and through final energy consumption will decrease by 24% and 23%, respectively.





The stabilisation and strengthening of this trend will contribute to achieving the national targets in the context of the new energy policy and will help bridge the considerable gaps between Bulgaria and other EU Member States.

The main areas of energy saving potential are as follows:

- Energy saving at final consumption, including households, transport, industry and services
- Energy saving in the processes of energy generation and transformation, including development of the gas distribution network, reducing the transmission and distribution losses, improving the efficiency of thermal power plants, increasing the share of energy generated from high-efficiency co-generation

The specific targets and measures to improve energy efficiency will be assessed in details and defined by updating the National Long Term Energy Efficiency Programme 2015 and the three-year Energy Efficiency Action Plans.

III. ANALYSIS OF THE STATUS AND OF THE NATIONAL POTENTIAL

EU proposals put the continent on another development path. They create the framework and incentives for the achievement of policy aspiration declared at the 2007 Spring European Council and re-confirmed at the Bali Conference. These form the nucleus of European efforts to modernise the economy so it can successfully tackle the challenges of the 21st century.

The table below [1] shows the essential characteristics of different energy resources from the point of view of their availability, greenhouse gas emissions, electricity generation costs, sensitivity to price levels, and import dependence of EU – 27 - at present and according to 2030 projections:

Table 1

Energy resource	Cost 2005 (EURO/MWh)	Cost 2030 (EUR/MWh, CO ₂ = 20-30 EUR/ton)	Emissions (kg CO ₂ /MWh)	Import dependence EU – 27		Efficiency	Price sensitivity	Reserves/ annual generation
				2005/	2030			
NATURAL GAS	35 – 70	40 – 85	400 – 440	57%	84%	40 – 50%	Very high	64yrs
OIL	70 – 80	80 – 95	550	82%	93%	30%	Very high	42yrs.
COAL	30 – 50	45 – 70	750 – 800	39%	59%	40 – 48%	Medium	155yrs.
NUCLEAR FUEL	40 – 45	40 – 45	15	100% uranium ore		33%	Low	85yrs.
BIOMASS	25 – 85	25 – 75	30	0%	0%	30 – 60%	Medium	RES
WIND	35 – 175	28 – 170	10 – 30	0%	0%	95 – 98%	None	
HYDRO	25 – 95	25 – 90	5 – 20	0%	0%	95 – 98%	None	
SOLAR	140 – 430	55 – 260	100	0%	0%	-	None	

Source – International Energy Agency

Based on this, the following conclusions can be drawn:

- **Nuclear energy** is outlined as the most reliable resource for the generation of clean (practically zero CO₂ emissions) electricity, and nuclear power plants – as an important element of future development plans for electricity systems not only at minimum costs to the economy but also at minimum greenhouse gas emissions, so that the high requirements can be met to reduce greenhouse gas emissions by 20%, 30% and 50%, respectively by 2020, 2030 and 2050 over the 1990 baseline, without jeopardizing the economic growth of EU Member States. As can be seen from the table above, electricity generated from nuclear plants is characterized by constant production costs based on the relatively constant prices of nuclear fuel and the practically non-existent CO₂ emissions, which facilitates the achievement of sustainability and competitiveness priorities. It should be noted that Member States are given freedom to determine their own energy mix, including nuclear energy, but this will be accompanied by stringent requirements related to security, safety, nuclear waste management and decommissioning procedures.
- The use of **indigenous coal deposits** has its own future as a stabilizing energy source. Taking into account the key role of indigenous lignite coal deposits for energy security, it is necessary to follow a policy that would strike a balance between environmental legislation and the promotion of indigenous coal. In the longer term, a number of technical solutions are possible to improve the efficiency and reduce the carbon intensity in electricity generation from coal -burning plants.



- Costs for the generation of **electricity from RES** are the only ones with a declining trend by 2030, due to technological progress and zero greenhouse gas emissions. Without expecting that RES energy can replace conventional sources, it will be more and more attractive due to economic reasons, thus reducing the need for specific mechanisms to promote its generation.
- In addition, the technological development of **hydrogen energy**, combined with the use of emission-free technologies for hydrogen generation, are an important direction to progress in energy, due to which electricity and liquid fuels will be gradually replaced in a number of specific areas that are more appropriate for hydrogen applications. This refers to small applications, autonomous systems, fuel cells, transport etc.

1. ENERGY SECURITY

The country's reliance on the import of energy and resource (energy dependence) is one of the standard indicators of energy security. It is defined as the ratio of the net energy imports and the gross inland energy consumption; it looks as follows, broken down by years:

Table 2 ENERGY DEPENDENCE OF BULGARIA	1999	2000	2001	2002	2003	2004	2005	2006
Energy dependence, total, %	49,8	46,5	46,0	44,0	47,9	46,0	47,7	46,6
Energy dependence, coal, %	33	33	37	32	36	36	39,4	37,3
Energy dependence, crude oil, %	99,3	99,2	99,4	99,3	99,4	99,5	99,5	99,6
Energy dependence, natural gas, %	99,2	99,6	99,3	99,3	99,5	89,3	86,4	87,1

Source: NSI

Bulgaria gets over 70 % of its total consumption from imports. The indicator quoted above for energy dependence is considerably lower due to the methodology used by Eurostat which recognises nuclear energy as an indigenous source, equal to three times the quantity of electricity generated by nuclear power plants.

The import dependence for natural gas and crude oil is practically complete and is traditionally only directed at the Russian Federation. On the other hand, however, the penetration rate of natural gas as a heating source (the type of consumption that is most sensitive to interruption of supplies) is only 25%. This share is formed from the heat energy generated from natural gas and the direct combustion of natural gas for heating. The development of gas-distribution networks will increase the share of natural gas as a heating resource and will respectively provide for higher future dependence. The production of indigenous energy resources in Bulgaria is shown below:

Table 3 PRODUCTION OF INDIGENOUS ENERGY RESOURCES IN BULGARIA, thousand toe	1999	2000	2001	2002	2003	2004	2005	2006
Coal	4341	4520	4497	4428	4645	4537	4177	4307
Crude oil	44	46	34	38	31	31	30	28
Natural gas	22	12	18	16	13	270	384	375
Other solid fuels	413	550	532	627	671	717	691	735
NPP and HPP	4591	5154	5426	5652	4854	4716	5257	5566
TOTAL	9411	10282	10507	10761	10214	10271	10539	11011

Source: NSI



Lignite coal deposits in the «Maritsa Iztok» basin (90% of the local coal production) are estimated at 1,200 million tons (proved reserves) and at the current production rate that exceeds 20 million tons per year and expectations for this rate to reach 30 million tons, could be expected to last for 50 – 55 years. The technology for use is however obsolete and has low efficiency rates – about 30%. The renewal of power plants and the construction of new ones will raise this coefficient to and above 40%. Indigenous coal mining also includes production of bituminous coal (10.4 –percent share of the total local production) and black coal (with a share of 0.1%).

Renewable energy sources are estimated at about 6 Mtoe/year, which, given the current rate of energy consumption, amounts to about 15%. The developing production of liquid biofuels will significantly increase these estimates.

The quantity and potential of **uranium ores** are only derived from estimates, the production of such ores was terminated and the mining facilities were closed down due to the high cost, obsolete technologies and radioactive pollution. Under the changing conditions of growing prices of liquid fuels, uranium may prove to have serious potential.

Natural gas reserves are quite modest but still of some interest as a local source that may, to a certain extent, limit the price increase for imported natural gas.

As a whole the primary energy balance of the country is well-structured from the point of view of diversity and location of energy resources used. This provides for a reasonable level of security of supplies and a relative price stability that guarantees economic competitiveness.

Table 4 STRUCTURE OF PRIMARY ENERGY BALANCE, thousand toe	1999	2000	2001	2002	2003	2004	2005	2006
Coal	6509	6725	7120	6464	7253	7081	6890	6868
Other solid fuel, incl. biomass	528	584	689	753	821	819	829	916
Oil and oil distillates	5783	5453	5457	5365	5291	5761	6568	7154
Oil products	-1174	-1233	-1365	-892	-638	-1372	-1573	-2106
Natural gas	2686	2932	2738	2404	2500	2517	2818	2905
Nuclear and hydro	4591	5154	5426	5652	4854	4716	5257	5566
Electricity	-168	-397	-595	-541	-472	-505	-652	-666
TOTAL GDEC	18755	19218	19470	19205	19609	19017	20137	20637

Source: NSI

The requirement for reliable energy supply for Bulgaria in the long-term perspective calls for stock-taking of both the national specifics and external factors. Analysis in this aspect is shown below.

1.1. COAL MINING

Advantages

(1) Coal in Bulgaria is the only local compact energy resource. The availability of coal mitigates the unfavourable trends of increase in the prices of primary energy sources, the growing dependence on the import of primary energy carriers and the deepening difficulties in diversifying the sources of supply.

(2) The production of indigenous coal is the source of energy independence and long-term employment. Local coal mining ensures over 60% of the country's gross domestic consumption of coal and about 15,000 jobs.



(3) Local coal mining has a strong position as a resource for electricity generation. Over 95% of local coal is used for electricity generation and in 2007 it was the resource for 38.4% of the gross electricity generation of the country. This advantage, in combination with the importance of coal for the security of energy supplies defines their key role in development of national electricity.

(4) In view of the importance of local coal mining for the power security, the legal framework provides opportunities for preferential dispatching of plants burning indigenous coal from open-pit and underground coal mining. The introduction of this regime is only admissible for security considerations and within the limited annual quota.

(5) Open pit coal mining will continue to form the backbone of Bulgarian power energy. The leading role is that of the «Maritsa Iztok» mines, with a share of 84% of the total indigenous coal production in the country. The company operates the East Maritsa Lignite Basin, the largest lignite coal deposit in the country with geological reserves of 2,100 million tons, of which 1,200 million tons of proved reserves. The mines and thermal power plants that are their direct partners in the region, represent a technological profitable complex which has the potential to generate up to 40 per cent of electricity in the country.

(6) The remaining coal mining basins in the country are located in geographical proximity to their key consumers – power generation plants and heating companies. This places indigenous coal in more favourable positions as compared to competitive imported resources.

Disadvantages

(1) Environmental restrictions related to sulphur, dust, nitrogen oxides and greenhouse gases will cause many coal-burning power stations to severely limit their operations or close down completely. This will result in reducing the demand for local coal and hence its production.

(2) Indigenous coal is of low-calorific value, with high content of sulphur, dust particles and nitrogen oxides. Stringent environmental restrictions with respect to the emissions of sulphur dioxide, nitrogen oxide and dust in power generation require large investment that would increase production costs. In compliance with commitments already made by the country (Implementing Programme Directive 2003/80/EC) part of the electric generation facilities have been brought in compliance with environmental requirements within the expected deadline; another part were granted transitional periods within which they are expected to either take the necessary measures or cease activity; a third group of installations operate in a limited production mode and for limited periods of time without adhering to the requirements for reduced emissions; the three units of TPP «Bobov Dol» will be decommissioned in a phase-out manner by 2014;

(3) The electricity generated from indigenous coal is a major emitter of greenhouse gases. Participation in the Emissions Trading Scheme will have the most negative impact precisely on indigenous coal-burning plants that are the largest emitters of greenhouse gases – between 1.1 and 1.3 tons of CO₂/MWh (at 0.4 tons of CO₂/MWh for natural gas plants). The payments for carbon pollution (purchase of allowances) will result in considerable and gradually increasing rate of production costs for these plants. On the one hand, the new (clean coal) technologies are still in the experimental phase, on the other hand their introduction will become a factor increasing the price of electricity.

Potential

(1) The long-term use of fossil fuels is a strategic policy of the European Union that will continue to have significant contribution to mitigate the price fluctuations of primary energy carriers. The future use of coal is closely related to progress of technologies in two main aspects: efficiency in the production and industrial application of clean coal technologies.



(2) The significance of local coal for energy security is incontestable. The Bulgarian energy policy will follow technological developments towards generation efficiency and clean coal technology and will introduce state-of-the art technology in line with European requirements and the country's economic capabilities. In order for local coal to be secured its role in the future with its stabilising role in the national generation of electricity the construction of new and renewal of existing power stations, modern technological solutions – high-efficiency and low-carbon – will be implemented.

(3) The future of coal industry is secure. It is guaranteed by the successful and timely completion of the rehabilitation and environmental projects in Maritsa Iztok - 2 TPP and Maritsa Iztok - 3 TPP; the commissioning of a the new lignite capacity at Maritsa Iztok -1 TPP.

(4) The country's ambition and efforts are directed to the implementation of a project for the construction of new lignite capacity – TPP «Maritsa Iztok 4», which is to be one of the first power plants in Europe equipped with the carbon capture and storage technology. The successful realisation of the project is largely dependent on the funding options for such projects that are in the process of being now discussed at the European level.

(5) The construction of replacing capacity in lieu of decommissioned power plants burning indigenous coal, is a possible alternative and a matter of free economic initiative. The liberal regime for the construction of new generating facilities coupled with the development of more efficient and low-carbon technologies that will get strong financial backing at the EU and national level, are a good prerequisite.

(6) In view of the importance of the share of indigenous fuels in the primary energy balance for the country's energy security, the procedures of issuing permits for the exploration, research and extraction of indigenous energy resources will be simplified and sped up. Also simplified will be the administrative regimes related to the expropriation of lands included in royalties schemes. Also improved will be the control on the expropriation of proved efficient deposits and adherence to the provisions of concession contracts.

1.2. ELECTRICITY

Advantages

(1) The structure of electric power generation in Bulgaria is optimal with respect to diversity and location of energy resources. The generation diagram for 2007 is dominated by coal-burning plants – 51.6%, followed by the nuclear plant – 33.9%, plants burning natural gas – 5.7%, plants (including HPPs), using RES - 7.7%.

(2) The structure of electricity generation is dominated by indigenous energy carriers, if nuclear energy is to be treated as a local energy carrier. The share of indigenous energy carriers used in the generation of electricity for 2007 is 81.2%, and that of imported carriers is 18.8%. Nuclear fuel is treated as an indigenous source because: the deposits identified are widely distributed in geographical terms; nuclear fuel are not risky from the point of view of the specifics of the annual loading in the reactor; the prices of nuclear fuel are stable in time - relatively slow and limited fluctuations as compared to those of liquid fuels.

(3) The national energy mix is risk-free and practically independent of the fluctuations and unforeseeable price changes for liquid fuels and natural gas. The share of liquid fuels and natural gas in the structure of electric power generation in the country for 2007 was 5.1%. This provides for a higher degree of security of the Bulgarian power generation system in view of its autonomy from monopolised price fluctuations and supplies from the global markets of liquid fuels.



(4) Electric power generation in the country fully meets and exceeds domestic demand, as a result of which Bulgaria is a leading exporter of electricity for the SEE region. Up until 1993, the country was a net importer of electricity, but after 1997, due to the sharp decline in domestic demand, it started to export electricity at growing rates (annual average growth above 20%). Even in under the most conservative estimates for electricity generation, supply will completely cover domestic demand for the period by 2020 and the export capabilities of the country will be preserved.

**Table 5
PROJECTIONS FOR THE GENERATION AND CONSUMPTION
OF ELECTRICITY**

	2010	2015	2020
Total electricity generation, GWh	44714	49441	65823
Total consumption of electricity, GWh	42317	47147	51512

Source: NEC EAD

(5) The electric transmission grid of Bulgaria features a good geographical structure and can reliably service the transmission of energy from power plants to consumers. The projects implemented by means of which the improved security of operation of the high voltage power grid is ensured; improved system for measurement of electric power in the electricity transmission network; streamlining of the management of transmission and transformation of electricity in the power grid; introduction of dispatcher management systems for territorial dispatcher centres to carry out the parallel mode operation of the electric system of Bulgaria with the Union for the Coordination of the Transmission of Electricity (UCTE).

(6) Distribution networks within the territory of Bulgaria have been in the process of serious development and re-configuration over the past years. This process depends on the construction of new industrial, tourist and household plants on the one hand, and on the changed characteristics of electric appliances and installations, f.e. air conditioning installations, on the other.

(7) The national transmission and cross border power grid is well developed. Bulgaria has inter-grid electric lines connecting the country with all neighbouring countries and has transmission capacity of 9 bln kWh per year.

(8) The electric power system of Bulgaria is a full member of UCTE, works in parallel with the electric systems of countries from Continental Europe and represents a separate control block. From the point of view of the security of power systems and UCTE regulations, any national system should be able to deal with usual system disturbances (deficit or surplus). The Union operates on the principle of solidarity, and starting from the onset of the emergency, all partners provide short-term assistance to the system in distress. This calls for every system to always be able to provide the necessary facilities and all types of reserves according to the rules of the united system. The import of electricity from systems outside the synchronized zone is technically possible, but is provided under lower quality criteria and security of supply.

(9) The operational reliability of the power grid in terms of balance of generating capacity and the adequacy of the network is provided by a licensed company - «ESO» EAD. To achieve the fulfilment of its obligations, «ESO» EAD prepares forecasts for the consumption and the necessary generating capacity to cover demand in the country and in the region in accordance with the requirements for reliable operation of the system. When power shortages are forecast, or generation capacity, respectively, «ESO» EAD is obliged to promptly inform and make a proposal to the Council of Ministers on the need for additional new capacity and the organisation of a bidding procedure to select an investor. At the same time, «ESO» EAD is obliged to inform the electricity transmission company on the need for new electric transmission networks, including intergrid connections.

(10) The permits, reconstruction and modernization of the transmission network, as well as the provision of access to it, are activities subject to licensing, respectively to control on the



part of the regulatory authority. The funding of these activities is provided from the regulated revenues defined on the basis of business plans approved by the regulatory authority, an integral part of the license, issued to the transmission company – owner of the electricity transmission network. The transmission company is part of NEC EAD (subsidiary of BEH EAD).

