

B. ENERGY

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The specific priorities and challenges that our society faces in the field of energy production and consumption are described in the Energy strategy. The Strategy is mainly oriented toward the end results and the actions and measures which must be undertaken for achieving the results.

The main priorities of adopted Energy strategy, corresponding with the priorities of the energy policy of the European Union, are:

- ✓ Security of supply;
- ✓ Competition in energy sector;
- ✓ Protection of the environment.

Instruments for achieving the goals

Achievement of the main priorities figured out in the Energy strategy requires consistent actions, regulated with use of concrete instruments and set up adequate goals.

The used instruments could conditionally be separated in organization-administrative and technical – economic. The jointly working of all instruments leads to economically measurable results, which concentrated expression is high-effective and competitive energy.

✓ Legal framework

The adequate legal framework and secondary legislations establish the conditions for regulating of public relation, in such way, allowing the functioning of a modern energy sector, ready for integration with the energy system of the European Union.

During the period 2002-2004 the legislation reform in energy sector has been developed. The necessary legal framework and secondary legislations, which format is close to the European Union directives, have been established.

Restructuring in the energy sector

➤ Restructuring in the coal sector

With the adoption of the Energy strategy the following priorities have been figured out:

- Redirection of subsidies from the state budget for financing the environmental projects;
- Introduction of market relationships between coal mining companies and the consumers;
- Control over the implementation of privatization and concessions contracts of privatized companies;

- Development of “Maritza East EAD mines” in conformity with the long term plans for energy production in the region.

➤ *Restructuring in the electricity sector*

In the year of 2000 the National Electricity Company (NEC) had been restructured and seven distribution companies have been separated as well as seven energy production companies. NEC is now functioning as an energy transmission company.

Regarding the requirements of the Energy Law the restructuring of NEC is coming, with the deadline the date of integration of Bulgaria with EU, in the following directions:

- Public supplier, including the hydro energy;
- Transmission company, including the functions in management of energy system and trading operator.

Privatization

Strong instrument through which the attraction of investments and competition between the energy companies can be achieved is privatization.

Price policy

During the last two years this policy was oriented toward removing the price disproportion in the energy sector and as a result of this the neutralization of financial disequilibrium between the energy sub sectors was achieved.

Important element of the price policy is the adaptation, by stages, of energy prices to international, thus is supporting the process of equalize the level of purchasing capacity with the EU countries.

√ *Price reform in district heating sector*

The price reform in the district heating sector is directed to stop the subsidize of producers through normalization of the prices for households up to levels that cover the prime cost and assuring the recovering for development of companies.

√ *Price reform in electricity sector*

The price reform in the electricity sector is a part from the large scaled and accelerating reforming of the sector in conformity with the Energy strategy, and is directed to:

- Discontinuance of crosssubsidize for households prices;
- The prices for households and economic consumers should be defined through the “expenditure plus” method;
- Increasing the investment potential of the energy companies.

For this purpose the following actions have been undertaken:

- Introduction of social oriented two-steps tariff of electricity for households;
- Annually rise of the tariffs (for the period 2001-2004) for second step after the end of the heating season.

➤ *Price reform in the natural gas sector*

With the adopted in 2004 Ordinance for regulation of the prices for natural gas the methods for regulation of the prices for natural gas was defined as well as their formation and amendments, the set of rules for information submission and the approval of the prices.

Ensuring social security trough lending of targeted social support from the budget

During 2002-2004 period there was performed the delayed for years price reform in the energy sector. More commonly this reform can be characterized with performing activities in the directions drawn in the energy strategy:

- Stage by stage reaching electricity and heat energy prices that can cover the initial costs by applying of indicative schedule for tariff rising;
- Keeping the price level for the economic consumers;
- Stopping of the centralized subsidizing of heat energy prices and electricity energy prices for the households;
- Securing of adequate energy protection for the needy layers of the population;
- Introduction of differentiated prices for the different categories consumers fo natural gas by regulating trough “costs plus” method.

Establishment of market structures and conditions in the energy sector

The introductions of the market relationship in the energy sector are the natural mechanisms for increasing its competitiveness and efficiency. Their development is directed toward achieving the following goals:

- Decreasing of the expenditures and limiting the price growth;
- High security and quality of supply;
- Transparency and equity allocation of the benefits;
- Integration in the European energy market;

Energy and environment

The main priorities of the energy policy in the field of the environmental protection are:

- Achieving the principles of the sustainable development and its integration in the sector policy;
- Realization of the energy policy of Bulgaria in performance the national goals for achieving of economic growth of the country and establishment of preconditions for integration in European structures in environmental friendly way;
- Implementation of purposefully and long-term policy in the energy sector, in order to meet the challenge of the 21 century “climate change”.

