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## **RENEWABLE ENERGY SOURCES**

### **Energy efficiency Agency**

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#### **Summary**

The paper presents the activities of the Energy Efficiency Agency, its main functions, as well as the new legislation stimulating the use of RES, stipulated in the new Energy Law of Bulgaria.

The second part of the paper describes the potential of renewable energy in Bulgaria, i.e.

- o wind energy
- o solar energy
- o biomass energy
- o hydro energy
- o geothermal energy
- o The draft of a National Program on RES 2005-2015

The third part describes the main issues of the new ENERGY EFFICIENCY LAW and the established Energy efficiency fund

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**The Energy Efficiency Agency is a successor of the following institutions:**

- 1992- Section, within the Ministry of energy for implementation of

Phare projects

- 1997 - National energy efficiency agency at the Council of Ministers
- 1999 - State energy efficiency agency at the Council of Ministers.

**EEA is the national EE and RES center, collaborating with all national stakeholders:**

- Ministries and administrations
- Branch organizations
- Regional and local administrations
- Non-governmental organizations
- Economic subjects

### **The main functions of EEA**

- Elaboration of programs and projects
- Assistance for finding co-financing
- Organization of seminars, conferences and working shops
- Transfer of know-how and experience
- Execution of projects
- Delivery of qualified consultant services
- Execution of energy audits

The New legislation stimulating the use of RES is stipulated in the new Energy Law

The milestones for establishment of new legislative framework are:

*To reach the national indicative targets*

- Taking in consideration the principles of electric energy market
- Taking in consideration the features of various RES and technologies for electric energy production
- To keep the preferences by changing the incentives mechanisms

Stimulation of energy production from RES until the establishment of a system for issuing of and trade in green certificates.

- Mandatory purchase of energy , generated from RES at preferential prices
- Priority accession to the grid of power plants generating energy from RES

Regulation of a new market for Green Certificates (GS) since January 01 2006

- Defining minimal obligatory quarters, as % from the total annual production of electric energy
- Structuring of Commercial system with Green certificates - obligation of the producer
- Conditions and order for issue and trade with GS

*Stimulation of energy co-generation until the establishment of a system for issuing of and trade with GS.*

- Mandatory purchase of energy , generated from CHP at preferential prices by powers up to 50MW
- Purchase at negotiated prices and/or at balancing prices - for quantities generated by powers above 50MW
- Equal participation in the GCs market

## POTENTIAL OF RENEWABLE ENERGY IN BULGARIA

Bulgaria disposes with considerable potential of RES and could cover substantial part of its general energy needs through the development, working out and the utilization of the renewable sources.

### WIND POTENTIAL IN BULGARIA

The wind resources determined for level 10 m. above the ground can, although rather schematically, be grouped in three wind energy zones:

#### *Zone of little dimensional wind energy*

Little dimensional wind energy means wind energy equipments (WEE) with installed capacity from several kW to several dozens of kW. Usually in that term they include multi-blade WEE, which serve usually for supply of separate objects with power, for combined work with photovoltaic plane elements, for drawing a water from wells, for grinding of seed and other purposes. The elevation on which the wind wheel is about 10-20 meters up the terrain. The wind resources, which allow the spreading of small dimensional wind energy, are situated in areas with energy flow density on level 10 m., exceeding 100 W/m<sup>2</sup>. It includes the plain part of the country (Danube plain and Thracia), the valleys of rivers Struma and Mesta, as well as the high plains of Western Bulgaria.

#### *Zone of middle dimensional wind energy*

Middle dimensional wind energy means WEE with installed capacity from several decades of kW to several hundreds of kW. These are usually three-blade wind turbines with installed single power from several dozens to several hundreds of kW. It includes Black sea coast and Dobrudja tableland, subtle strip of the Danube riverbank and the places in the mountains with height above the sea level up to 1000 m. Here the density of energy flow is within the limits of 100-200 W/m<sup>2</sup> on a level of 100 m. above the terrain.

#### *Zone of the big wind energy*

Big wind energy means the WEE with installed single capacity from several hundreds kW to several MWs. These are usually one, two and three-blade wind generators, situated in a given scheme, which depends on the terrain conditions, as well as if it is observed clearly defined prevailing direction at the given place or not. These equipments usually are grouped in the so-called wind farms and they are connected to the transmission grid without using of accumulating devices. The height on which is situated the pivot shaft of the wind wheel usually varies from 50 to 100 m, but could be higher in dependence of the blade length. The wind resources, which could be enough for the development of these equipments covers regions with energy potential, exceeding for a 10 m. level 200 W/m<sup>2</sup>. That zone includes the open mountain ridges and tops with a exceeding of 1000 m. sea level, as well as the jutting out in the sea parts of land (as cape Kaliakra and cape Emine).

## SOLAR ENERGY POTENTIAL IN BULGARIA

Technological possibilities for solar energy utilization in Bulgaria are not disregarding. Depending on the duration of the solar shining -  $h$  and the summed up solar radiation received on horizontal surface on the country territory could be conditionally separated into three zones, namely:

Zone A - encompasses regions in SE Bulgaria, part of the South Black Sea coast region, the rivers Struma, Mesta and Maritza valley, where the duration of the solar shining is The wind resources determined for level 10 m. above the ground can, although rather schematically, be grouped in three wind energy zones:

### Zone of little dimensional wind energy

Little dimensional wind energy means wind energy equipments (WEE) with installed capacity from several kW to several dozens of kW. Usually in that term they include multi-blade WEE, which serve usually for supply of separate objects with power, for combined work with photovoltaic plane elements, for drawing a water from wells, for grinding of seed and other purposes. The elevation on which the wind wheel is about 10-20 meters up the terrain. The wind resources, which allow the spreading of small dimensional wind energy, are situated in areas with energy flow density on level 10 m., exceeding 100 W/m<sup>2</sup>. It includes the plain part of the country (Danube plain and Thracia), the valleys of rivers Struma and Mesta, as well as the high plains of Western Bulgaria.