Disadvantages

(1) Power generation facilities in Bulgaria are considerably obsolete. Part of them will be decommissioned, another part will be modernised and brought in compliance with the new environmental norms which will, however, requires large investment. The age structure of thermal power plants and nuclear units is shown in the next schedule

Table 6 AGE STRUCTURE OF ELECTRICITY POWER PLANTS	over 35 yrs	31 – 35 yrs	26 – 30 yrs	21 – 25 yrs	16 – 20 yrs	over 15 yrs
Heat power plants	28.8	13.3	22.2	11.4	9.1	15.2
Heating TPPs	56.7	8.3	4.2	8.5	15.7	6.6
Factory TPPs	49.3	21.1	8.0	9.9	3.4	8.3
NPP	0.0	23.4	11.7	11.7	53.2	0.0

**Note: For NPP „Kozloduy“ was reported
the entire installed capacity of 3,760 MW**

Source: MEE

(2) After the decommissioning of units 1-4 of Kozloduy NPP, the export capacity has been reduced, the ground was set for potential increase in the share of imported energy carriers in the power mix and emission intensity (ton CO₂/ MWh) of the electric power sector was increased. The commercial export of electricity in 2007 was 4.5 bn kWh (10.5% of gross electric power generation), which is 41.6% less as compared to 2006. The emission intensity per MWh of electricity generated from 0.48 tons/MWh in 2006 increased to 0.59 tons of/MWh in 2007. (or by 23%). .

(3) The development of wind power generation will require facilities needed to offset the disbalance in the power generation system. By 2020, it is planned that 2000 MW wind generating plant will be commissioned, generating nearly 4 bn kWh of electricity per year. Power generation from wind plants is unstable and has a wide fluctuation range, which requires the maintenance of reserve capacity (1,200 MW) to replace them in order to cover the load diagram. This will result in higher prices for the energy mix.

(4) Efforts to achieve the national target for renewables will generate additional costs for the power generation system arising from their priority connection to the transmission and distribution grid. According to current legislation, costs related to the connection of RES installations to the grid are paid by the transmission or distribution companies, respectively. Network companies experience difficulties in implementing this obligation due to the risk of untimely and/or incomplete coverage of these extra expenses from regulated prices for transmission/distribution. Additionally there is no mechanism, through which these expenses, arising from the implementation of obligations to society, can be fairly distributed among all consumers.

(5) There is no sufficiently clear differentiation between the functions and responsibilities of separate network companies. This creates difficulties in maintaining and developing the network.

(6) The business plans of the transmission company, in particular their investment plans, are not subject of a clear regulation from the point of view of obligation for the necessary



network development. The market players do not have sufficient access to information regarding future decisions on the development of the network, which hinders investment activity and planning. Challenges to the prompt and adequate development of the network and a reasonable quality of supply occur due to the insufficient return on capital enforced by the regulator as an element of regulated prices.

(7) Consumers' needs in the country get ahead of the development of the distribution infrastructure. The lack of sufficient and timely investment in the development of distribution infrastructure has had unfavourable impact on economic growth – it impedes, delays or postpones planned investments. Challenges to the prompt and adequate development of the network and a reasonable quality of supply occur due to the insufficient return on capital enforced by the regulator as an element of regulated prices.

Potential

(1) The large projects planned or already started for new power generation facilities, as well as the construction of infrastructure for their connection to the national power grid will guarantee that domestic demand is met and improve the country's position as a net exporter of electricity:

- NPP «Belen» (commissioning in 2014) will increase by over 35% the system's generation capacity as compared to 2007 and at the same time will contribute to a considerably cleaner energy mix with respect to sulphur, dust, nitrogen oxides and greenhouse gases
- TPP „Maritsa Iztok 1” (commissioning in 2010) will increase by 11% the generation capacity of the system over the 2007 baseline, it will take up the leading position among coal burning plants in the SEE region with respect to environmental requirements and will contribute to the long-term independence of power supply through the use of indigenous energy sources
- The rehabilitation and modernization of key power plants such as TPP «Maritsa Iztok 2», TPP «Maritsa Iztok 3», TPP «Varna» and others will allow for the operational life to be extended in an environmentally friendly and cheaper manner (as compared to investment for new capacity)
- The utilisation of the potential of considerable hydro resources through the successful completion of the Tsankov Kamak Hydro Plant, as well as the construction of hydro complexes «Gorna Arda», «Nikopol – Turnu Magurele» and «Nikopol – Călărași» will considerably support the implementation of the national RES target and will contribute to the improvement of the environmental indicators of the energy mix. The state will help with the implementation of new projects by creating a favourable institutional environment, but a necessary prerequisite for their implementation will be the availability of investment interest at a corporate level

(2) Pursuant to national law, as regards the construction of new power generation capacity, the principle of free economic initiative applies. The State reserves its right to initiative only in cases of shortages of power generating capacity identified by «ESO» EAD. At the moment, there is growing interest and investment activity for projects concerning RES power stations that offer long-term guaranteed purchase of energy and stable prices. In spite of the liberalisation of the market and related assessments pointing at high risk, there is also investor interest in projects for new power plants that will operate in the market environment and under the usual risks.

(3) The infrastructure projects that were launched or planned will contribute towards the adequate enlargement and modernisation of the power transmission system needed for the



proper functioning of the electricity market, as well as for the exchange of electricity with the SEE region and the EU:

- Completing the „Energy 2” project for rehabilitation and modernisation of the power transmission system; building substations high and medium voltage power lines
- Completion of the construction of the electric power inter-grid connection with Macedonia: subst. Chervena Mogila (Bulgaria) – subst. Shtip (Macedonia) – part of European Corridor № 8
- Construction of the second inter-grid power line between Bulgaria and Greece - project Inter-Grid Powerline 400 Kw subst. „Maritsa Iztok” – Galabovo – subst. Nea Santa ”Komotini”
- Also discussed is a possible future option to construct a second inter-grid connection with Serbia at Vidin to subst. Bor (Serbia) and a new electric power line to Romania at NPP “Belen” to subst. Domneşti (Romania) .

(4) Bulgaria will continue to fulfil its obligations as member of UCTE to achieve higher operational security of its national and interconnected electric power systems. A strategic task is to attract investments to increase the transmission capacity of inter-grid lines at least to 10% of the installed capacity of the generating system, the continuous updating of communication, information and management systems, as well as the technical characteristics of all aggregates that would allow for increasing the volume of trade, respectively the security of supplies. This will create additional options related to negotiating the import of electricity in the event of continuous disconnection from regular operation of large generation installations.

(5) The introduction of new requirements to ensure the independence of transmission system operators (within the framework of the Third Energy Liberalisation Package) will create the potential to guarantee an adequate level of investments in the power grid and the speedier integration between national grids. Both models discussed envisage for the transmission system operator to be also the owner of transmission assets including the appropriate license with the respective rights and responsibilities. It is envisaged that 10-year network development plans be drafted based on wide public discussion monitored by the regulator. The implementation of plans will be obligatory, and in the event of declared incapacity on the part of the operator to make investment in infrastructure, identified as necessary in the plan, the regulator will have the power to oblige the operator to fulfill its commitment or organise a competition so that the investment can be made by a third party.

(6) The accelerated expansion and modernisation of distribution networks for medium and low voltage and of their management and protection systems are of primary significance to the security and the quality of electric power supply. The availability of sufficient generation capacity and a well developed transmission network are a necessary but not sufficient condition for the security of supplies to electricity consumers. Distribution networks are the finishing part of the electric power system that provides a direct connection with individual consumers. The timely development of the network primarily depends on the provision of enough investment funds for electricity distribution companies. The prices for distribution of electricity are regulated and laid down on the basis of business plans approved by the regulatory authority. From this point of view, striking a balance between the requirements for adequacy of the distribution network and the necessary price increases is the regulator's important task.

(7) A primary and increasingly important task of the regulator will be to observe both the development plans of the transmission companies and those of distribution companies, in order to be able to assess their adequacy and rationality. This will have a favourable impact on consumer prices and the security of supplies.



1.3. NUCLEAR ENERGY

Advantages

(1) Nuclear fuel is regarded as an indigenous energy source. The generation of nuclear energy is not dependent on price changes of fossil fuels, because a little quantity of uranium supplied mostly from stable regions (without conflicts) in the world, is sufficient to keep the reactors going for a whole decade. Unlike conventional fuels transport (by air, land, and sea), the regularity of supplies, storage and re-stocking can be carried out during the spring and summer period and do not depend on weather conditions. The supply of nuclear fuel is guaranteed by means of long-term contracts with predictable global companies.

(2) The share of fuel costs in the prime cost of NPP - generated electricity is about 18%. For coal-burning power plants the same component is about 35%, and for gas it is about 60%, due to which price changes for nuclear fuel have a relatively smaller effect on the price of electricity from NPPs.

(3) Nuclear energy has a serious contribution towards meeting the electricity demands of the country's economy and population. Even after the decommissioning of units 1-4 at NPP “Kozloduy”, the nuclear plant's share in the total electric power generation in Bulgaria in 2007, was 34%. At the same time, our nuclear power station is the most economical producer in the country.

(4) Nuclear energy is a reliable and emission-free source for electricity generation. The high level of safety of the units, in full compliance with valid international standards, has been explicitly confirmed by a number of peer reviews – on the part of the International Atomic Energy Agency, the Western European Nuclear Regulator's Association (WENRA), Atomic Questions Group of the European Union Council, the World Association of Nuclear Operators (WANO). In order to meet its obligations for environmental protection and reduced greenhouse gas emissions, nitrogen oxides, sulphur dioxide and dust particles into the air, our country will continue to rely on nuclear energy. Of major significance to the achievement of high operational standards is the qualified staff – the availability in the country of rich expertise and scientific potential in the field of nuclear energy and technology represents an extremely valuable human capital

(5) Bulgaria has been fulfilling its obligations arising from the Convention on Nuclear Safety and is committed to maintaining a high level of nuclear safety and radiation protection. The investment programme implemented over the past years allowed for the improved operational safety of existing nuclear facilities up to an internationally acceptable level. Nuclear safety is a matter of national security. The main responsibility for it is borne by the operator, and legislative and regulatory issues are within the competence of the regulating authority – the Nuclear Regulatory Agency. The Act on Safe Use of Nuclear is based on the principle of strengthening the independent and competent regulatory regime, with clearly understandable legislation in the field of nuclear safety and radiation protection, the existence of a stringent licensing regime and the availability of sufficient resources and competences of the regulatory authority.

6) The decommissioning of nuclear units in the country is carried out in accordance with the Revised Strategy for the Decommissioning of Units 1-4 of the Kozloduy NPP adopted in 2006. It takes into account the state-of-the-art methods of decommissioning and the experience from the implementation of such projects in other countries. The proposed philosophy at the base of the revised decommissioning strategy is for the smooth and continual use of human and financial resources, as well as of facilities for RAW management; this is where the term "continuous dismantling" comes from.

(7) At the end of 2004, the Council of Ministers adopted the national «Strategy for management of spent nuclear fuel and radioactive waste». The Strategy envisages measures to develop a modern



single national system for management of SNF and RAW in the Republic of Bulgaria. The Strategy applies the principles of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the recommendations of competent international organizations, the European Community acquis and the institutional setting used in a number of European countries.

(8) Two specialized nuclear funds have been established in the country – „Decommissioning of nuclear facilities“ and „Safe storage of radioactive waste“. These funds are the financial instruments to implement state policies of safe radioactive waste management (including their disposal) and activities related to the decommissioning of nuclear facilities. These funds are targeted and have been set up to ensure the implementation of specific long-term public activities for a period of more than 300 years. Revenues to the funds are mostly collected from the contributions of entities operating nuclear facilities and generating RAW as a result of their operation, as well as from the state budget.

(9) By virtue of the Act on Safe Use of Nuclear Energy, in 2004 the State Enterprise «Radioactive Waste» has been established. Radioactive waste becomes state property at the time waste is transferred to SE «RAW» which is responsible for the safety of the RAW delivered and the facilities where these are stored and treated. The main tasks of the enterprise are the planning, design, construction of necessary facilities (including national storage facility), the transport, management of radioactive waste on the territory of Republic of Bulgaria and the decommissioning of nuclear facilities. The activities of SE «RAW» are financed from the «RAW» fund and are subject to regulatory control in accordance with ASUNE.

(10) With financing from the European Commission and the Donors' Assembly, the Kozloduy International Fund (KIDSF) was set up and is successfully operating. The Fund was set up to provide support to Bulgaria in the process of decommissioning of nuclear units and mitigating the resulting negative economic, social and environmental consequences. Grant funds are used for the financing of projects related to the activity of NPP «Kozloduy», for the restructuring, improvement and modernisation of the generation, transmission and distribution of energy, improvement of energy efficiency and development of RES.

Disadvantages

(1) The decommissioning of units 1-4 of NPP «Kozloduy» resulted in complex economic, environmental and social consequences. The early decommissioning of nuclear capacity reflected negatively not only the energy and environmental balance and the opportunities for export of electricity. From the social point of view, there was negative impact on the rate of employment and socio-economic development above all in municipalities closely related to the nuclear plant.

(2) The generation of nuclear energy is not flexible and entails certain substantial permanent expenses. This requires the presence of an optimum quantity of reserve capacity so that the power generation system can adjust to the fluctuations of the electric power market.

(3) The prime cost of electricity from NPP will increase. This is result of three factors: large capital expenditure for the construction of NPP, including the establishment of safety systems and systems for safe storage of RAW and SNF; the high requirements related to the storage of spent fuel and the decommissioning of nuclear units; the potential problem with the non-proliferation regime.

(4) The two nuclear funds – „Decommissioning of nuclear facilities“ and „Safe storage of radioactive waste“ were set up in 1995, and money started being transferred to these funds at the end of 1999 (three years before the decommissioning of the first two units). The funds are meant to provide the financial resource for specific long-term activities in the field of nuclear energy. Contributions to the fund are mostly made by NPP „Kozloduy“ based on the annual generation of electricity. International practice is for such funds to be set up even before the commissioning of the nuclear plants so that charges levied on the electricity sold during the



whole period of operation can be accumulated as funds for future expenses in the decommissioning and disposal of nuclear reactors and the final storage of RAW. From this point of view, Bulgaria is lagging behind in setting up such funds and collecting funds therein.

(5) The problem with storage of RAW from nuclear energy has not yet been solved. The planned construction of a national storage facility for low and medium radioactive waste (to become operational in 2015) will partially solve the problem. Activities for the construction of a long-term storage facility for highly active RAW are still in the initial stage (the deadline under the Strategy for RAW and SNF management is 2030).

Potential

(1) A lower carbon energy mix, stable prices and opportunities for growing exports can only be achieved through the sustainable development of nuclear energy. To achieve this goal, it is necessary that the project for the construction of the new nuclear power plant - NPP «Belene» is successfully and timely completed, and also to maintain the current high operational standards of existing nuclear facilities, which will lead to a considerable (as compared to the present time) increase of the share of nuclear energy in the total structure of electricity generation.

(2) Introducing the highest possible safety standards in the generation of nuclear energy and the management of RAW and SNF is a matter of national security and will remain a priority in the country's energy policy. To take into account the planned development of nuclear energy in Bulgaria and the country's EU membership, as well as the obligations under the Treaty Establishing the European Atomic Energy Community, the Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste adopted in 2004 will be updated. Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste (2004) The purpose is to review the policies related to the optimal solution of issues at the final stage of the nuclear cycle in the national nuclear energy. Major priority in this respect will be given to the successful completion (planned for 2015) of the project for the construction of the national radioactive waste storage facility. It is there that the final storage of low and medium-active waste from NPP in the country and from the Novi Han facility will be provided. An important project is the construction of the Dry Spent Fuel Storage Facility (DSFSF) at NPP «Kozloduy» which already started; the facility will provide the long-term safe storage of spent nuclear fuel for a period of no less than 50 years, meeting the international standards in this area.

(3) The setting up and maintenance of a modern system for training and re-training of staff is a critical precondition for the reliable and safe operation of nuclear power plants. The training of specialists for the nuclear industry at universities and the additional further training in nuclear power plants is a key task for the nuclear energy industry. An active government policy is needed to maintain and upgrade the education and training system for this industry.

(4) Bulgaria is actively participating in international initiatives to ensure the sustainable development of the national nuclear energy. In the short term, it is not so much technological innovation in nuclear energy that is needed but the introduction of market mechanisms, licensing and regulation of the use of nuclear energy at the level of inter-governmental and international standards.

(5) The new European energy policy declares support for the development of nuclear energy. The generation of nuclear energy is an option to reduce CO₂ emissions and is playing important role to face challenges related to climate change. It is a matter of the sovereign right of each Member State to decide whether it is going to use nuclear energy. It is important that emphasis continue to be placed on the security and safety of nuclear power generation. In this connection, the European Commission proposes the setting up of a High Level Group on Nuclear Safety in the EU whose primary task will be to develop Community-wide rules in the field of nuclear safety and security. In



order to ensure the projected energy consumption and reduce import dependence, solutions must be based on new investment or the extension of the lifetime of some existing nuclear plants.

1.4. HEAT ENERGY

Advantages

(1) District heating provided by heating companies is the main form of heating in densely populated larger cities. Heat energy has a relative share of 10% in the total final energy consumption and 20% in the total energy consumption of households.

(2) During the 2002 -2007, the consumption of heat energy in the country was stabilised. This is the result of the energy policy that put an end to price subsidies (subsidising from the state budget was re-directed from energy producers to underprivileged consumers of energy), the launch of individual measurement and regulation of energy consumption, thus creating the right conditions for investment projects to modernise the facilities, reduce losses in the heat transmission network and at individual substations.

(3) District heating is an equal competitor to the now developing household gasification and heating from electricity. Investment for the construction of low pressure gas-distribution networks and their maintenance costs increase the price per unit of heat energy considerably above the costs for existing heating networks, if these are modernised. In addition, the initial expenses for purchase of the necessary appliances needed for the use of natural gas are estimated at about 2,000 BGN per household. With the phased-in increase of electricity prices it should also not be a serious competitor to centralised heating to meet the population's heating needs. This is the main prerequisite for the expected increase of consumption of heat energy by 2020.