Limitation of the effects over the environment during the production of electricity and heat energy

The energy sector is one of the major sources of carbon dioxide and sulphur dioxide emissions in the country. During 2002 from the production companies in the sector are emitted about 48 % of the carbon dioxide emissions and during 2003 – 54 %. This increase is a result from the rising of the electricity production from thermal power plants during 2003 in comparison with 2002. That is why is necessary the implementation of a number of ecological measures which will lead to reduction of the harmful emissions of the sector. The main purposes concerning environmental protection during electricity and heat production are:

- Reduction of Greenhouse gases emissions;
- Reduction of the harmful emissions of SO_2 , NO_x and *particulates* under the emission limit values;

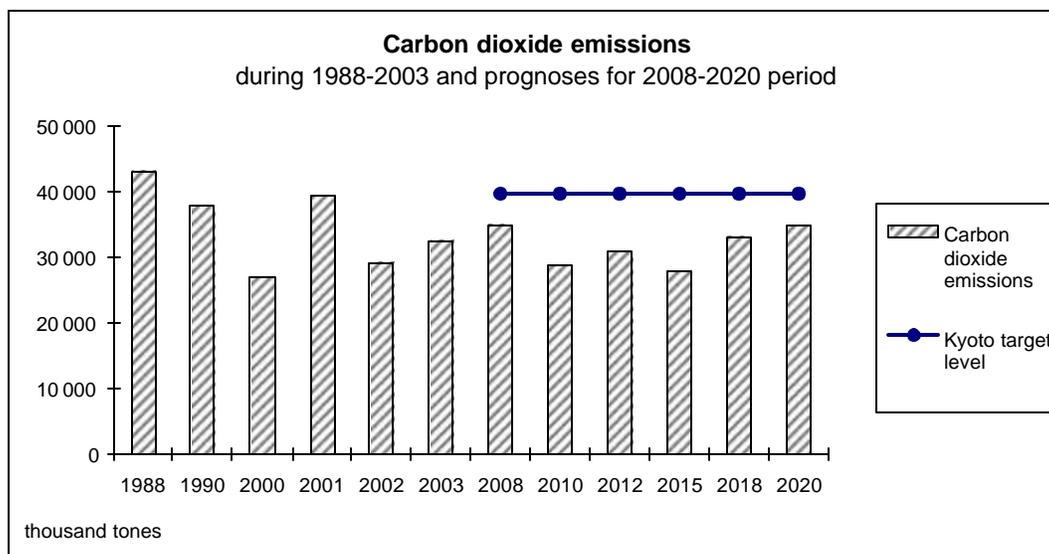
Climate change

One of the major international environmental commitments is the United Nations Framework Convention on Climate Change. On 16 of February, the Kyoto Protocol has become in force.

The protocol is signed by Bulgarian Government in 1998 and sets an 8 % GHG emissions reduction over the period 2008-2012 compared to the baseline year 1988.

GHG emissions in Bulgaria are well below the target for the first commitment period. The country now faces the challenge to control and limit the expected future increase in emissions resulting from economic growth. Reducing or maintaining CO_2 emissions may be done as "no regret" at minimal costs now because in the years to come the marginal costs of future reduction measures will increase. The best approach for Bulgaria to maintain GHG emissions levels low is by avoiding carbon-intensive economic growth to the extent possible. Furthermore, climate change issues need to be considered when formulating and implementing the national economic development policies.

On the figure below is shown the prognoses for CO_2 emissions and the Kyoto target.



In spite of the increasing of the heat production in 2003, the emissions from this production are decreasing. Part of this decrease in the district heating sector is obtained by:

- Implementation of rehabilitations in the heat substations;
- Introduction of system for heat accountancy, which system allows real regulation and registration of used heat energy;
- Implementation of activities for optimization of the production process in the district heating sector.

Air protection

Bulgaria is not expected to become member of the European Union before 2007; irrespective of that, the sector is implementing a policy of meeting European requirements.

As a future EU member the legislation of the Republic of Bulgaria have to be in full correlation with European Commission's Directives. There are extremely hard environmental and economic requirements for the country.

According to Directive 2001/80/EC the main object is reducing SO₂, NO_x and particles emissions emitted by large combustion plants and the limitations for SO₂ are higher than these in the second Sulphur Protocol are.