### Zone of middle dimensional wind energy

Middle dimensional wind energy means WEE with installed capacity from several decades of kW to several hundreds of kW. These are usually three-blade wind turbines with installed single power from several dozens to several hundreds of kW. It includes Black sea coast and Dobrudja tableland, subtle strip of the Danube riverbank and the places in the mountains with height above the sea level up to 1000 m. Here the density of energy flow is within the limits of 100-200 W/m<sup>2</sup> on a level of 100 m. above the terrain.

### Zone of the big wind energy

Big wind energy means the WEE with installed single capacity from several hundreds kW to several MW. These are usually one, two and three-blade wind generators, situated in a given scheme, which depends on the terrain conditions, as well as if it is observed clearly defined prevailing direction at the given place or not. These equipments usually are grouped in the so-called wind farms and they are connected to the transmission grid without using of accumulating devices. The height on which is situated the pivot shaft of the wind wheel usually varies from 50 to 100 m, but could be higher in dependence of the blade length. The wind resources, which could be enough for the development of these equipments covers regions with energy potential, exceeding for a 10 m. level 200 W/m<sup>2</sup>. That zone includes the open mountain ridges and tops with a exceeding of 1000 m. sea level, as

well as the jutting out in the sea parts of land (as cape Kaliakra and cape Emine).

## **SOLAR ENERGY POTENTIAL IN BULGARIA**

Technological possibilities for solar energy utilization in Bulgaria are not disregarding. Depending on the duration of the solar shining -  $h$  and the summed up solar radiation received on horizontal surface on the country territory could be conditionally separated into three zones, namely:

Zone A - encompasses regions in SE Bulgaria, part of the South Black Sea coast region, the rivers Struma, Mesta and Maritza valley, where the duration of the solar shining is over 2200 h/y and the summed up solar radiation received on horizontal surface is bigger than 1600 kWh/m<sup>2</sup>.

Zone B - encompasses regions in Danube plain, Dobrudja region, Trace lowland, West Bulgaria and Balkan hollow fields and Stara Planina mountain regions, where the duration of the solar shining varies from 2000 to 2200 h/y and the summed up solar radiation received on horizontal surface varies from 1500 to 1600 kWh/m<sup>2</sup>.

Zone C - encompasses the remaining part of the country territory but mainly its mountains, where the duration of the solar shining is less than 2000 h/y and the summed up solar radiation received on horizontal surface is less than 1500 kWh/m<sup>2</sup>.

## **BIOMASS ENERGY POTENTIAL IN BULGARIA**

In Bulgaria the utilization of biomass for energy generation is insignificant: 963 MW - installations for energy generation from wood leavings, although the enormous potential with which the country disposes 68 286,1 TJ/year - (agricultural solid wastes); 478,4 TJ/year - (natural fibers) 1134,3 GWh/year - (Landfill gas).

## **HYDRO ENERGY POTENTIAL IN BULGARIA**

The potential for the generation of cheap and ecological energy from the rivers, water supply and hydro-meliorative system in Bulgaria is not used. The research shows, that in Bulgaria exists possibilities for construction of new 730 HPPs with small capacity, as their total installed capacity is 210 MW and annual generation - 795.106 KWh.

## **GEOHERMAL ENERGY POTENTIAL IN BULGARIA**

Bulgaria disposes theoretic potential for geothermal energy usage, which is evaluated to 14387 TJ/year, but up to now it is installed only 100 MW heat capacity. Heat power of the geothermal sources could be used for CHP energy, could be constructed district heating systems at combined supply with geothermal energy and a classical energy resource.

After the micro HPPs, the geothermal energy and heat pumps probably will have the second most considerable increase in short-term plan.

## ENERGY EFFICIENCY LAW

The new law is based on the EU energy efficiency acts including Directive 2002/91/EC on the energy characteristics of buildings as well as the Energy Charter Agreement /A protocol concerning energy efficiency and related environmental aspects attached to the Energy Charter Agreement/, the Kyoto Protocol, etc.

### Establishing of Energy efficiency fund

The establishment of "energy efficiency" fund as a tool for attracting financial resources to promote the development of energy efficiency and utilization of renewable energy sources is an important step supporting the efforts to reduce the emissions of greenhouse gases.

#### Fund's Goals

Funding of projects for improvement of energy efficiency.

#### Objectives

Management of financial resources obtained through:

- *Grants from international financial institutions, international funds, Bulgarian and foreign natural and/or legal persons - the initial financial aid from the Global Environmental Fund;*
- *Financial revenues;*
- *Profit on investments;*
- *Loans or other instruments from banks or investors.*

### *National Program on RES 2004-2014*

*National Program on Renewable Energy Sources is the first national program on renewable energy and real Action Plan at the same time, as structured of concrete investment projects and project proposals for the large-scale application of the renewable energy from:*

- *Sun (hot water and heating and photovoltaic power systems)*
- *Wind*
- *HPSs up to 10 MW*
- *Biomass (from agriculture, forestry, industry and household), Biogas (from landfills)*
- *Geothermal*

*The NATIONAL RES PROGRAMME was awarded in the ceremony of TAKE - OFF Campaign in January 2004, Berlin and the EEA became a New RES Partner.*