(4) The combined generation of heat and power increases the efficiency and cuts the generation costs for both types of products. All heating companies using natural gas (85% of the heat energy generated) provide an economy of 10% of primary energy. In 14 heating companies (from a total of 16) installations for combined generation are in place. The installed capacity of co-generation plants is 774.7 MWe_l.

(5) The total energy efficiency of cogeneration for all heating companies is 67.23%. Power plants operating on natural gas report a general energy efficiency rate of about 75 % while coal-burning plants have a 33% to 58% efficiency rate. Power and heat cogeneration plants based on gas piston engines have a guaranteed general energy efficiency above 80%.

(6) The combined generation of heat and electricity has favourable environmental impact as it reduces the emission of greenhouse gases. The general capacity and generation indicators for cogeneration in the country and the environmental effect from these are indicated below:

Table 7 CAPACITY AND GENERATION INDICATORS FOR COGENERATION IN THE COUNTRY	Indicators			
	Electric capacity	Co-generated electricity	Co-generated heat energy	CO2 reduction
	MW _{el}	GWh _{el}	GWh _{th}	thousand tons
Total	728,6	1469,7	4594.3	980

Source: MEE

(7) The national policy for the development of district heating through high-efficiency cogeneration of heat and power is developed on the basis of Directive 2004/8/EC on the



promotion of cogeneration. It is regulated in the Energy Act, the Ordinance establishing the quantity of electricity produced from cogeneration, and the Ordinance on the issuing of certificates of origin for cogenerated electricity. The approach to support cogeneration envisages two types of incentives: obligatory purchase of electricity generated and preferential prices.

Disadvantages

(1) Household consumption exceeds 70 per cent of the total quantity of heat energy sold by heating companies. This defines and the basic challenge heating companies' face: retaining existing customers and attracting new household customers

(2) There is a trend for deterioration of the financial status of heating companies. Both the size of negative financial results and the number of companies reporting losses is increasing.

(3) Almost 90% of the installed cogeneration capacity is 20 to 36 years old. The last commissioned power boilers and steam turbines were made operational in 1988. The new cogeneration systems installed during the last 2 or 3 years have a total capacity of 32 Mwe1 and limited capacity from 0.4 to 3.3 Mwe1. Most of them were purchased second hand and have electric efficiency of over 38 %.

(4) Only 53.2% of the generated heat energy comes from co-generation installations. In Sofia, 38% of the heat energy generated and sold comes from power plants that do not provide cogeneration but only water heating boilers. The main reason behind the insufficient investment in the construction of combined modules are the low (until recently) preferential prices for purchase of cogenerated electricity. These prices were meanwhile raised to a reasonable level, but the lack of stable rules and long-term price guarantees continue to impede investment activity.

(5) Heat energy sold to end users is 80% of the total heat energy generated. This means that losses along the heat transmission networks are 20%

(6) Plants using solid fuel are not in a position to achieve the saving of primary energy required in Directive 2004/8. In view of the regulated reference values for the efficiency of separate generation, these plants report higher fuel consumption than separate generation. In addition, these plants are facing environmental protection issues because of which the question of their future operation will have to be decided in the near future.

(7) The smaller difference in prices of heat energy and electricity for households is a valid reason for many consumers to give up using district heating. In view of the price hikes for fuels and the critically high prices of heat energy for household consumers, there is a real danger that heating companies will continue to lose custom (in some regions the price of heating is close to or even higher than the night rate for electricity).

(8) The collectibility of receivables from household customers is critically low. At this time, heating companies have very low collectibility of receivables from household customers – about 50%. The reason for this is the method of sale – to each separate apartment in a «condominium building». Bulgaria is the only country in Europe where the heating company sells heat energy not to “the building”, but to each separate apartment. In such condominium installations and the inability of heating companies to cut heating supply to separate apartments that fail to pay their bills, all heating companies have huge amounts of uncollected bills from customers. At the same time, this method of sale creates consumers' expectations that the heating company is responsible for the quality of heat energy to each apartment, which is impossible because the quality in depends, to a considerable degree, on the condition of the building installations located after the boundary of ownership of facilities.

(9) The proposals for obligatory association of people living in condominium buildings are not met with support. Meanwhile the current attempt to induce consumers to form associations by means



of legal incentives in the form of lower prices for heat energy has not been successful. The option for legal entities (merchants) to take over the functions of suppliers of heat energy against a certain discount from heating prices also failed.

(10) The problems mentioned above – the negative financial performance and critically low collectibility – are both interrelated and also linked with the enormous debt to the public supplier of natural gas – „Bulgargaz” EAD. If this trend persists, it would pose a serious threat to the security heat energy supplies.

Potential

(1) Due to the insufficient potential for competition among participants in the process of heating supply, the Energy Act does not provide for the introduction of a liberal market model and respectively the liberalisation of heat energy prices. This means, that the prices for generation and transmission of heat energy will remain regulated and the regulator's main task must be to regulate through incentives that would encourage companies to work more effectively in favor of consumers. At the same time, regulated prices have to guarantee the financial security of companies and sufficient rate of return for investment in efficiency.

(2) The major challenge that district heating companies face – the low rate of collectibility of customers' bills, is not insurmountable. One of the tools for improving the collection of receivables (mostly from household consumers) should be the introduction of modern and proven practices such as outsourcing bill collection to specialised collection companies, factoring etc. In this way, apart from the direct effect – higher collectibility – and other positive results will also be achieved: avoiding the difficulties related to direct contact with the customer, focusing resources on the main business activity (heat generation and transmission), transfer of collectibility risks to a third party. In the longer term, efforts must be directed at encouraging owner associations in condominium buildings and the introduction of new technical solutions for measurement of individual consumption.

(3) The increased share of high-efficiency cogeneration is already defined as a strategic objective. Every four years, prepares analysis for the national potential for highly efficient co-generation and evaluates progress towards increasing the share of highly efficient co-generation in the gross consumption of electricity. According to this analysis, there is major technical potential for the modernisation of cogeneration installations to increase power generation through existing heat energy generation (the ratio of electricity to heat energy generated from cogeneration installations is 0.379, and for Sofia – 0.32).

(4) In view of the expected increase in the consumption of heat energy – both in industry and households – opportunities for cogeneration of electricity will also increase. In addition, the industrial heat burden is relatively stable throughout the year, which is an additional favourable factor to develop cogeneration. According to the analysis drawn up in 2008, by 2020 it is expected that power from cogeneration sources will double in volume, and its share in the total consumption of electricity will increase from 10% to 15%. In addition, apart from traditional primary energy carriers, biomass and waste will also be used.

(5) It is envisaged that a market mechanism be introduced to encourage cogeneration. The Minister of Economy and Energy will propose for approval by the Council of Ministers a draft act that is in line with EU policy, by 31st December 2011.

(6) Investment should be encouraged to improve the heat transmission network. A good example in this respect is the company «District Heating – Sofia» which, thanks to intensive investment in the network, supported by means of state-guaranteed loans, the technological losses along the heat transmission networks were reduced to 16.8%.



(7) The proper management of investment already made and of investment that is currently being appropriated, will depend more and more on the activity of the private sector. On the one hand – due to the fully changed structure of property in the heating industry, and on the other. – due to the legally regulated free regime for construction of new capacity supported by incentives and preferential treatment for cogeneration plants. Attracting the private sector in a suitable way has proven successful and efforts in this respect have to continue in order to achieve the successful privatization of heating companies in the cities of Sofia, Pernik and Shumen. .

1.5. NATURAL GAS

Advantages

(1) Bulgaria features a strategic geographical location. Bulgaria is located between Russian and the South and South East parts of the EU between the EU and the Caspian Region and the Middle East, which provides the country with considerable opportunities to diversify the sources and routes of gas and oil supplies.

(2) Bulgaria is in geographical proximity to the producers/suppliers of oil and natural gas in the Black Sea and Caspian regions and the Middle East. This provides a competitive advantage coming from the lower transportation costs and respectively opens opportunities for negotiation of relatively lower prices of the respective imported energy resources.

(3) Bulgaria is located on an energy line crossroads between the main producers and consumers of energy resources in Eurasia. On the territory of the country there are transit gas lines from Russia in the South and Southwest direction – transit quantities by the national gas transmission company in 2007 exceed 17 bn cubic m. of natural gas and provide a source of substantial financial revenue that generates potential for further expansion of the gas network and the transit business. Currently, Bulgaria is a gas distribution centre in the SEE region – our country provides the supplies of natural gas to Turkey, Greece and Macedonia and is a guarantor for the security of gas supplies in the region.

(4) Bulgaria is conducting a consistent long-term policy aimed at the implementation of new strategic energy projects on the country's territory. This makes our country a predictable and welcome partner. The national aspirations and efforts are aimed at securing that the future gas pipeline routes from Russia, the Caspian, the Middle East and North Africa pass through the country's territory in the North-West and West direction. This is why the country is already participating in the preparation and implementation of the following projects:

- The top priority EU gas project of - „NABUCCO” for transmission of natural gas from the Caspian region, the Middle East and North Africa to the SEE region and the EU, thus providing Bulgaria and the EU with access to considerable gas resources from these regions and respectively will diversify the possible sources and routes of natural gas.
- The strategic „South Stream” project from Russia under the Black Sea to the Bulgarian coast, with two lines planned to criss-cross Bulgaria - the „South” and „North” line, respectively to Italy and Austria, which will ensure the diversification of routes and a direct link between the main supplier – Russia and the main consumer – EU.
- Projects for oil pipelines – Bourgas-Alexandroupolis and Bourgas-Vlorë (through which a considerable part of Russian oil exports will flow), with the implementation of which (or one of them) Bulgaria will be positioned as an important transit centre of Russian and Caspian oil to European and global markets



(5) A well-developed primary gas transmission infrastructure is in place in the country, providing considerable unused capacity. It could secure supplies in view of the growing consumption in the long term period.

(6) In order to further develop the gas distribution network, regional and municipal gas distribution licenses have been issued which cover the greater part of the country's territory. An important part of the licenses issued are the long-term business plans approved by the regulatory authority according to which licensees have to develop the network. A favourable regulatory environment has been established to encourage larger investment – on the part of the regulator, a specific approach was adopted to adjust prices at net present value, guaranteeing a high rate of return and prior inclusion in the prices of the projected value of investment, as well as an option to set differentiated prices depending on the type of consumer. At the same time, failure to adhere to business plans is subject to control and respectively sanctions from the regulatory authority.

(7) An underground gas storage facility is in place in the country - "Chiren". Using the gas stored at Chiren, the seasonal fluctuations in consumption are compensated, and an emergency, operational and strategic reserve is provided. The storage facility has usable volume of about half a billion cubic metres, but it is an important factor for the uninterrupted supply.

Disadvantages

(1) Indigenous natural gas production is negligibly small. Consumption in the country is ensured through imports.

(2) Bulgaria has only one source of natural gas supplies – the Russian Federation. This explains the almost 100% dependence on Russian gas supplies.

(3) Natural gas is supplied to Bulgaria using a single pipeline. This means that in the years to come no supply of additional quantities of natural gas for the country is possible using this route. Additional natural gas supplies from Russia will only be possible after the construction of the South Stream gas pipeline.

(4) There are no inter-grid connections between Bulgaria and neighbouring countries. This deprives the country of both alternative supplies and opportunities for solidary action in the event of temporary deficit.

(5) Regardless of the liberalisation of trade in natural gas, long term agreements on the delivery of natural gas will continue to be used to stabilise the supply and the prices. On the background of increasing demand and growing competition for access to energy resources on a global scale, it is critically important for new long-term agreements to be signed on the supply of natural gas from the Russian Federation that would guarantee the national consumption of natural gas and economic development in the long term.

(6) No satisfactory practices are yet in place regarding the long-term planning and funding of the network development - due to the short period (2007 – 2008), within which the organisational and legal restructuring of „Bulgargaz” was carried out, and respectively the separation of the activities of transmission and transit from all remaining activities.

(7) Bulgaria has only one storage facility for natural gas (Chiren) with limited capacity. In the event of major restriction or interruption of gas supplies, its current capacity for storage and particularly its daily intake capacity would be insufficient to guarantee security of supplies for the country.

(8) There are no working mechanisms at the EU level for solidarity actions in case gas supplies are limited or cut for Member States, nor a coordinated external EU energy policy to third countries. Moreover, under the priorities of the newly adopted Energy Policy for Europe, special measures need to be taken to ensure the diversification of gas supplies to EU Member States, who are only dependent on one external supplier – as is the case with Bulgaria.

(9) The construction of the country's gas distribution is still in the initial Stage. As few as 1.5% of Bulgarian households have access to natural gas, while for Europe this percentage is 55%. At the same time, nearly 40% of the energy used by Bulgarian households (including for heating and household needs) is electricity, while for the EU the same figure is 11%. The excessive „electrification” of households in the country results in three times more use of primary energy as compared to environmental and cheaper alternative – direct use of natural gas.

(10) The lack of timely and adequate investment in the development of the gas-transmission network corresponding to the plans for construction of the gas distribution network, is a major obstacle to the gasification in the country. Proof of this is the fact that in all settlements with developed gas-transmission network the construction of gas distribution networks has also started. This is mostly due to the lack of corporate and regulatory policy for the planned development of the transmission network - the obligatory development and implementation of long-term investment plans, control and sanctioning of the implementation. Additionally the legally unclear differentiation between transmission and distribution networks, and respectively between the functions and responsibilities of separate network companies – impedes the development of the distribution network and creates conflicts between the transmission and distribution companies.

Potential

(1) The European policy of co-operation is the key to long-term energy security. The establishment and implementation of a coordinated EU foreign energy policy is one of EU priorities. Enhanced partnership and cooperation in the energy sector with the EU's and SEE's main suppliers such as Russia, the Middle East, North Africa and the Caspian Region; with the main consumer countries such as the USA, Japan, China, India, and especially the dialogue with the transiting countries such as Ukraine, Belarus, Turkey and the South Caucasian countries is a key prerequisite for ensuring the balance of demand and consumption under clear and stable transit rules.

(2)The Trans-European Energy Networks programme (TEN-E) will be used to develop the gas infrastructure in Bulgaria and in third non-EU countries. This will provide the physical prerequisites for the integration of European infrastructure to that of neighbouring countries and will remove existing limitations and barriers to energy flows.

(3) Bulgaria has significant contribution to the signing and entry into force in 2006 of the Energy Community Treaty between EU and SEE countries. Bulgaria has both the potential and the interest to preserve its leading position in the shaping and implementation of a common regional policy mainly focused on the development and construction of suitable energy infrastructure, and in particular gas infrastructure, that would physically allow for the functioning of a market for the entire Energy Community and its connection with the common EU energy market.

(4) Bulgaria is in a position to play a key role in the future enlargement of the European Energy Community to a Pan-European Energy Community. Bulgaria is a country from the Black Sea region and has amassed rich experience as part of the cooperation with Black Sea and Caspian countries in the energy field. These are strategically important for the security and diversification of energy supplies and the transport of energy resources to Bulgaria, the region and the EU. Seeing the dynamics of the future establishment and development of the Pan-European Energy Community, it is expected that countries from the Mediterranean, Black Sea and Caspian region will join it, with the Energy community remaining as its core.



(5) The EU's interest in securing a ground connection of European countries with the Caspian region, the Middle East and North Africa through Bulgaria are fully in line with national interests. At the same time, a wider approach and a more flexible policy is needed due to the emerging parallel or competitive alternatives on the background of the dynamically changing international environment.

(6) Options are in place to establish inter-network connections with Turkey, Greece, Serbia and Romania, and these may be put in operation faster and at lower cost as compared to larger transit projects. These connections will diversify the sources and routes of supplies for the country, provide an option for natural gas supplies to and from Bulgaria and at the same time contribute to the closer cooperation among Balkan countries in the economic and energy field.

(7) The construction and use of terminals for regasification of liquefied natural gas is a widely used alternative for gas pipelines, providing the diversification of sources and routes. It is practical for such a project, requiring substantial investment and ensuring large capacity for the facilities that much exceed the country's needs, to be coordinated and implemented in collaboration with some of the countries in the region with high consumption and respectively greater need for additional supplies of natural gas. An important condition for such a project is the construction of gas inter-network connections between countries in the region.

(8) The highest degree of energy security is provided by indigenous energy resources. It is in Bulgaria's interest to encourage the exploration and research of new deposits in the Black Sea shelf and elsewhere within the territory of the country.

(9) Besides the Russian Federation, there are also opportunities to conclude long-term agreements with other countries producing natural gas. These are countries from the Caspian region, the Middle East and North Africa. Speedier action should be taken in this respect in view on the background of a fast-developing process of pre-purchasing free quantities of natural gas, mostly by Russia and Turkey, in the producing countries of the Caspian region, the Middle East and North Africa that are the sources of the NABUCCO gas pipeline.

(10) The globalised co-operation policy and stronger positions of the national gas company, create realistic opportunities to take its investment activity outside the country's borders, namely:

- Investments in the exploration and extraction of energy resources, and in the construction of gas infrastructure in the natural gas producing countries from the Black Sea region (including Russia and Ukraine) and the Caspian region, the Middle East and North Africa (f.e. through the purchase of shares in gas deposits). This would provide for the higher reliability of supplies and more competitive price of natural gas for Bulgarian consumers
- Acquisition of shares in the companies that own the gas transmission and gas-distribution networks of the countries transiting natural gas to Bulgaria, thus providing both economic benefits and greater security of the gas-transmission system for the supply and transit of natural gas for and through Bulgaria.
- Investment in the development of gas transmission and gas-distribution networks in SEE countries and particularly in the Western Balkans. Some of the Western Balkan countries still have no sufficiently developed gas infrastructure and gas-distribution networks in particular. This creates opportunities for investment and access to new gas markets.