The significant decreasing of the share of nuclear energy in national energy balance increases extremely the role of thermal power plants. Their normal exploitation will be crucial for sustainable and secure energy supply. That's why the Bulgarian government has adopted: **“Implementation program for directive 2001/80/??”**.

The program defines the approach, activities and terms that the operators of large combustion plants in Bulgaria have to consider when fulfilling the requirements from the Directive.

According to Implementation Program it is necessary building up of desulphurisation plants, replacement of the current fuel with low-sulphur content fuel, as well as introducing other modern flue-gas desulphurisation technologies.

For the purpose of particulate emissions limitation is necessary many of the plant's electrostatic filters to be rehabilitated, as well as for NO_x reduction is expected installing of low-nitrogen burners.

Energy efficiency

Bulgaria is behind compared to most European countries in terms of the reasonable utilization of the energy resources by the economy. For 1 000 Euro of the GDP the Bulgarian economy uses 0.38 tons of oil equivalent, which is over twice the average value for the European Union and exceeds considerably the same indicator of the European countries in transition.

Reason for the high energy intensity of the Bulgarian economy

- Maintained unreasonably low energy prices in the past;
- Constructed as a result of incorrect price signals energy intensive technologies;
- Underdeveloped low voltage gas distribution network;
- Low load of the generation capacities;
- The condition of the buildings;
- The delay of the modernization of the district heating system.

The use of electric power is especially wasteful. In 2001 the use of electric power per unit of GDP in Bulgaria is seven times higher than the average for the OECD countries, four times higher than that of Hungary and Turkey and 60% higher than that in Romania.

Because of the low energy efficiency mainly of consumption, but also of the conversion, Bulgaria has a huge potential for energy saving in a cost-effective way. It may be estimated to about 40% for the existing buildings, 30% - for the district heating sector and 30% - for the industry.

THE STRATEGY OF THE GOVERNMENT

Up to 2002 the development of energy efficiency projects was based mainly on sub-legislative administrative and legal regulations (standards, consumption quotas, labeling, etc) and did not lead to any achievements in this respect. The established energy efficiency projects were not realized due to the significant insufficiency of investments and the lack of a financial market for energy efficiency. The 2001 government is making serious efforts to deal with these consequences.

The trends in the energy efficiency policy, stipulated in the Energy Strategy of Bulgaria, National Action Plan in Energy Saving and the new Energy Efficiency Law:

- Commercialization of the energy effective services through elimination of the price deviation in the economy and the establishment of cost-oriented prices;
- Completion of the regulatory framework in the field of energy consumption and strengthening of the institutions ;
- Introduction of the requirements of the European legislation in the field of energy consumption and the environment ;
- Execution of educational and information programs concerning the effective technologies and the experience of the European Union and other countries;
- Promotion of the developing of a financial market for energy efficiency through establishment of a trade-oriented fund which is to play a key role in this difficult to make more active activity;
- Public-Private Partnership – the main principle in the establishment of the Energy Efficiency Fund in Bulgaria.

According to the new Energy Efficiency Act an Energy Efficiency Fund shall be established for financing the activities on energy efficiency improvement. A process of institutional building of the Fund is ongoing at the moment. It is expected, the actual activity of the Fund to start at the beginning of 2005.

The Fund shall administer financial resources granted for investment projects for development of the energy efficiency in accordance with the priorities provided under the adopted by the Council of Ministers national long-term and short-term energy efficiency programs.

The Fund resources shall be spent on:

- onerous funding of projects for development of energy efficiency in Bulgaria;
- guarantee activity on credits granted by financial-credit institutions under energy efficiency projects;

- Fund support according to annual revenue and cost budget, adopted by the Governing Board.

PROMOTION OF GENERATION FROM RENEWABLE SOURCES AND COGENERATION OF HEAT AND ELECTRICITY

Chapter 11 of the Energy Law lays out the provisions dealing with the promotion of electricity generation from renewable sources and high-efficiency cogeneration of heat and electricity.

PRESENT situation

The public provider and public suppliers are required to purchase, at a regulated prices, the entire electricity output of generators utilizing renewable resources or high-efficiency cogenerators, with the exception of electricity contracted at negotiated prices or balancing electricity.

FUTURE situation / year 2006/

This mandatory acquisition mechanism is applied until the introduction of the system for the trade of Green Certificates pursuant to an ordinance adopted by the Minister of Energy. The transmission and distribution companies must also give priority connection to their respective networks to the generators utilizing renewable resources and cogeneration facilities.