(11) The role of gas storage facilities as a tool to increase security of supplies will increase. The demand for capacity on the part of countries and companies that have no storage facilities will also grow. Essential are the measures to expand the capacity of the existing gas facility in Chiren and



start the construction of new storage facilities in the country in order to guarantee the security of supplies and establish Bulgaria's position as a gas distribution centre. These will ensure the gas supply in emergency situations and stimulate the liberalisation of the gas market. With the expansion of the Chiren facility and the construction of new gas storage facilities, the right environment will be created for Bulgaria to form its own trading platform for natural gas (gas exchange) providing services to the consumers, suppliers and merchants in the SEE region; the platform will be compatible with the other commercial platforms in the CEE region and Europe.

(12) Replacing electricity with natural gas for heating and household purposes will contribute to the threefold saving of primary energy. The rate of gasification could be accelerated mostly through the adoption and mandatory implementation of long term development plans of the gas-transmission network by the gas-transmission company, which is in line with the business plans approved by the regulatory authority for development of the gas-distribution networks. The implementation of such a plan will be financed with the revenues from transmission, and, if possible - also with revenues from the transit of natural gas. In addition, with the aim of bridging the gaps between different regions in the country, the Bulgarian state, using EU programmes and funds, will support the development of gas infrastructure to municipalities for which there is no investor interest (and respectively no licenses have been awarded) due to the great distance to the transmission network.

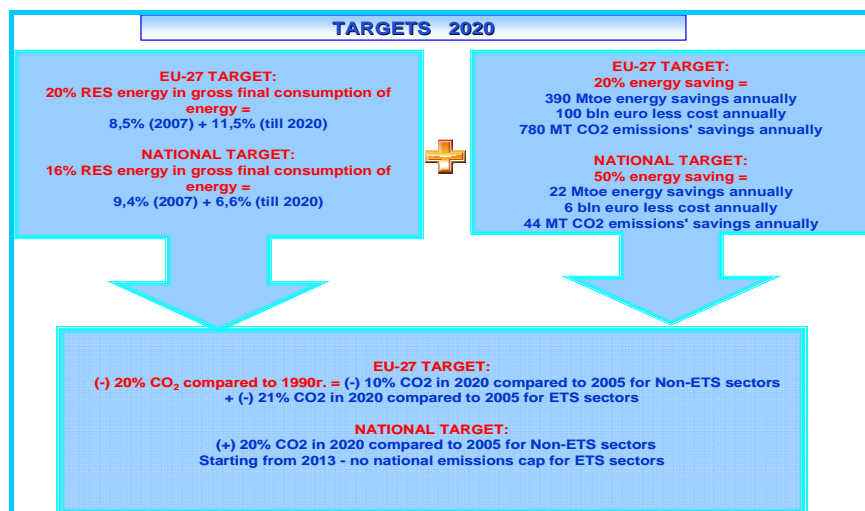
(13) Very useful to the development of gasification are activities related to the supply of compressed natural gas. In view of the economic inefficiency in the construction of linear gas infrastructure to small municipalities and remote sites, the delivery of compressed natural gas creates an option for their gasification. The supply of compressed natural gas would help develop the gas market and the intra-city gas distribution network in a given municipality and at a later stage a gas line would be constructed to it.

(14) There is major potential in the national gas market to expand the use of natural gas in the automobile transport. This potential could be utilised by promoting the construction of gas stations (methane) as an environmentally friendly and cheaper alternative to other fuels.

2. SUSTAINABLE DEVELOPMENT

The tasks to be addressed by the European Community are defined as follows:

- Develop competitive renewable and other low carbon energy sources and energy carriers, in particular alternative fuels for transport
- Limit the energy consumption in Europe
- Make global effort to reverse climate change and improve air quality



2.1. ENERGY EFFICIENCY

Advantages

(1) With the adoption in 2004 of the Energy Efficiency Act and its amendments in 2008, Bulgaria achieved a satisfactory level of harmonisation of the national legislation with the acquis. The establishment of the Energy Efficiency Agency ensured the necessary institutional conditions for the implementation of an integrated approach to energy efficiency. The programmes and plans adopted are the fruit of this integrated approach.

(2) As part of public-private partnership efforts, the Bulgarian Energy Efficiency Fund was set up and is successfully operating. It sets the background for funding of energy efficient projects in various sectors of energy generation and consumption.

(3) The abolition of price subsidies sent the correct economic message to consumers and investment promotion in energy efficiency measures. Subsidies have been redirected to underprivileged users in order to mitigate the impact of price increases.

(4) Efforts have been made to enable heat energy consumers to manage their own consumption by introducing heat regulation appliances and individual distribution of consumption. Building substations have been modernised with the help of state-guaranteed loans; the new technology allows for flexible management and results in the economy of heat energy.

(5) The modernisation of the national district heating system has started; the same applies to the development of the gas distribution network that may in, to a considerable degree, contribute towards the realisation of the significant energy saving potential. Using state-guaranteed loans, the heat transmission network in Sofia was modernised and as a result, expenditures for the transmission of heat energy in the city of Sofia are lower than the loss in other urban areas with district heating in spite of the greater distances.

(6) The Bulgarian legislation consistently introduces the provisions of EU directives on the marking and labelling of energy appliances. Evaluation and testing systems have been introduced, as well as the certification of buildings.

(7) As a result of the policies that are already in place, over the past years sustainable economic growth is ensured by using practically unchanging volumes of energy.

Disadvantages

(1) In spite of the positive trend for improved national indicators on energy intensity, these continue to be far above both the EU average and above these of CEE Member States.

(2) Differences in the rate of energy intensity of gross inland energy consumption are particularly large. This is the result of:

- The extremely large share of primary energy and resources used for transformation – over 96% of the gross inland energy consumption. About 2/3 are used by electric and heat energy plants, whereby over 70% of the primary energy carriers are lost in the processes of transformation and transportation.
- The low efficiency of power generation plants resulting from the operation of mostly obsolete technologies
- The low share of high-efficiency cogeneration of heat and power



- Large losses in the transportation of energy to end users

(3) The efficiency of energy end use is not high enough. Especially vis-à-vis the industry sector, energy intensity is higher than the EU standard due to the large relative share of energy intensive subsectors due to the insufficient development of nonenergy intensive subsectors manufacturing products with higher added value. The share of the transport sector is increasing, which leads to greater consumption of liquid fuels. Although the consumption of households is lower than the EU average, it is still stable around a large share of electricity and insignificant share of natural gas – the use of electricity for heating is a sign of inefficiency due to the great losses in transformation.

(4) The prices of electricity and natural gas for the industry in Bulgaria are among the lowest in EU-27. The prices of electricity for the household customers are among the lowest in EU-27. The prices of electricity for the population for EU-27 are approximately 40% higher than these for the industry. This standard ratio is related to the higher expenses for network services for household consumers and higher expenses for energy for this type of consumption due to its instability in the day/night and seasonal section. For Bulgaria, this ratio is below 20%. The low prices encourage the use of energy instead of saving it. This creates the conditions for export of a national product through industrial export. On the other hand, barriers are created to the maintenance and modernisation of networks, thus creating risks for the security of energy supply to households.

Potential

(1) The prices of different types of energy have to match the economic proportions, so that activities and solutions to businesses and households are based on accurate information and motivated by correct price signals that would create energy-saving incentives. At prices corresponding to the actual economic costs, the price of electricity for the population for example must be at least twice the price of heat energy and natural gas. These proportions will be valid in the future, too, in spite of the expected increase in the price of natural gas to its market levels in 2012.

(2) To improve the efficiency of transformation processes and the transmission of energy, two groups of measures will be undertaken: the consistent restructuring of final consumption towards reduced transformation of energy from one type into another - promote the direct use of natural gas, biomass, solar for heating, use of decentralised energy at the point of consumption; set up a regulatory environment that encourages energy companies to invest in energy efficient technology in the extraction of energy resources, the generation and transmission of energy.

(3) The functioning of power plants and the industry under the conditions of a single competitive energy market, on the one hand, and participation in the European Emission Trading Scheme, on the other, will encourage market-oriented investment in the field of energy-saving and the introduction of new more efficient technologies.

(4) Improving the efficiency of final consumption requires the application of a wide array of methods. For operators of industrial installations covered by the Emission Trading Scheme, the «polluter pays» principle will play role of a natural incentive to save energy. For remaining end users, the measures in Directive 2006/32/EC on energy end-use efficiency and services will be implemented; these will be incorporated into the three consecutive three-year action plans in 2007, 2011 and 2014; after the first three years, the option will be discussed to introduce the system for trade in white certificates depending on EU-level decisions.

(5) With the changes in the Emission Trading Scheme from 2013, introducing an obligation for power plants to pay for greenhouse gas emitted, the country will have a considerable financial resource aimed to support measures in the field of energy efficiency, the



development of RES, the introduction of new technologies (including clean coal) and the fight against energy poverty. In 2020, this resource is estimated EUR 1,600 M/year in income to the national budget.

(6) The changing conditions of energy and the future perspectives require the updating of educational programmes at universities, introducing new specialties and curricula. This is obviously necessary in the three basic aspects: new energy technologies, energy economy under market conditions, energy efficiency. This will develop a capable labour force of specialists to contribute fresh ideas and new practices in the local energy technologies, the management of companies and the new market structures and mechanisms.

2.2. RENEWABLE ENERGY SOURCES

Advantages

(1) Bulgaria has a significant unused potential of renewable energy sources. According to the National Long Term Programme to Promote the Use of Renewable Energy Sources 2005-2015, the available potential of different RES is estimated at about 6000 m. toe per year, which includes hydro, wind, solar, geothermal energy and biomass. Energy generated from RES in 2005 was 1000 Mtoe and is mostly produced by HPPs (24%), energy from biomass (70%) and geothermal energy and others (6%).

(2) With the adoption of the Act on Renewable and Alternative Energy Sources and Biofuels, the framework is set in place to develop RES, AES and biofuels and specific measures and incentives are being planned for some technologies in order to achieve the national targets by 2010 regarding the share of renewable electricity in total inland electricity consumption and the share of liquid biofuels in the transport sector. To achieve the objectives of the Act, a system of measures and activities is foreseen at the national, regional and local level to encourage the development and use of technologies for the generation and consumption of RES and AES energy and promote the development and use of technologies for the production and consumption of biofuels and other renewable fuels. One of the key purposes of the Act is to guarantee the security of investors and financing institutions and the financial viability of the projects for construction of plants for RES electricity generation by means of a system for preferential purchase prices for electricity generated by different RES technologies, long-term agreements on the purchase of RES – electricity, provision of conditions for priority access to energy networks and other administrative preferential treatment.

(3) The existing system of preferential purchase prices for electricity generated, differentiated according to the different RES technologies, created considerable investor interest, particularly in the field of wind energy. According to the estimates under the project «Creating a mechanism to encourage power generation from RES in Bulgaria in a cost-effective manner», at the current levels of preferential prices about 30% of the unused potential of hydropower can be used (small and micro HPPs), 40% of the wind potential and more than 60% of biomass (straw and wood) that would generate about 7 bn kWh (or 0.6 Mtoe) of electricity per year.

(4) The powers given to regional governors and the mayors of municipalities for the organisation and coordination of activities related to the implementation of national RES programmes at the regional and local levels set the ground for wider use of local RES for the generation of electricity and energy for heating and cooling at the local level. The inclusion of local RES resources into the plan for development of settlements contributes to achieving the objectives for local sustainable development. The decentralised generation of renewable energy or the use of solar, wind, geothermal energy and biomass according to the local potential and needs is a sector with large perspectives in the country - this will avoid any expenses related to the connection to grids and transmission and distribution losses.



(5) Funds are successfully being utilised to implement projects in the field of renewables – both for electricity generation and for the decentralised generation of energy – from specialised credit lines provided by the Kozloduy International Fund and supported by the European Investment Bank. Bulgarian organisations and companies successfully participate in projects, financed by EC energy programmes «Intelligent Energy Europe» and the framework programmes for research and demonstration. A number of non-governmental organizations, agencies and centres specialized in the rational use of energy and RES have been set-up and are successfully operating.

(6) Opportunities for investment assistance for projects in the field of RES and in particular the decentralised generation of energy – are provided in the operational programmes for use of EU funds, namely: «Development of the competitiveness of the Bulgarian economy», «Regional development», the rural areas development programmes.

(7) National programmes have been adopted for biomass and biofuel use in transport sector by 2020. The latter programme sets also the national targets on the share of biofuels in the transport sector by 2020.

Disadvantages

(1) The relatively higher investment outlay for some of RES technologies reduces investor interest on the one hand, and on the other, generates additional public expenses in the form of higher preferential prices for these technologies.

(2) Promoting the use of biofuels and biomass can result in adverse effects if it is not linked to clearly defined criteria for sustainability and restrictions arising from them. Similar adverse effects could be the deforestation in the use of biomass, more expensive foodstuffs in the use of agricultural land to grow energy crops for biofuels.

(3) There are not any available mechanisms to encourage heat and cooling energy generation from renewables. The development of this sector, in spite of its great potential, is practically stagnant.

(4) The existing encouraging mechanisms for renewable energy use need further development to a market direction so that the economically more efficient technologies are encouraged first, as these require relatively lower public support.

(5) A number of limitations of administrative and environmental nature are in place concerning the use of the RES potential. Environmental restrictions cannot be ignored, for instance those related to the “Natura” network. Administrative procedures, however, should be simplified, and wherever possible, completely removed.

Potential

(1) Upgrading the existing support schemes to achieve the most efficient use of opportunities for electricity generation from RES. Both in setting the national sectoral target to 2020 on the share of RES electricity in gross inland final consumption, and in the support schemes, the principles of flexibility should be applied which:

- Adequately reflect all changes in the market environment and technological progress
- Take into account the technical and economically justified capabilities of the national electricity system to integrate new producers of RES electricity



- Take into account the necessary costs (public and investment) for development of different RES technologies
- Guarantee the achievement of the national targets at the lowest possible cost to society

(2) The support schemes should be accompanied by a transparent mechanism to compensate for any expenses arising from the implementation of obligations to society in the purchase of RES electricity at preferential prices. This mechanism should envisage both the offsetting of additional costs of the public supplier and of the final consumers of electricity at preferential prices, and distribute such costs fairly between all consumers – on the other hand.

(3) The introduction of clearer, transparent and non-discriminatory rules and criteria with respect to the integration to the electric grid of RES electricity producers requires the further development of regulatory mechanisms. These must be in line with the new EU legislation.

(4) Encourage the use of small applications of RES to achieve the national target for the generation of heat and cooling energy from RES. The leading role in increasing the use of the local RES potential will be played by local and regional authorities. On the one hand, they should lead by example, demonstrating the efficient use of energy local RES resources, and on the other, by establishing a favourable environment to develop private investment and the installation of facilities and systems for use of RES electricity and energy for heating and cooling in housing and industrial areas within their territory. Attention should be given also to the option for the processing and use of waste for energy production. Activities in this direction can be accompanied by measures to attract investments and promote the development of production and technologies and/or elements of RES technologies leading to job creation and development and diversification of local commercial activities. At the same time, the achievement of sectoral targets will depend, to a large extent, on the efficient development at national level of specific support schemes and the regulation in the field of construction, including by means of inclusion of measures and requirements for opportunities assessment to increase the share of all types of RES in the building sector. A significant element is the access to funding, the availability of flexible financial instruments and schemes reflecting the specifics of various RES technologies and opportunities for receiving technical assistance, both by local administrations and by companies and citizens. In addition, both at the national and local level, it is necessary to carry out active information campaigns and provide accessible information on the measures and support schemes, the net benefits, costs and energy efficiency of appliances and the systems for use of electricity, heating and cooling energy from RES.

(5) Introduction of specific mechanisms and programmes in support of the generation of renewable energy and biofuels with funds raised from the auctioning of emission allowances, EU funds and others financial sources and fiscal instruments.

(6) Updating of the national programmes on biomass and biofuels in connection with the introduction of specific criteria for sustainability and the relevant encouragement mechanisms with a view to implementing the national targets.

(7) Use of targeted policies in the field of energy efficiency combined with the policy for use of the cost-efficient potential of RES for additional economic benefits to the country. This can be carried out through direct investment in joint projects for utilising the RES potential on Bulgarian territory and the paid-for transfer of part of the energy to EU countries that lack sufficient potential to achieve their national targets. Apart from direct economic benefits, this policy will result in indirect effects, namely: development of high-efficiency production, transfer of technology and knowledge, development of regions, including underdeveloped rural and border regions, contribution to environmental protection.



(8) Expanding the range of training and preparation of highly-qualified specialists in the new aspects of technology: production of energy carriers from RES, technologies for transformation and use of RES, including opportunities for energy generation in small scale or the so-called „distributed energy”, up-to-date systems for management of the electric power grid, including in connection with the integration of RES in the energy grid and others. Attention should also be given to the need to launch schemes for qualification and certification of technicians specialised in the construction and maintenance of small biomass boilers, solar thermal and photovoltaic systems, geothermal systems and thermal pumps.

(9) Upgrading the administrative procedures to remove of regulatory and non-regulatory barriers to the development of RES. One opportunity in this respect is the creation of a single coordinating administrative authority that will be responsible for processing all administrative documents (permits, licenses etc.), related to the installation and use of RES technologies, and for the provision of administrative assistance to applicants. In addition, with the setting up of an information system (planned in the Act on RES, AES and biofuels), the access will be provided to detailed up-to-date information for opportunities to use different RES technologies by geographic regions.

2.3. GREENHOUSE GAS EMISSIONS

Advantages

(1) The presence of active policies in the field of efficient generation, transmission, distribution and consumption of energy and incentives for renewables in the country lead to direct reduction of greenhouse gas emission and significantly contribute to fulfilling Bulgaria's obligations under international agreements in the field of fight against climate change.

(2) All power generation operators participate in the EU Emission Trading Scheme since 01 January 2007. Their participation in the scheme stimulates investment in improving the efficiency of their generation. The fulfillment of operators' obligations includes an element of flexibility or in cases, where a certain operator is not in a position to introduce technological improvements or these require considerable investment outlay, the operator can fulfill 12.5% of its obligations by investing in «joint implementation» or «clean development» projects, or purchase credits /permits from such projects in international markets at prices lower than those of the Scheme.

(3) Bulgaria has a sizeable surplus of greenhouse gas emissions as part of its obligations under the Kyoto Protocol, mostly due to the restructuring of economic activities. This allows the country to use the flexible financial mechanisms provided for in the Protocol (“joint implementation”, “international trade”) to attract investments in clean technologies, particularly in sectors not covered by the European Emissions Trading Scheme. Currently the country is implementing «joint implementation» projects in the field of power generation from RES, cogeneration, household gasification and others.

Disadvantages

(1) There is significant delay in the procedure of adopting the National allocation plans for emission allowances related to Bulgaria's participation in the EU ETS in 2007 and in 2008-2012 period. This makes it difficult for operators to plan their investment programmes and participation in the emission allowance market.

(2) It is considered that part of the «joint implementation» projects indirectly lead to reducing the power generation from thermal plants. Pursuant to Commission Decision of 26 November 2007, the quantity of reduced emissions listed in the approved «joint implementation» projects as such having indirect effect, should be taken from the power-generating sector in the allocation of emission allowances in the national plan.



Potential

- (1) Active policy in the field of energy efficiency and creating the necessary conditions to reduce by half the energy intensity of GDP.** This will result in a chance to save up to 50 mln tons of greenhouse gas emissions/ per year by 2020.
- (2) Active policy in the field of efficient use of the local RES potential to achieve a share of RES energy in the gross final energy consumption in 2020 higher than that defined for the country in the Directive on encouraging RES energy.** Regardless of the fact that it is economically justified for the RES energy surplus to be transferred to others countries, the reduction of greenhouse gas emissions achieved will still have to be ensured to meet the country targets.
- (3) Use of the Kyoto Protocol flexible mechanisms to attract investment to projects not covered by the European Emissions Trading Scheme.**
- (4) Use of at least 60% of the national revenues from emissions trade** and the new liberal regime related to state aid in the environmental field to encourage the introduction of innovative, high-efficiency and clean generation technologies, including carbon capture and storage technologies.
- (5) Encourage research and demonstrations in the field of energy and new technologies** by introducing diverse non-market incentives, demonstration projects, co-operation programmes, education of highly qualified specialists, funding of scientific research and others.
- (6) Introduction of specific measures to support the development of new branches of the energy industry and in particular hydrogen energy, including the preparation of economic and regulatory conditions for commercial application of state-of-the-art.** The technological development of hydrogen energy, combined with the use of emission-free technologies for hydrogen generation, are an important direction to progress in energy, due to which electricity and liquid fuels will be gradually replaced in a number of specific areas that are more appropriate for hydrogen applications. This refers to small applications, autonomous systems, fuel cells, transport etc.

3. DEVELOPMENT OF THE NATIONAL ENERGY MARKET

The reliable energy supply at reasonable prices is a key factor for economic growth and competitiveness. In 1995, the European Union took a decision to start the phased-in introduction of competition in the electricity and gas markets to improve the effectiveness of sectors and of economy as a whole. From 01 July 2007, the Bulgarian electricity and gas market was also fully liberalised. This means that each user of electricity and natural gas was given the legal right to choose a supplier and was provided with free and equal access to the energy transportation network to the place of end-use.

Because of the priority objective to achieve a competitive, secure and environmentally sustainable market of electricity, Member States should guarantee that they would ensure the management of energy enterprises in accordance with the rules as defined in the Directives, to be implemented under the principle of equal treatment of all market operators (both as regards its rights and its obligations). At the same time, Member States have the power to enforce on companies in the energy sector, liabilities related to public services concerning the security, regularity, quality and price of supplies and environmental protection.

Member States are obliged to establish regulatory mechanisms that would ensure the adequate and efficient control and transparency to avoid abuse of dominant position, particularly to consumers' detriment. The national regulatory bodies are the ones responsible for ensuring non-discrimination,



efficient competition and efficient operation of the market and should be completely independent from the energy industry.

Turning the complete liberalisation from a legal right into a practical option for every user requires effort, changes, and time. It depends on the active position of all market players to say when, how and to what extent the target will be met for efficiently working market mechanisms under conditions of competition and transparency.

3.1. REGULATION

Advantages

(1) With the adoption of the Energy and Energy Efficiency Act in 1999, the independent State Energy Regulatory Commission was established. With the adoption in 2003 of the Energy Act – the basic legislative act based on the Energy Strategy of 2002 and brought in line with the regulations of EU Directives, introduced some changes in the powers and scope of regulation and set the grounds for the proper functioning of SEWRC in a stable legislative environment. Gradually SEWRC was given greater autonomy, competences and functions that are defined and clearly differentiated from those of the Energy Ministry. The key elements of SEWRC autonomy are the mandates of its members; independence in decision making; powers to set the rules for pricing and tariffs. The financial independence of SEWRC is ensured through its right to collect fees as provided in the EA, in accordance with a tariff adopted by a Council of Ministers' decree.

(2) The regulator introduced standard regulatory methods that are gradually being improved. SEWRC applies diverse price adjustment methods towards licensed energy companies. With the accumulation of experience, information and with the strengthening of the administrative and professional experience of the regulator, conditions are being set in place to make a transition from yearly pricing based on the individual costs of each company to longer regulatory periods and pricing based on the relevant standard indicators and depending on the degree these were met.

(3) Consumer protection measures have been introduced on the background of the complete liberalisation of the electric and gas market. It is the duty of each Member State to guarantee that all household consumers and, at the regulator's discretion, small enterprises (according to the definition), can benefit from the right of universal service – the right to receive electricity and natural gas of a certain quality at reasonable, easily and clearly comparable and transparent prices. The end supplier, which is a new operator in the Bulgarian energy sector, is responsible for this type of supplies to underprivileged consumers connected to the electric power or gas distribution network within the territory for which it is licensed. The supply of electricity and natural gas from an "end supplier" is provided at publicly announced terms and conditions at SEWRC-regulated prices – both for the purchase of electricity and natural gas by the end supplier from the public supplier, and for the sale of it to groups of underprivileged customers. To ensure the supply of electricity by the end supplier, SEWRC sets the availability of electricity generation, according to which each producer is obliged to conclude transactions at regulated prices with end suppliers and/or the public supplier. In addition, a necessary condition to obtain the right to export electricity from the country is that household consumers and small enterprises are provided with the electricity of the established quality at transparent and reasonable prices.

(4) A system for energy support to underprivileged (socially disadvantaged) households. A significant aspect of government policy for consumer protection are the measures, taken to protect the Bulgarian consumer from energy poverty, and these include a policy of social assistance which aims to guarantee the most efficient social protection of people needing help from the state. One of the mechanisms to achieve this objective is the regulated system, in place since 1998, to provide targeted energy assistance governed by the provisions of the Social Assistance Act and its implementing instruments. During the 5 month heating period, targeted energy assistance for electricity, heat energy,



solid fuel and natural gas is provided to citizens in need if they meet certain criteria. The annual update of the amount of assistance is in accordance with the changed prices of the energy carriers concerned.

(5) The reliable energy supply at affordable prices in the country is a key factor for economic growth, competitiveness and a guarantee of the right to universal service to household consumers. The regulated prices for electricity and natural gas for the industry and households are among the lowest in Europe.

Disadvantages

(1) SEWRC functions with respect to the regulation of the water supply sector were further added in order to get the most benefits from the administrative and professional capacity in the energy sphere already in place. This resulted in certain difficulties demonstrated in: cumbersome administrative procedures and decision making processes; impeded strengthening of the required professional capacity related to the introduction and development of modern regulatory practices in the energy industry.

(2) Low regulated prices do not ensure sufficient income for energy companies to maintain and develop the energy sector. This creates risks to the security and quality of supply, thus impeding the meeting of environmental standards. At the same time, they are the reason for energy overspending, in the form of ungrounded growing expenses for energy use.

(3) The introduction of modern and efficiency-promoting methods of price regulation for Bulgarian energy companies is still in its initial stage. The regulatory methods still being applied to some energy companies „reward” ineffective energy companies and „punish” those that operate efficiently just to cover actual individual expenses without taking into account the efficiency potential.

Potential

(1) Restoring the specialised energy regulator will contribute to the profiled and targeted strengthening of the regulator's professional capacity, facilitate administrative procedures and simplify the decision-making process. This is a necessary prerequisite to successfully cover the new and higher requirements to energy regulators in Europe. The professional strengthening of the regulatory institution goes hand in hand with ensuring an adequate salary level for SEWRC members and its administration thus creating an incentive for them to meet the ambitious requirements to their qualification and responsibilities.

(2) The necessary increases of regulated prices can be controlled (by schedule) and limited to a growth lower than the GDP growth. Thus the goals for secure and good quality power supply will be achieved without hindering the economic growth and the welfare of citizens and the affordability of energy goods and services.

(3) Good practices in EU Member States as regards complex tariff systems and up-to-date regulatory methods can be successfully introduced in Bulgaria, too. In this way, two goals will be achieved: first, reducing the volume and facilitating the operation of the regulatory institution and, second, encouraging licensees to improve the efficiency of their activity. Achieving this second objective is of particular significance to consumers because regulatory practice in others countries shows that setting up efficiency incentives is a more successful approach to cut expenses and energy prices than conventional regulatory control.



3.2. MARKETS

Advantages

(1) A market model of the electricity and gas sectors has been introduced. The market model of the Internal Market of electricity (and natural gas) is based on regulated access of third parties to the network, whereby transactions are carried out by means of direct bilateral contracts between producers/ traders and consumers and a balancing market (at which shortages are purchased and surplus is sold under bilateral contracts). During the transitional period of phased-in liberalisation the relationship among market players is effected in a regulated and a free market of electricity. These two segments work under different conditions, but jointly and the connection between them is established by the power grid operator whose functions also cover the administration of transactions at freely negotiated prices and the organisation of the balancing on the electricity market. The market model introduced with the adoption of the Energy Strategy of Bulgaria in 2002, subsequently also applied at the regional level as a market model for South-Eastern Europe countries through the Regional Strategy for Development of the Power Industry in SEE (of 2005) and with the signing of the Energy Community Treaty between SEE countries and the European Community (in force since July 2006).

(2) Starting from 1 July 2007, the Bulgarian market for electricity and natural gas has been fully liberalised. This means that each consumer was given the legal right to choose a supplier and was provided with free and equal access to the energy transportation network for the purposes to deliver the energy to the place of its end-use. At national level, the acquis concerning the internal markets of electricity and natural gas was transposed at an accelerated pace. The commitments made by Bulgaria in the process of negotiating the country's EU accession under Chapter 14 "Energy" resulted in the transposition of EU energy legislation, and legal measures for the liberalisation of the energy sector were implemented at the same time as in EU Member States. As a result, starting from 01 July 2007, the complete legal liberalisation of the national electricity and natural gas markets and the elimination of restrictions on import and export are in place.

(3) In compliance with EU and national energy legislation, the required restructuring of the energy companies was successfully completed within the set deadlines («NEC», «Bulgargaz» and the electricity distribution companies). The restructuring of NEC EAD, of the electricity distribution companies and of Bulgargaz EAD at the end of 2006 was carried out in connection with the country's commitments under Directive 2003/54 (Electricity) and Directive 2003/55 (Gas). These Directives required the unbundling of network operators separating them from all other activities with the exception of the transmission/distribution of energy, while complying with minimum mandatory requirements for independence of operators. The purpose of restructuring was to provide free access of consumers to the network which is a key prerequisite for the efficient functioning of the market.

(4) In order to achieve the efficient management of energy companies under changing market conditions, well-established foreign energy companies are now successfully operating in the country. The electricity distribution companies were privatized, as well as the heating companies (with the exception of those in Sofia, Shoumen and Pernik), a number of electric power generation plants. The new TPP «Maritsa Iztok 1» and gas distribution networks are also being constructed by private investors. This ensured investment for the maintenance and development of energy assets.

(5) In September 2008, the «Bulgarian Energy Holding» (BEH EAD) was established. The holding consists of the state-owned energy companies «National Electric Company» EAD, «Bulgargaz» EAD, «Bulgartransgas» EAD, «Bulgartel» EAD, NPP «Kozloduy» EAD, «TPP Maritsa Iztok 2» EAD, «Mini Maritsa Iztok» EAD. With the establishment of the new holding structure, Bulgaria now has one of the largest energy companies in the region and a national energy leader, with consolidated assets worth about BGN 8.5 bln, consolidated income in the amount of about BGN 3.6 bln and a total number of employees about 21 thousand people.



Disadvantages

(1) All prices in the internal market along the «generation– supply» to the end - user chain, as well as the predominant part of generated/ sold electricity in the country are still subject to price regulation. According to EU directives, the prices that must be subject of regulation in the conditions of a liberalised market are the network prices, i.e. the prices for the transmission and distribution of electricity. The regulation of other prices in the «generation – supplies» chain, including end-consumer prices, is a possible option, but only for a transitional period and to be phased-out, if such regulation is required to ensure the protection of vulnerable consumers and if no condition for competition are in place.

(2) The long-term contracts which have been signed limit the energy quantities and the number of players on the liberalized domestic electricity market. NEC EAD, in its capacity as Public Provider, is currently purchasing and/or will purchase in the long-term period the entire availability (capacity) and electricity generated from the “Maritsa – Iztok” Complex, at negotiated, fixed prices under long-term contracts. With these contracts, the necessary investment was attracted for the rehabilitation of existing and the construction of new generating facilities. However, these contracts have a negative impact on the process of liberalisation as they take a considerable portion of the potential market segment.

(3) The mandatory purchase and non-market prices for part of the electricity generated in the country arising from the implementation of Public Service Obligations limit the development opportunities for a competitive energy market. This concerns RES and cogeneration energy, and also in the event that the Minister, for reasons related to the security of supplies, sets a quota on the generation of electricity from local resources.

(4) In spite of the favourable legal preconditions in place since 2003, no exchange-type market has been set up in the country. The existing model of bilateral contracts and balancing market is the foundation on which the structuring of a comprehensive market model should continue. A functioning electricity exchange would be the natural environment for its development.

Potential

(1) The setting up of a power exchange and cooperation with the power exchanges functioning in the region is a prerequisite for stepping up competition. Market liquidity is defined both by the freely traded volumes of electricity, and the number of participants on the wholesale market. Setting up an electric power exchange based on the integration of already functioning electricity exchanges in the region and the exchanges in Bulgaria will naturally create the liquidity conditions that are currently missing.

(2) Issues related to the long-term contracts in their entirety, and in particular - the mechanisms for compensation of non-recoverable (stranded) costs could not be solved autonomously and will have to be reviewed in the overall context of the forthcoming establishment of a comprehensive market model in the country. In this context, an appropriate mechanism should be put in place to integrate long-term agreements for the purchase of electricity and a fair mechanism to compensate for non-recoverable expenses.

(3) The creation of BEH EAD aims for the centralised and efficient management of participating business units with adequate market behavior and functioning under single strategic management. It will ensure the development of competitive advantages of the Bulgarian energy industry, its position in the regional and European market, in full compliance with the regulations of EU and national law. The establishment of BEH ensures the higher efficiency and quality of energy services, optimisation of expenditures and the introduction of modern mechanisms to attract investment.



(4) The new requirements for unbundling of transmission network operators to be introduced at the EU-wide level, will provide additional safeguards for their independence and respectively for the stable development of transmission networks and equality of access to them. This will ensure the more effective functioning of the market and lower prices in favor of consumers.

(5) The higher requirements on consumers' awareness as concerns the network development plans and price projections will allow them to take adequate decisions and adapt promptly to planned changes. The role of SEWRC will be decisive in this respect.



IV. STRATEGIC DECISIONS 2020

The strategic decisions defined arise from the analysis of the state of the energy industry and the assessment of its potential. They are aimed at achieving the national targets and guaranteeing that Bulgarian interests are protected. At the same time, Bulgaria's efforts, in her capacity as Member State, will contribute towards the easier transition to a more secure, more efficient and low-carbon EU economy.

Strategic decisions are grouped in two packages, as described below.

1. «BRIDGING THE GAPS» PACKAGE

The status analysis identifies differences with respect to the efficiency in generation, transport and use of energy, the market development and corporate management as compared to EU practices in the these areas. Bridging these gaps is a necessary precondition that would give our country a competitive position in the European market – in favour of both the economy and all citizens. Therefore the implementation of decisions included in this package is mandatory. The implementation is not influenced by external risks and circumstances – it fully depends on the mobilisation of internal resources and efforts at national level. This applies also to the funding needed to implement the decisions: The regulatory policy on prices will be important for the timely development of networks, the accelerated development of RES, cogeneration and energy efficiency in the supply and consumption of energy. Along with this, the successful integration of the country in the European Emissions Trading Scheme will ensure the transfer into the state budget of considerable financial resources (EUR 1, 600 million per year by 2020) from operators covered by the Scheme that can be entirely directed towards encouraging RES, energy efficiency, new technologies (including clean coal) and fighting against the energy poverty.