Obligation

- The National indicative targets for promoting consumption of electricity generated from renewable energy sources are set as a percentage of the gross annual electricity demand in the country.
 - The Minister of Energy and Energy Resources specifies the minimal mandatory quotas for electricity generation from renewable sources as a per cent of the total annual generation by each producer.
 - Minister of Energy and Energy Resources specifies the minimum volumes of electricity from highly efficient combined generation for each producer as a percent of the total annual output by each produce.
- Each producer shall be considered to have fulfilled his obligation upon submission, to the Commission, of green certificate(s) indicating the volume of electricity from renewable energy sources comprising its obligation.

Each producer shall be considered to have fulfilled his obligation at his presenting to the Commission of green certificate(s) indicating the volume of electricity from highly efficient combined generation comprising his obligation.

For successfully implementation of the new legislation a number of sub-legislation ordinances have been developed.

Ordinance for Certification of the Origin of Electric Power Generated by Renewable and/or Combined-Generation Sources, Issuance of Green Certificates and Their Trading

This Ordinance makes provisions for the conditions and procedure of:

- Certification of the origin of electric power generated by renewable sources and/or by combined generation (co-generation) power plants;

- issuance of Green Certificates and their trading;
- reporting and control of performance of the for electric power generation obligation under Art. 161, paragr.2 and Art. 163, paragr.2 of the Energy Act; entry of the circumstances subject to registration in the public registers, and the manner of obtaining information from them.

This Ordinance is issued for the purpose of encouraging environmentally clean and efficient electric power generation in a liberalizing power market environment.

Minister of energy adopted the Ordinance.

IMPLEMENTATION OF TARGET

Bulgarian position on the share of electricity produced in Bulgaria from RES until 2010

On the basis of the preliminary analysis and the updated information, Bulgaria can anticipate that the total realistic share of electricity generated from RES in 2010 will be 10% of the gross domestic consumption. However we do not exclude the possibility to reach 11% target, in case the climatic conditions are favorable. However, the Republic of Bulgaria notes and insists to have it explicitly noted in the Annex of Directive 2001/77/EC, that the possibility of reaching this most ambitious indicative target is highly dependent upon the total annual rainfall, timing of rainfall during the year and inflow as well as other climatic factors heavily affecting the level of hydropower production and utilization of solar and wind energy. Furthermore, the RES utilization is limited by the relevant environmental and related national legislation corresponding to the respective EU legislation.

The possibilities for reaching these ambitious indicative targets are dependent on some national specific conditions.

The preliminary analysis made regarding the possibilities for utilizing the RES potential for generation of electricity is based on:

- “Possibilities for generation of electricity from RES” project
- “Impact of the economic potential of RES on their development in Bulgaria” project
- The statistical data and information from the responsible authorities

On the grounds of preliminary data:

- The utilization of the hydro energy potential in Bulgaria is largely dependent on the quantity of water resources and the country’s climate conditions.

The surface waters account for 70% of the water resources and the underground water resources of the country are 30%. Their use is distributed as follows:

- Drinking water supply – 8–10%;
- Irrigation - 5-35%;
- Industrial water supply – 20-26%;
- **Hydro energy – 15-35%.**

The latest studies regarding the climate conditions in the country and the possibilities for using the hydro energy potential in Bulgaria show that the country is not rich in water resources. There is considerable differentiation in the territorial distribution of the available water resources.

According to data of the Ministry of environment and Waters as of the year 2000 and data of the National meteorology and hydrology institute there is almost five-year tendency for a gradual **decrease of the annual rainfall quantity**, which is 65.4% of the annual norm.

In relation with the unequal rainfall by years and regions, the flow of the internal rivers fluctuates, being about 75% of the annual norm in 2000.

The forecasts for reaching **3495 GWh** electricity generation from RES until 2010 are a quite **optimistic scenario**.

The water resources are the useable part of natural waters (surface and underground waters) and they are formed predominantly by *rainfalls*. By 2000 there is almost five-year tendency for a gradual **decrease of the annual rainfall quantity to** 419 l.m⁻².y⁻¹ (65,4% of the annual norm), which reverses in 2001, and in 2002 the registered average level is 574 l.m⁻².y⁻¹ (120% of the annual norm). An extremely uneven rainfall distribution across the country's territory is characteristic of the whole observed period (1999-2003). In 2000 the annual rainfall amount has decreased to 32% of the annual norm in some regions.

In relation with the unequal rainfall by years and regions, the *flow* of the internal rivers (except Danube) fluctuates, having a clear-cut minimum 9,6 bln m³.y⁻¹ (75% of the annual norm) in 2000. The absolute annual flow quantity increases to 12,1 bln m³.y⁻¹ over the next two years but still remaining only just 72% of the annual norm in 2002.