Nº	STRATEGIC DECISION	PERFORMANCE INDICATOR	EXPECTED OUTCOME
1	Improvement of energy efficiency at rates that are faster than the EU-average ones	Improved energy intensity of gross inland energy consumption by 50%	Doubling of GDP at half the size of gross inland energy consumption (toe/ EUR GDP) Saved energy – 22 Mt/annually Saved costs for energy imports – EUR 6 bln/annually Saved emissions – 50 Mt/annually
1.1.	Energy saving by end users	Improved energy intensity of final consumption by 35%	
1.2.	Saving energy in the processes of transformation and transportation of energy by means of:	Improved ratio between final energy consumption and gross inland energy consumption from 48% of 56%	
1.2.1.	Increased efficiency in energy generation	Improved energy generation efficiency by over 40%	
1.2.2.	Reducing expenses for electricity for power plants' own needs	Reduced losses for plants' own needs by over 30%	
1.2.3.	Increase in the share of cogenerated electricity	Doubling the quantity of cogenerated electricity and larger share in electricity consumption to 15%	
1.2.4.	Lower loss from the transmission and distribution of energy, including by developing distributed (decentralised) energy generation	Reduced transportation losses for energy by 30%	



1.2.5.	Saved primary energy by reducing the share of transformed energy – direct burning of natural gas at end users side	Access to the gas distribution network of 30% of the country's population	
2	Guaranteed implementation of the national target for 16-percent share of RES in gross final consumption of energy	Over 16-percent share of RES in the gross final consumption of energy	Import dependence for primary energy resources reduced by over 5% Emission intensity of gross inland energy consumption reduced by over 10%
2.1.	Realising the energy potential of biomass	Doubling the quantity of biomass used (including biofuels) for the generation of energy and for direct final consumption Additional quantities of biomass utilised equal to 650 thousand toe/year	
2.2.	Realising the potential of hydro (micro and small HPPs), solar and geothermal energy	Increase in the quantity of hydro (micro and small HPPs), solar and geothermal energy by 300 thousand toe/year	
2.3.	Utilisation of the energy potential of wind	Wind-generated energy increased by 350 thousand toe/year	
3	Introducing efficient tariff systems and regulatory methods for network companies	Introduction of comprehensive cost oriented tariff systems Introduction of regulatory methods encouraging companies' efficiency Ensuring sufficient regulated income for companies to achieve the required efficiency indicators	Security of power supplies at competitive prices for transmission and distribution of energy for industry and households
4	The efficient separation of the supply and generation activities from activities related to the management and operation of networks	Efficient regulatory monitoring and corporate structures ensuring the independence of system operators	Free and equal access to the network for all users
5	Establishing a competitive electricity market as a way of achieving the priorities for competitiveness, energy security and sustainable development	Creation of an electricity power exchange	Favourable conditions for competition in the generation and supply of electricity
6	Guaranteeing the necessary natural gas supplies to meet domestic demand	Timely negotiation of quantities of natural gas for the domestic market – from the main supplier and/or from alternative routes and sources (interconnections with neighbouring countries)	Security of natural gas supplies for the Bulgarian industry and population.
7	Modernising the management of the companies integrated into the «Bulgarian Energy Holding»	Ensuring professional management, Transparency and good management practices Optimisation of expenditures and the introduction of modern mechanisms to attract investment	Improved efficiency and quality of energy services



8	Price certainty for the Bulgarian industry and households	<p>Timely notification of businesses and citizens on planned price changes</p> <p>Regulated (according to a timetable) price increases based on the economic costs of energy companies and considered to GDP growth</p> <p>National energy prices competitive with EU countries</p>	Favourable conditions for economic growth and the well-being of citizens through reliable energy supply at affordable prices in the country
9	Affordable energy for vulnerable Bulgarian citizens	Integrated state policy regarding the population revenues, including protection against energy poverty	Overcoming of poverty

2. «REALISING THE POTENTIAL» PACKAGE

The assessment shows the presence of a considerable potential related to the country's strategic geopolitical and geographical location, strong positions in the SEE region vis-à-vis the export and transit of energy, capacity for strengthening these positions by developing large-scale energy projects. The common EU policy stating as its priority the establishment of a single market and expanding it to a Pan-European energy community, represents a favourable environment for achieving Bulgaria's national aspirations. Implementing the decisions included in the this package depends on a number of global external factors such as liquid fuel and natural gas prices, the trend in energy demands, the coordination and co-operation among all actors in the «suppliers – transit countries – users» chain in the implementation of cross-border projects etc. After all, the choice of investors, their level of interest and financial situation will set both the direction and the extent of achievement as regards the realisation of existing potential. After all, the choice of investors, their level of interest and financial situation will set both the direction and the extent of achievement as regards the realisation of existing potential. Therefore dynamic changes in the external environment would require targeted and flexible efforts at national level that, in combination with a favourable external conditions, would result in the successful achievement of the country's ambitions.

№	STRATEGIC DECISION	PERFORMANCE INDICATOR	EXPECTED OUTCOME
1.	Priority development of large projects for generation of emission-free electricity	<p>Clean energy (nuclear plus renewable) with a dominating share (over 50%) in the electric power mix.</p> <p>CO2 emissions emitted for the generation of 1 MWh electricity will decrease by 40%.</p>	Electric power mix that guarantees independence and is environmentally friendly
1.1.	Construction of new nuclear facilities	Commissioning of new nuclear plant in 2014 - NPP "Belen" (2000 MWt)	Exceeding the national RES target, which means financial benefits from the transfer of allowances to other Member States
1.2.	Construction of new clean coal facilities	Commissioning of the fourth lignite power plant in the «Maritsa Iztok» Complex with a carbon capture and storage installation	
1.3.	Implementation of joint projects for large hydro power stations	Commissioning of HPP Tsankov Kamak, HPP Gorna Arda, HPS Silistra – Călărași, HPS Nikopol-Turnu Magurele	



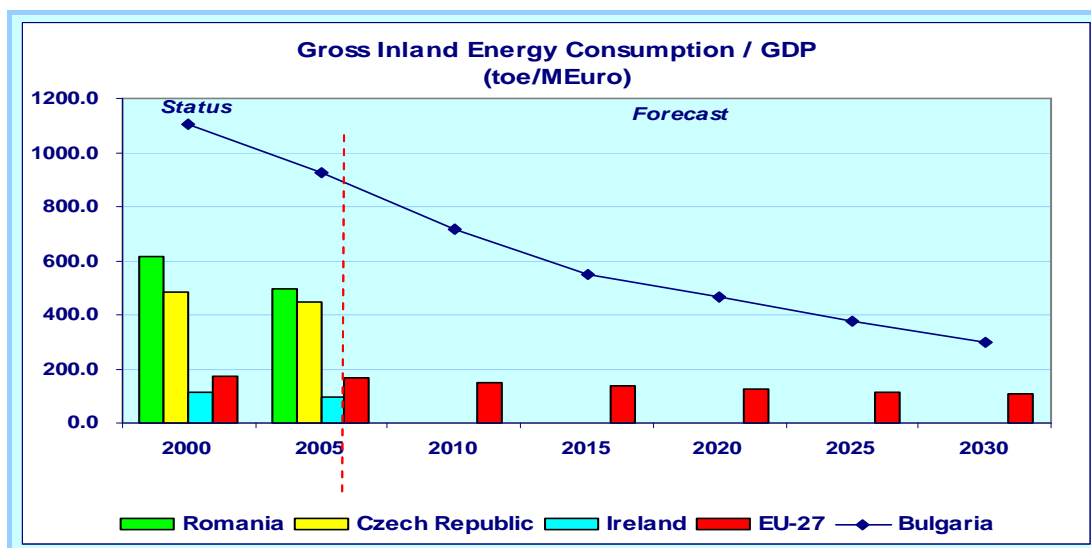
2	Diversification of natural gas sources and routes	<p>Successful implementation of the «Nabucco» and the «South Stream» projects and of new natural gas transit projects</p> <p>Construction of a regional re-gasification LNG terminal</p> <p>Expanding the capacity for storage of natural gas</p>	<p>Security of natural gas supplies through diversification of sources and routes</p> <p>Substantial income from the transit of natural gas: potential for further expansion of the gas network and the transit business</p>
3	Positioning of «Bulgarian Energy Holding» as a leading energy player in the SEE region	Taking the business and investment activity of the national „Bulgarian Energy Holding” outside the country's borders	Higher reliability of energy supplies and more competitive energy prices for Bulgarian users
4	Active position of Bulgaria in forming and conducting the common regional policy and playing a key role in the future expansion of the European energy community	Enlarging the European Energy Community to a Pan-European Energy Community by including countries from the Black Sea, Mediterranean and Caspian region	<p>Ensuring the physical capacity to allow for the functioning of a market for the entire Energy Community and its connection with the common EU energy market by developing the infrastructure</p> <p>Cooperation with countries from the new regions is of strategic importance for the country's energy security</p>
5	Bulgaria: the energy center of the SEE Region	<p>Five-fold increase of electricity exports</p> <p>Fourfold increase of natural gas transit through Bulgarian territory</p> <p>Construction of a natural gas distribution centre (hub) first for the Balkans</p>	<p>Bulgaria will be a major factor in the electric power security and stable development of the SEE region</p> <p>Bulgaria will play a key role in the supply of natural gas for countries in the region and the EU</p> <p>Strengthening Bulgaria's position as a gas distribution centre in the SEE region</p>



3. DEVELOPMENT FORECASTS AND EXPECTED RESULTS 2020 -2030

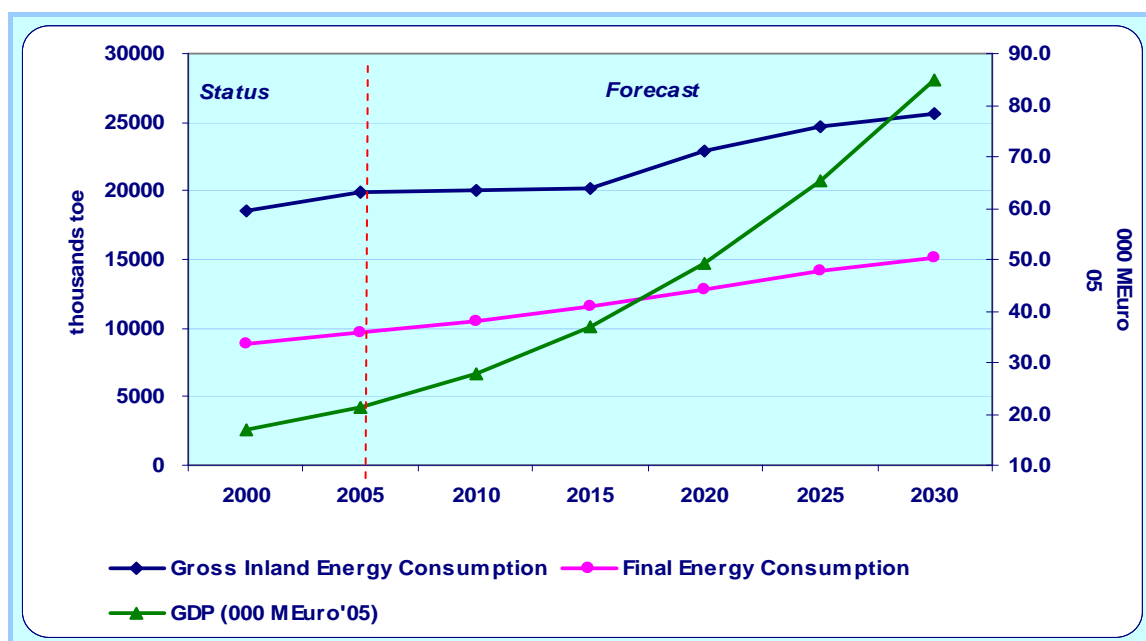
3.1. «BRIDGING THE GAPS» PACKAGE

- The energy intensity of the Gross Domestic Product (GDP) of Bulgaria will decrease two times till 2020 and three times till 2030 compared to 2005, at 4,4 % average annual decrease. The higher decrease rate of the national energy intensity compared to the other Member states and EU-27 will bring these levels closer.



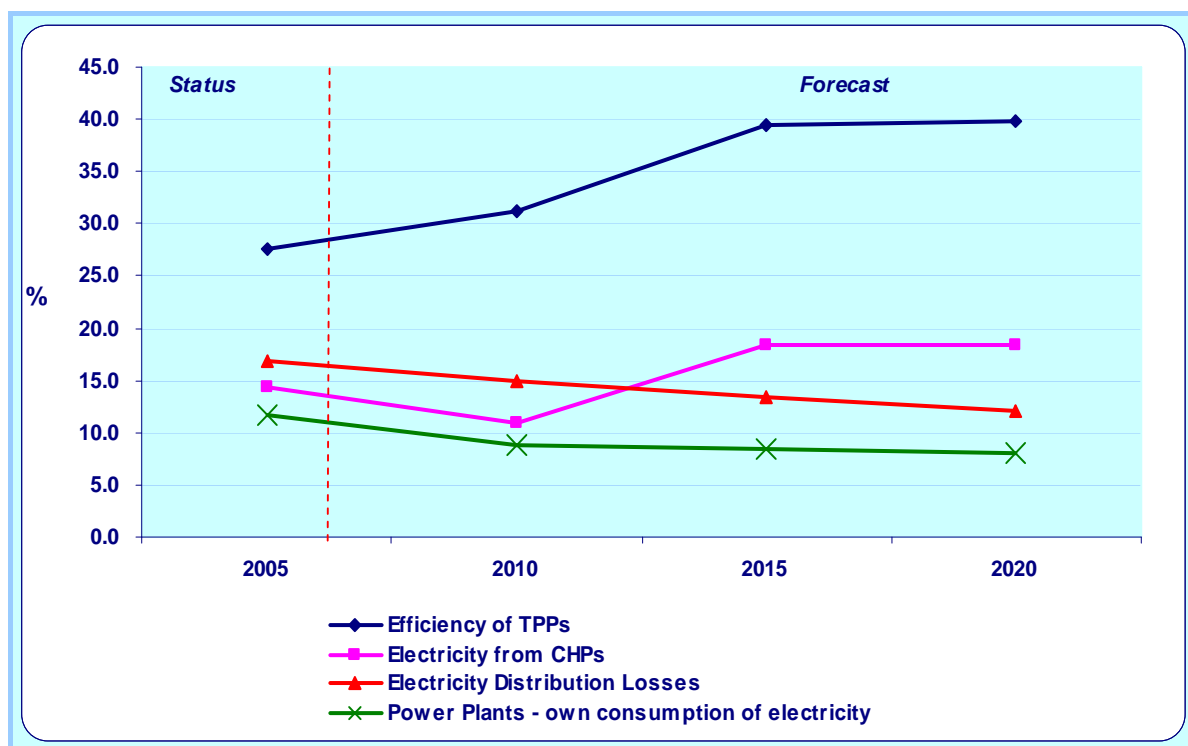
Source: MEE, Eurostat

- The national GDP will decrease 2.3 times by 2020 and four times by 2030 over 2005 figures, at a 5.5 % average annual increase. As a result of the reduced energy intensity, gross inland energy consumption will only increase 15.5% by 2020 and 28.7% by 2030, at an annual average growth of 1%, and final energy consumption will increase 32% by 2020 and 56% by 2030, at an annual average growth of 1.8%.



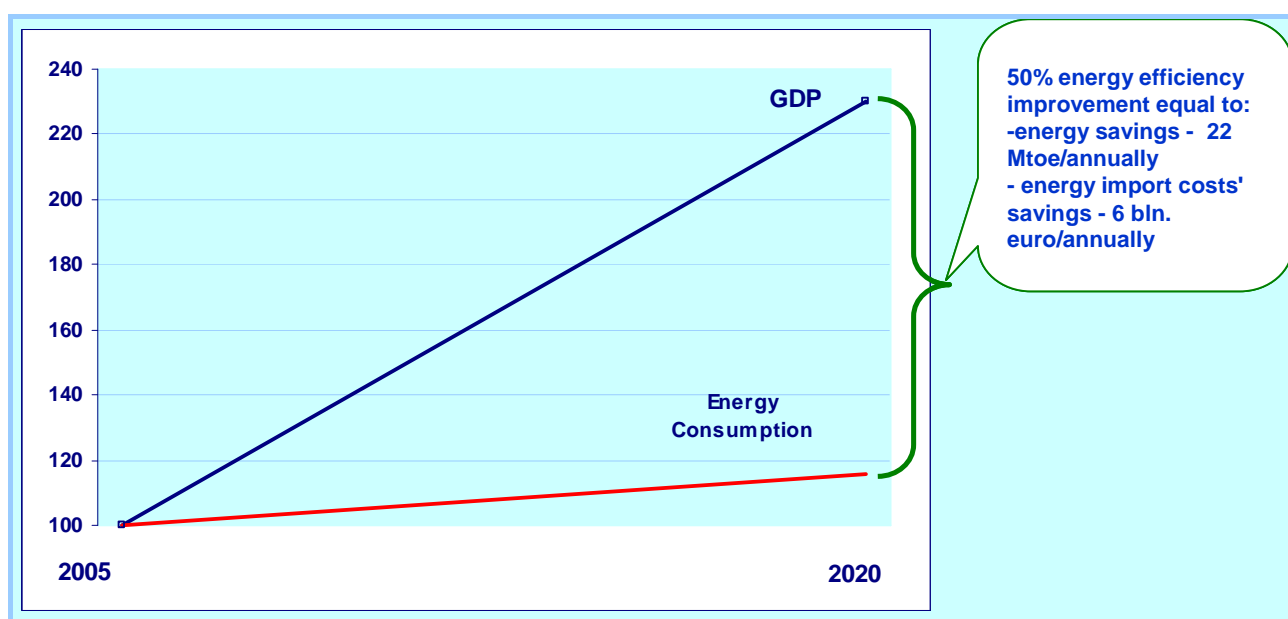
Source: MEE

- For the period 2005 – 2020 the energy transformation processes in the thermal power plants will become more efficient by 40% and the power plant efficiency will reach 40%. The share of cogenerated electricity in the total electricity consumption will increase by 50% - from 10% to 15%. The losses resulting from electricity distribution will decrease by 30%. The self-consumption of the power plants will decrease by more than 30%.



Source: MEE

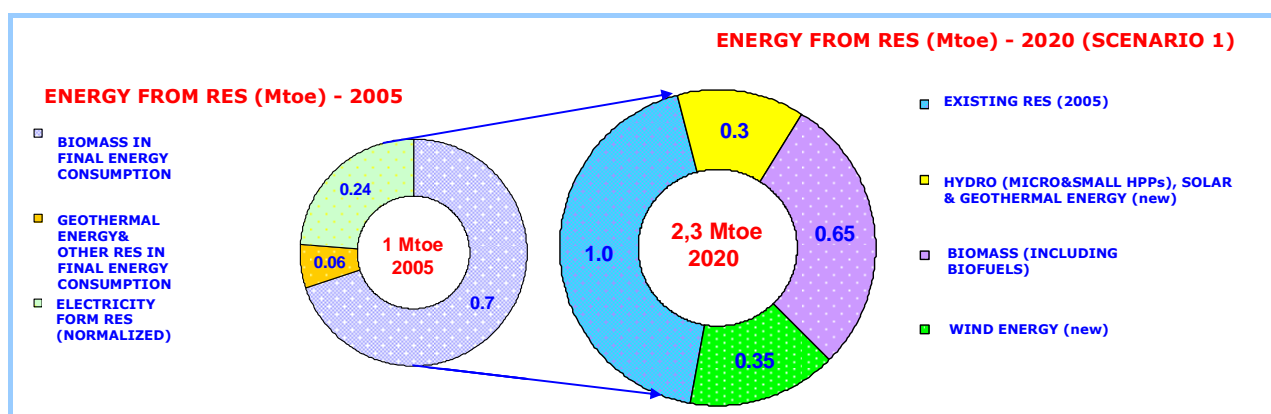
- The improved energy efficiency results in 50% saving of primary energy, equal to 22 mln toe/annum or 6 bln Euro annual savings from saved import of energy sources.



Source: MEE



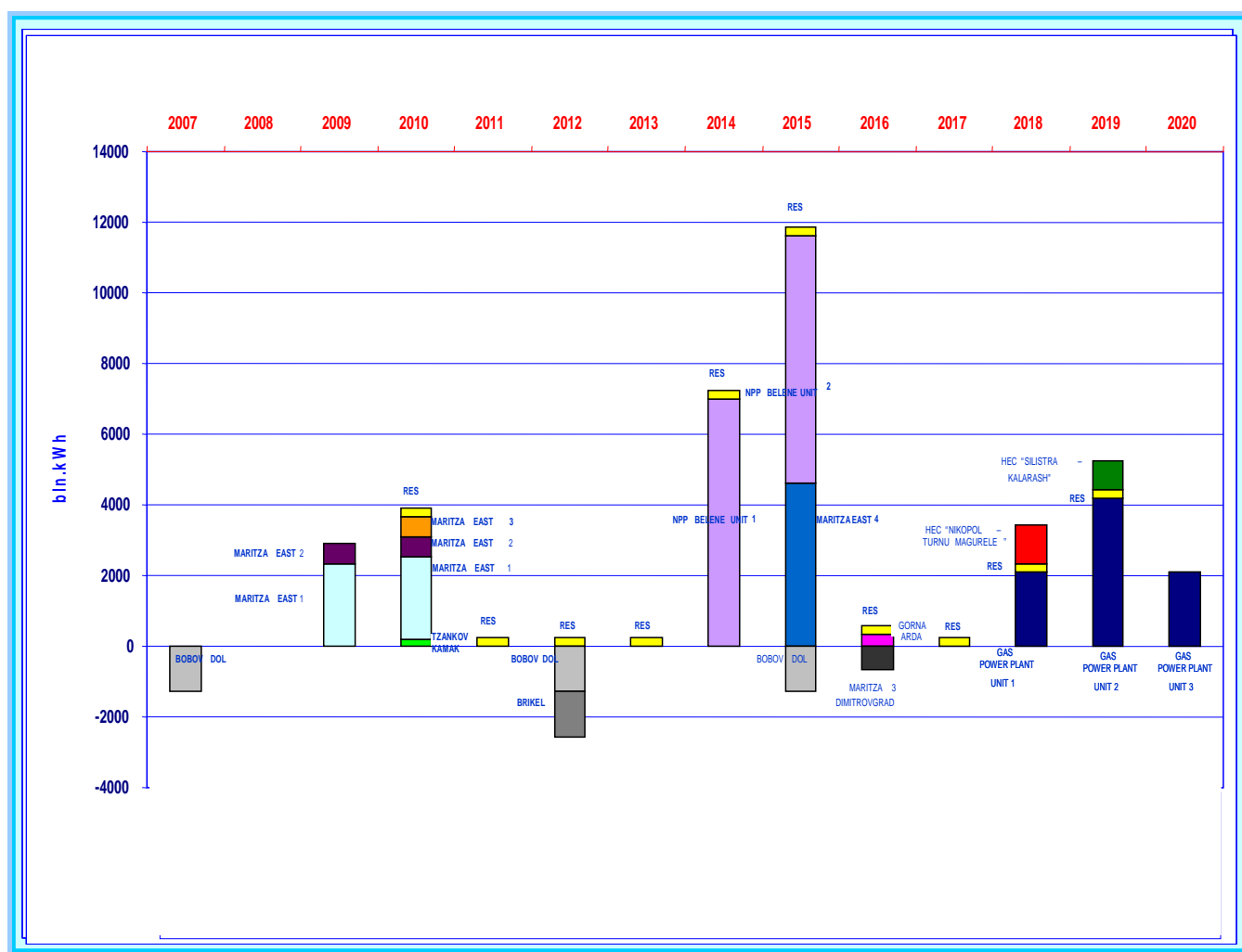
- The volume of renewable energy will grow by 130% over 2005 figures through support schemes for hydropower (micro and small HPPs), solar, geothermal and wind energy, biomass.



Source: MEE

3.2. “REALIZING THE POTENTIAL” PACKAGE

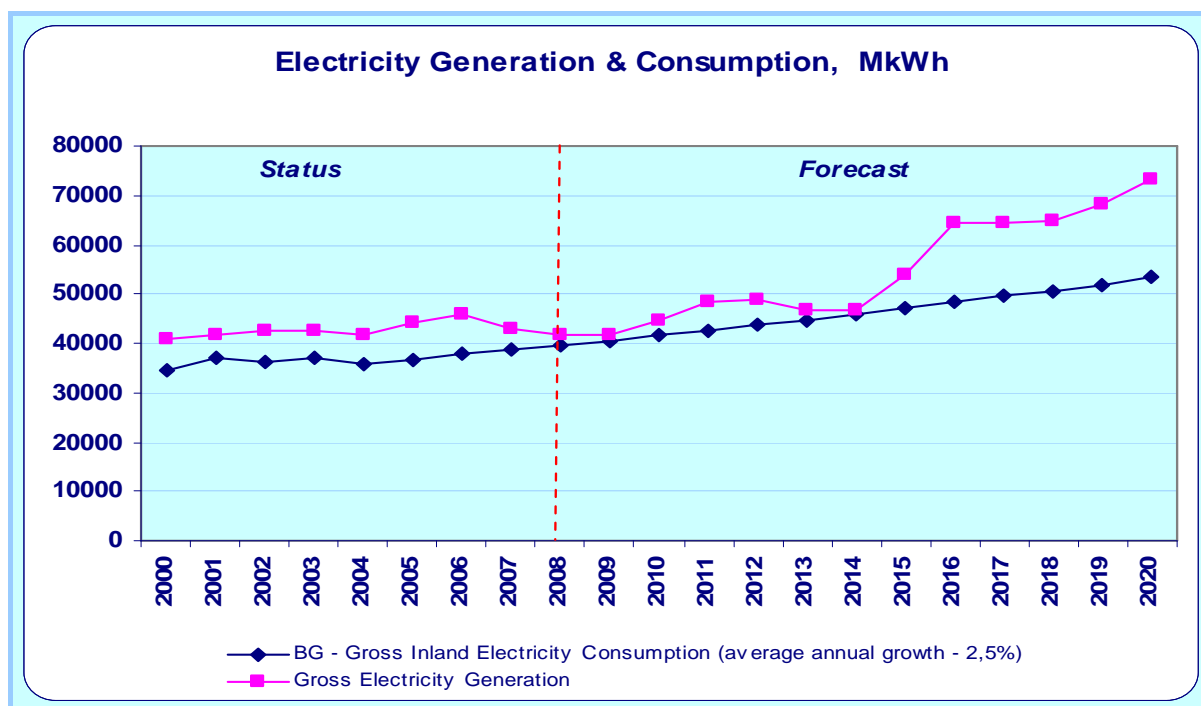
- The ambitious goals for strengthening Bulgaria's positions as a powerful energy center on the Balkans are being achieved by accelerated construction of new electricity generation power plants. Within the period till 2020, 7,000 MW new capacities will be commissioned.



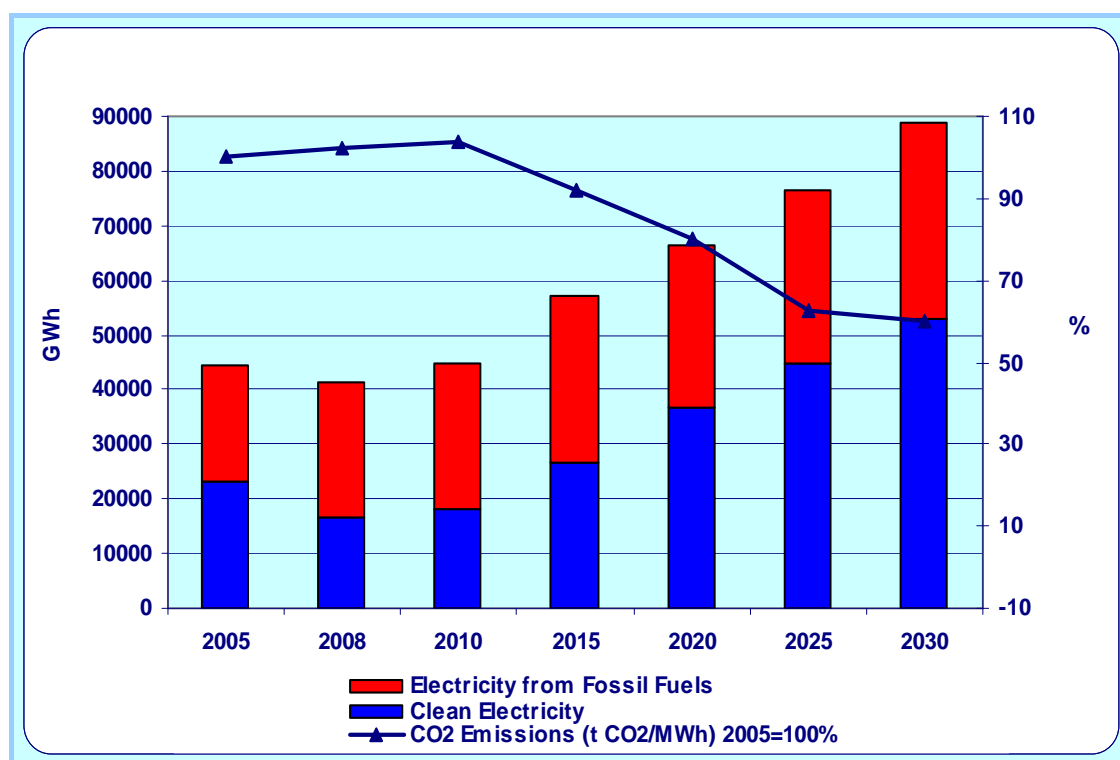
Source: MEE, NEC EAD



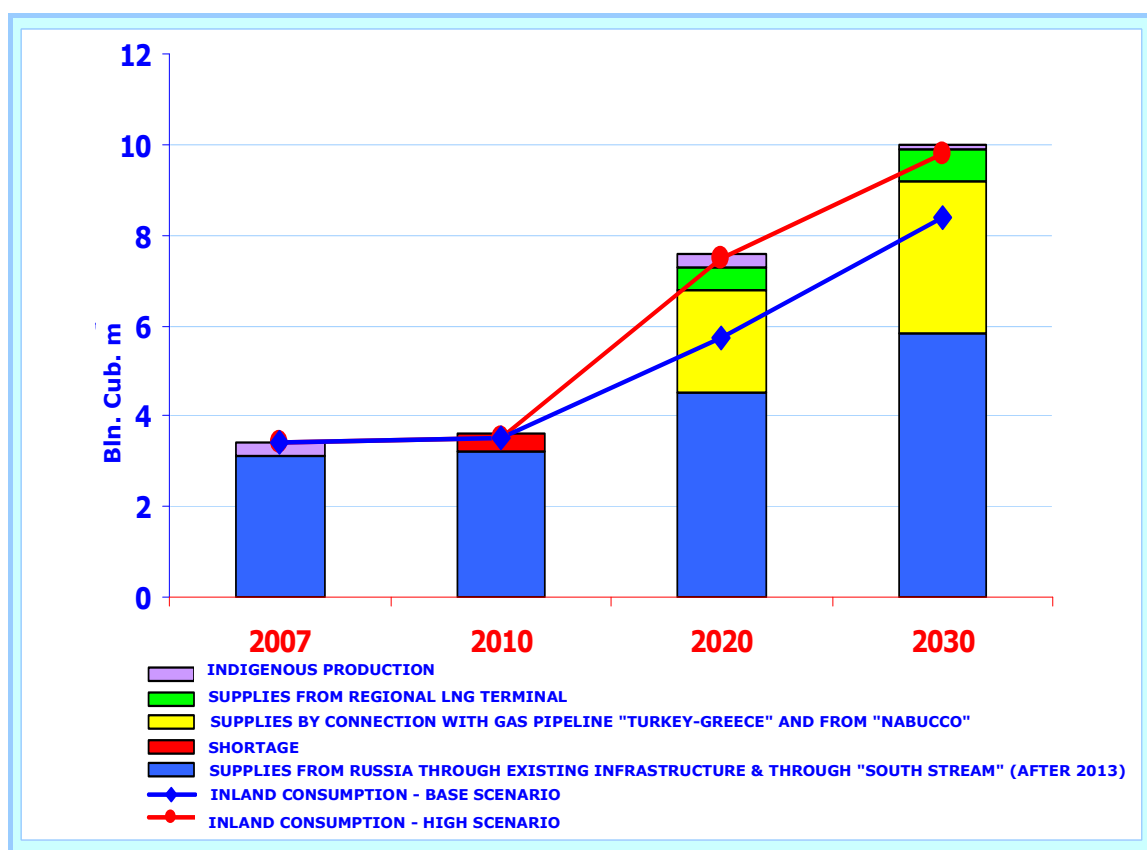
- The electricity generation in the country will increase by 70% -from 43,1 bln kWh in 2007 to 73,4 bln kWh in 2020 Under the optimistic scenario, the gross inland electricity consumption of will increase by 38% - from 38,7 bln kWh in 2007 to 53,3 bln kWh in 2020. The export possibilities will increase 4,5times compared to 2007 and will reach 20 bln kWh in 2020.



- The share of the generated clean electric power (RES and nuclear) in the country will increase from 41% in 2008 to 55% respectively in 2020 and up to 60% in 2030. As a result, CO₂ emissions emitted for the generation of 1 MWh electricity will decrease by 40%.

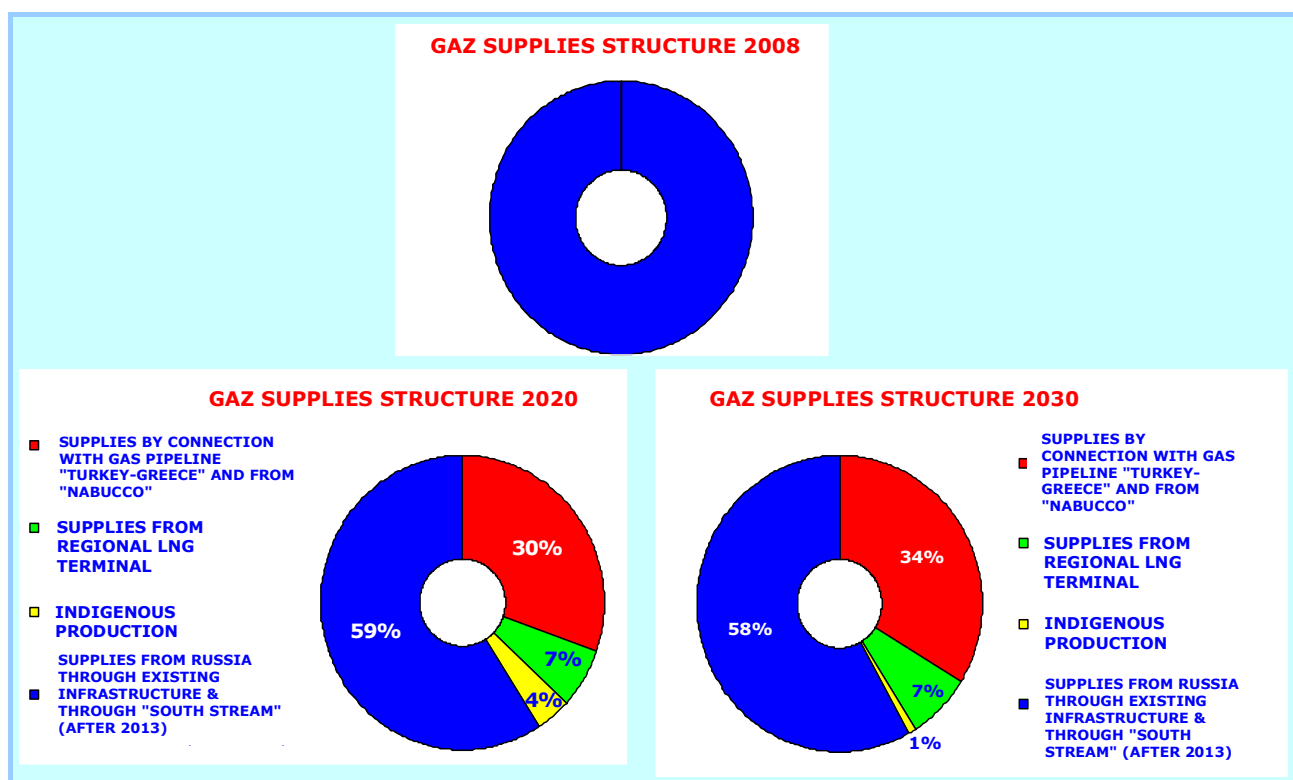


- The construction of a new gas infrastructure and a liquidated natural gas (LNG) terminal will guarantee the supplies, needed by the growing domestic demand.