The regulation of the inflow is characteristic of the internal waters in the country. Out of a total useful volume 6,8 bln m³ of nearly 2200 dams, the available volume in them shows a trend toward a gradual increase from 3,56 bln m³ (1998) to 4,60 bln m³ (2002). The total useable volume also increases gradually from 2,82 bln m³ (1998) to 3,71 bln m³ (2002). Nevertheless, the negative tendency toward decreasing the total quantity of **available water resources** is overcome only in 2002.

When examining the water resources by regions for basin management of waters, the unfavourable situation in the Black sea region becomes evident. In 2002 the registered total river flow in this region was 211.88 mln m³ or 27% of the annual norm, and the river inflow for 7 dams within the basin was 415.2 mln m³, which is about 71% of the total annual norm of the inflow. The useful water consumption of the seven dams was 229.19 mln m³. Provided that only 1.8% of the river flow of the internal waters is formed in this basin, this presumes the construction of additional accumulation volumes in the region.

- The increase of the percentage of electricity generation from HPPs in Bulgaria will lead to decreasing the percentage of water resources used for other purposes.

- The latest studies on the climate conditions in the country show unfavourable tendency for decrease of rainfalls by some 25% for the last five years, which leads to reducing the technical potential for construction of HPPs in the country.
- The existing technical and economic potential for HPPs with an installed capacity of more than 10MW has been already utilized or is unusable due to environmental constrains. Increase of the electricity generation can be expected only by HPPs having installed capacity of less than 10MW. There are possibilities for construction of HPPs with installed capacity of less than 10MW on running waters, on drinking water pipelines, dams as well as on some irrigation canals in the hydro ameliorative system.

A realistic projection for electricity generation from HPPs by 2010 is about 2920 GWh per annum which represents about 7.3% of the gross domestic consumption of electricity in the country. This projection takes account of the unfavourable climate tendencies in the country, their distribution, as well as the possibilities for construction of HPPs with installed capacity of less than 10MW on running waters, on drinking water pipelines, dams as well as on some irrigation canals in the hydro ameliorative system.

Past records demonstrate that during extremely dry years hydro power production may amount to 1,52TWh, whereas in wet years it could amount to 3,26TWh. Statistical data show that the level of electricity generated by hydro resources is highly volatile, and directly dependent upon climate conditions and thus it changes its value almost two times. The reported alteration and trends are considerable for a country of our scale.

- The biomass utilization for energy production in the country is mainly for heat generation, by a decentralized generation method at that. Using this resource for industrial generation of electricity is not appropriate since the available potential is distributed on a territory of 11.1 hectares, with the rural economy accounting for 55% and 35% being forests. Given this distribution, the actual technical potential that can be utilized is from 10% to 25% by taking into account the relevant transport costs (which will be significant for a centralized generation) as well as the environmental aspect.
- The industrial generation of electricity from biomass requires sustainable fuel supplies which on its part is dependent upon the collection rate. The potential sources of biomass for electricity generation are distributed across the entire country's territory (as stated above), i.e. there is no localization of considerable resources allowing the installation of generation capacity for industrial generation. The installation of large capacities is inexpedient from an economic and environmental point of view (meaning centralized generation which would replace the generating capacity of an existing large TPP).
- The use of biomass for electricity generation, predominantly by small private owners, industrial enterprises and others, will satisfy their own needs and the quantity of electricity fed into the grid will be lower than the expected levels.
- The access of facilities generating electricity from biomass to the national electricity distribution network is limited as the potential is concentrated in the mountain regions. The possible locations for this kind of generation are in the plains where the low-potential sources of biomass are located – straw and other waste products of agricultural activities.
- Pursuing an efficient use of the energy resources imposes cogeneration as a technical solution. By this kind of generation, the system's electrical and heat loads are co-related and their quantities directly depend on the consumption. The consumption of heat energy from this kind of generation will be mainly in the households and services sectors which determine the seasonal operation of the facilities with a nominal working capacity.

The indicated 180 MW – 250 MW (750 GWh – 880 GWh) installed capacities using biomass are the optimistic, maximum case, including both the centralized and the decentralized generation of electricity. The realistically attainable levels of electricity generation from biomass that will be reported in the gross domestic generation and reflected in the country's energy balance will be only just 55% - 60% of these values or about 550GWh (until 2010).

Based on the above data, we can anticipate that in 2010 the share of electricity generated from biomass in the gross domestic consumption will be some 1.37% (should the realistic plans be implemented).