Source: MEE, „Bulgargaz Holding” EAD

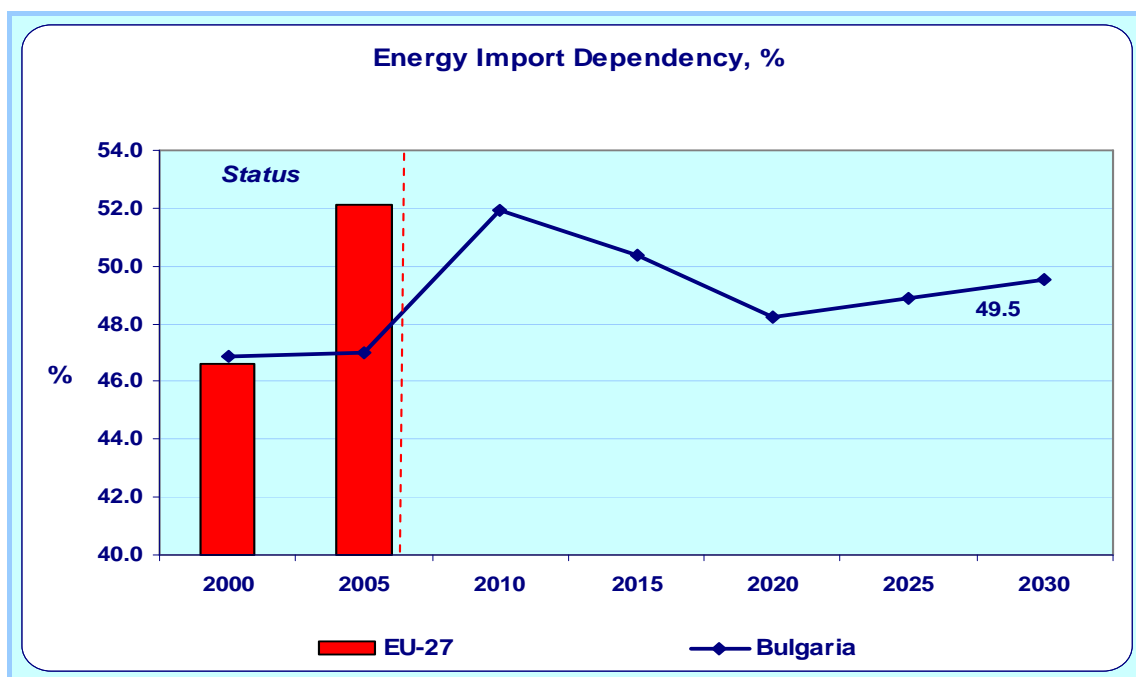
- The implementation of natural gas projects on the territory of the country will help for diversification of the sources and routes for natural gas supply for domestic consumption.



Source: MEE, Bulgargaz Holding EAD

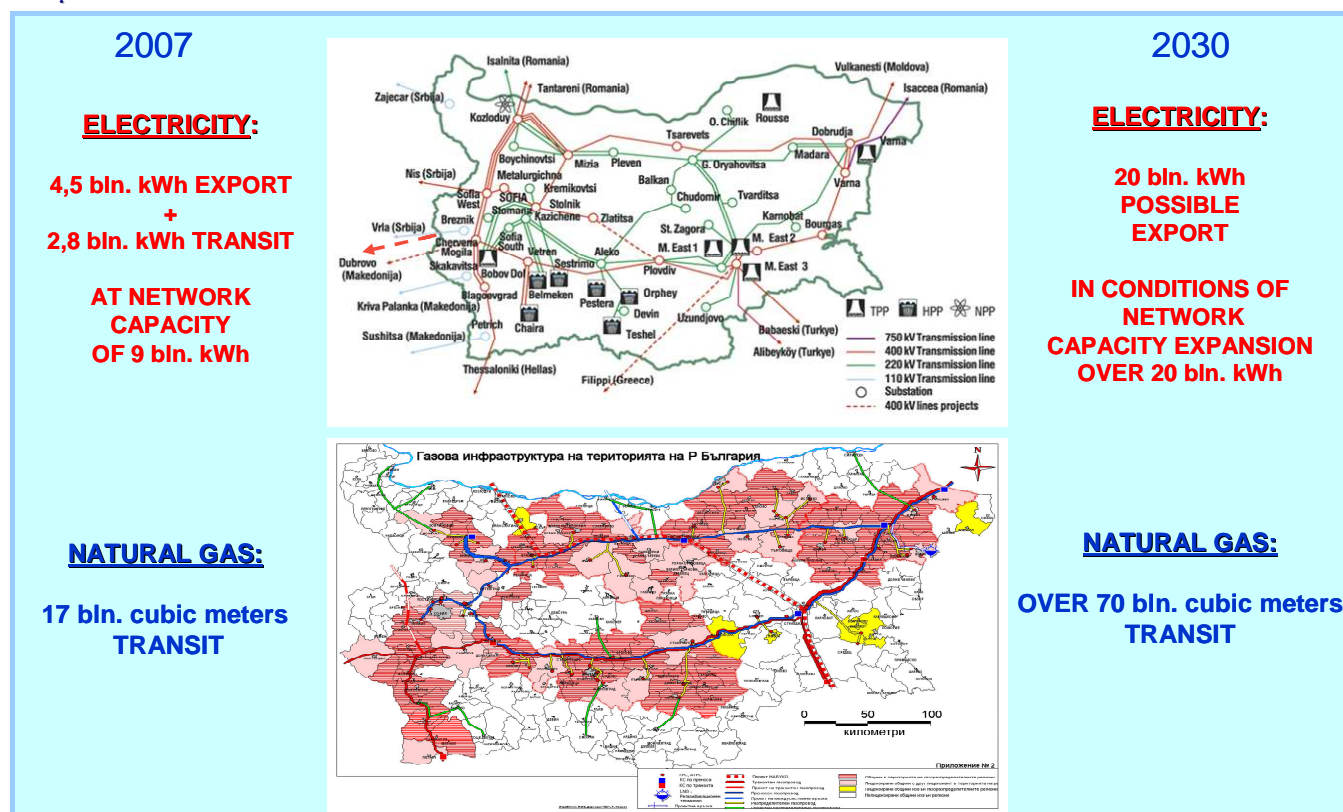


- Thanks to the development of nuclear power plants and power plants, using local coal, the country's dependence on imported energy sources remains stable and below the average level for the EU-27.



Source: MEE, Eurostat

- The successful implementation of the planned significant energy projects is strengthening the country's export positions and is turning it into a powerful transit center of electricity and natural gas in the region.



Source: MEE



V. STRATEGIC DOCUMENTS

With the purpose of setting the right environment in support of the implementation of strategic decisions and establishing a harmonised link between the Energy Strategy and its follow-up activities, this section provides a set of strategic documents containing guidelines on the work to be done.

At the same time, the mechanism of achieving long-term Community targets proposed by the Commission includes the development of strategic visions and the corresponding action plans for each Member State; follow-up monitoring and regular review of the stage of implementation of the national plans; corrective action, and respectively development of new plans for the next period.

In connection with the above information, strategic documents are grouped as follows:

- Energy forecasts and plans
- Strategic documents adopted in line with the requirements of the current European and national legislation and subject to updating
- Strategic documents developed due to key energy issues identified
- Strategic documents developed due to the adoption of new European energy legislation

1. ENERGY FORECASTS AND PLANS

The strategic planning and management in the energy sector requires the best possible understanding of expected developments in the economy and related developments in the energy industry. The key projections and plans that are yet to be developed will be fully aligned with national targets and strategic decisions and will help arrive at the best option for their implementation.

(1) Overall Energy Balance - Forecast by 2030

The projection horizon of EU countries is by 2030, with interim projections every five years. For this purpose, models have been developed that are used for forecasting in various base scenarios. At the national level, the need to develop projected balances arises from the Bulgarian legislation. The overall energy balance - forecast by 2030 will comply with the standards of EU forecasting, on the one hand, and with the national targets and strategic decisions, on the other.

(2) Forecast and Plan for development of the electricity system by 2030

The electricity balance forecast is part of the overall energy balance. Its development is the responsibility of the electricity system operator. The plan for development of the electricity system has to guarantee: security of supply; free access to the network for consumers and new producers; achievement of the RES target by means of adequate development of the network; adequate assessment of the country's capacity balance.

(3) Forecast and Plan for development of gas supply by 2030

The natural gas balance forecast is part of the overall energy balance. Its development is the responsibility of the gas transmission operator. The plan for development of gas supply has to guarantee: security of supply; free access to the network for consumers and extraction companies; achievement of the accelerated gasification target through adequate development of the gas network.

2. STRATEGIC DOCUMENTS ADOPTED IN LINE WITH THE REQUIREMENTS OF THE CURRENT EUROPEAN AND NATIONAL LEGISLATION AND SUBJECT TO UPDATING

- (1) National Long Term Energy Efficiency Programme
- (2) National Long Term Programme to Promote the Use of Renewable Energy Sources
- (3) National Long Term Programme for Biomass Use for the period 2008- 2020
- (4) National Long Term Programme to Promote the Use of Biofuel for Transport 2008 – 2020
- (5) Three-year energy efficiency action plans (2008 – 2010; 2011 – 2013; 2014 – 2016)
- (6) Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste

3. STRATEGIC DOCUMENTS TO BE DEVELOPED DUE TO KEY ENERGY ISSUES IDENTIFIED

(1) National Strategy for Energy Efficiency in Final Energy Consumption of the Republic of Bulgaria

The Strategy will lay down the national target for saving energy at final consumption, the stages, means and measures for achieving the target. The national strategy will be updated every 5 years. The strategy should be drafted and proposed to Council of Ministers for adoption by the Minister for Economy and Energy. The Strategy should be adopted by the National Assembly.

(2) Programme for efficient use of local energy resources

The programme will contain an updated assessment of the perspectives for the extraction and production of indigenous energy resources in Bulgaria, including options to reopen uranium mining. The opportunities for exploration, research and extraction of coal, oil and natural gas will be identified. Mechanisms will be provided for efficient use of coal deposits and biomass.

(3) Programme for accelerated gasification in the country

The programme will also identify the challenges faced by the gasification, measures to overcome them and mechanisms for accelerating the processes in order to achieve the target of providing access to natural gas to 30% of Bulgarian households by 2020.

(4) Programme for stabilization and development of the heating sector

The programme will include short-term measures to overcome financial issues and collectibility problems. Long-term measures will be foreseen, oriented to: improving the efficiency in the generation of electric and heat energy; reducing the losses due to the transmission and distribution of heat energy. Special attention will be given to development of combined generation of electric and heat energy and promoting decentralised heating.

(5) Programme for accelerated market development of the electricity sector

The programme will contain measures for phased-in market changes and the necessary preconditions to achieve targeted market development: introduction of the new energy legislation in the field of rules for the organisation and functioning of internal markets for electricity and natural gas; improvement of the regulatory mechanism to harmonise regulatory rules; establishment of a national electricity power exchange



(6) Programme for accelerated technological development and innovations

The programme will include measures to establish the necessary technical, economic and regulatory conditions for application of the new technologies, incl.: construction of new installations based on high-efficiency cycles and maximum use of combined power-heat generation; carbon capture and storage; technological development of hydrogen energy. The programme will envisage the expansion of activities within the Joint Research Centres with the EU and participation in bilateral and international research projects and programmes. It will also identify the opportunities for funding of research and development activities.

(7) Programme for training and qualification of experts in energy sector and new technologies

The programme will contain measures for: maintenance of good traditions in the education of specialists in the field of warm- and nuclear energy and minning sector; setting up modern training and additional qualification programmes for experts in the field of new technologies – RES, hydrogen energy, carbon capture and storage, energy saving etc. Because market-based relationships are penetrating even deeper in the energy sector, special measures will be taken to provide education and training in the field of energy economics. Because market-based relationships are penetrating even deeper in the energy sector, special measures will be taken to provide education and training in the field of energy economics.

4. STRATEGIC DOCUMENTS TO BE DEVELOPED DUE TO THE ADOPTION OF NEW EUROPEAN ENERGY LEGISLATION

Two legislative texts are currently being prepared in the EU – the «Climate/ Energy» package and the «Third Energy Liberalisation Package». Their forthcoming adoption will require the subsequent transposition of their provisions in national legislation. At this stage, the strategic documents and legislative changes to arise from the new European energy policy, may be only partially identified, namely:

(1) The National Action Plan to achieve a 16% share of RES in the gross final energy consumption by 2020.

To achieve its national target, Bulgaria should adopt a National Action Plan. The National Plan will contain sectoral subtargets respectively for the share of RES in transport, the generation of electric, heat and cooling energy by the year 2020. The plan will also contain the relevant measures to achieve these targets, the national policies for development of existing biomass resources, as well as the mobilization of new biomass resources and measures at national level to comply with sustainability requirements. The Action Plan will be developed using a standard/mandatory format to be proposed by the Commission.

The national plan is subject to notification and assessment by the European Commission; the EC will ensure public access to it. Prior to official notification, Bulgaria will present the Commission with a projections paper including: 1) the estimated quantity of renewable energy exceeding the indicative trajectory of the country and opportunities for net transfers of renewable energy to other Member States, as well as the potential for implementing joint projects by 2020; 2) the estimated quantity of renewable energy that the country would expect to import from other Member States and/or third countries by 2020. . Third-country status is also given to countries from the Energy Community that are not EU members, that will be able to take part in the achievement of EU targets after harmonizing their legislation with that of the EU.

The implementation of the plan to achieve the national target by introducing an indicative trajectory consisting of four indicative interim targets for each two-year period starting from the period 2011-



2012. For each of the interim two-year periods the country will report to the Commission on its progress in achieving the national target.

(2) Ten-year development plan for the gas transmission network

Every year, the gas-transmission system operator will have to submit to the regulatory authority ten-year a development plan of the network based on existing and projected demand and supply, after consultations with all stakeholders. The plan will have to contain efficient measures to guarantee the adequacy of the system and the security of supplies. More specifically, the network development plan: shows to market participants the key transmission infrastructure to be constructed or improved over the following ten years; contains all investment on which a decision has already been taken, and establishes the new investment to be made in the course of the next three years; foresees the timetable for all investment projects. In preparing the ten-year network development plan, the gas transmission operator should make adequate forecasts on developments in the production, supply, consumption and exchange with others countries, while taking into account both the investment plans for regional networks and in the entire European community, and the investment plans for storage facilities and regasification of LNG facilities.

(3) Ten-year development plan for the electricity transmission grid

Every year, the electricity transmission system operator will have to submit to the regulatory authority ten-year a development plan of the network based on existing and projected demand and supply, after consultations with all stakeholders. The plan will have to contain efficient measures to guarantee the adequacy of the system and the security of supplies. More specifically, the network development plan: shows to market participants the key transmission infrastructure to be constructed or improved over the following ten years; contains all investment on which a decision has already been taken, and establishes the new investment to be made in the course of the next three years; foresees the timetable for all investment projects. In preparing the ten-year network development plan, the gas transmission operator should make adequate forecasts on developments in the production, supply, consumption and exchange with others countries, while taking into account both the investment plans for regional networks and networks in the entire European community.

As noted above, after the entry into force of the two legislative packages, they will be transposed into national legislation within certain deadlines. This amendment of key laws governing the energy sector – the Energy Act, the Energy Efficiency Act and the Act on Renewable and Alternative Energy Sources and Biofuels, as well as of other laws, regulating the legal environment in which the energy industry is operating.



CONCLUSION

The Energy Strategy until 2020 sets the basis and represents the first significant step of the transition to high-efficiency and low carbon energy systems. Initially at the EU, and later at the national level, a policy programme by 2030 is to be developed, as well as a vision for 2050. The practical introduction of revolutionary technological changes in the power industry, in order to achieve its decarbonisation, the elimination of the dependency on the transport of oil and oil products, the wide availability of low energy housing and intelligent electric networks can only be achieved only if a co-ordinated timetable is in place for research and development, regulation, investments and infrastructure development. This requires intensive dialogue both among Member States and at the national level – between institutions, the academic community and industrial experts.

List of abbreviations

NPP	Nuclear Power Plant
GDP	Gross Domestic Product
GIEC	Gross inland energy consumption
RES	Renewable Energy Sources
HPP	Hydro Power Plant(s)
GW	Gigawatt(s)
GWh	Gigawatthour(s)
goe	Gram(s) oil equivalent
Goe/Euro/GDP	Gram(s) oil equivalent per unit of GDP
goe/EUR ‘05 GDP	Gram(s) oil equivalent per unit of GDP acc. to comparable prices of 05.
SEWRC	State Energy and Water Regulatory Commission
EC	European Commission
EU	European Union
kWh	Kilowatthour(s)
MW	MWatt(s)
MWh	Megawatthour(s)
MEuro	Million euro
MEE	Ministry of Economy and Energy
Mtoe	Million tons of oil equivalent
bln. EUR	Billion euro
Mln. EUR	Million euro
bln kWh	Billion kilowatthour(s)
Bln m 3.	Billion cubic meters
SMEs	Small and medium-sized enterprises
Mt	Million tons
SNF	Spent nuclear fuel
RW	Radioactive waste
TPP	Thermal Power Plant(s)
toe	Tons of oil equivalent
t CO₂/MWh	Tons of CO ₂ emissions per megawatt hour
HPS	Hydro Power Site
Thousand toe	Thousand tons of oil equivalent
SEE	South East Europe
CCS	Carbon Capture & Storage technologies (Carbon Capture & Storage)
CO₂	Carbon Dioxide
UCTE	Union for the coordination of transmission of electricity References



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