Wind power. Legislative and financial framework. Possibilities of exploitation in Republic of Moldova

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***Abstract* — Wind energy can be converted into a usable form of energy using wind turbines to produce electricity, wind mills for producing mechanical power, wind pumps for pumping water, or sails for moving the ships. Currently, on the worldwide scale, there are wind farms consisting of hundreds of wind turbines, which are connected to an electricity grid. With existing technology for new constructions, wind energy produced on land is convenient priced compared to the energy produced from fossil sources, in some places, the energy produced by wind energy conversion systems can be even cheaper. Wind power off shore is higher, also the visual impact produced by turbines is lower, but the construction and maintenance of these turbines are more expensive than in the case of those constructed on land. Small wind farms can provide energy for remote or isolated areas that are not connected to grid. Compared to energy obtained from fossil sources, wind energy is renewable, widely available, clean, produces no emissions of greenhouse gas during conversion and uses little space. Environmental effects are generally less problematic than the ones created by other energy sources.**

Moldova is far behind the world's progresses regarding renewable energy and pragmatic solutions for spreading conversion technologies are needed, keeping in mind the current economical, political and social problems that the republic faces.

Keywords— renewable energy; wind energy; energy efficiency; legislation;

I. INTRODUCTION

Moldova imports 97% of its energy needs [1], which makes it very vulnerable to the economic and political changes, as the economic sector is often used as a political weapon by the Russian Federation, the country's main energy supplier . Also, 76.4% of electricity is imported from Ukraine. This fact was conditioned by historical factors, and the lack of primary energy resources of the country. However, according to studies, the potential of renewable energy available in the country are significant (Table 1) [1] and its exploration would considerably reduce the degree of energy dependence of the country and of course, would help in creating new jobs.

The most used sources of available renewable energy is hydropower and biomass, solar and wind energy are not being exploited.

Unlike the present days, in 1950 to 1960 in Moldova there were hundreds of wind turbines for water pumping, which disappeared with the electrification of the country that took place during that period. In present there exists only one wind turbine for commercial use and other small wind turbines are made with for research purposes by Technical University of Moldova, also 20 other small power plants are owned by Mr. Nicolae Constantinov, the

Table 1. The availability of the principal RES

Type of RES	*Availability*		
	PJ		*10^3 TEP*
Solar	50.4		1.2
Wind	19.4		0.7
Hydro	12.1		0.3
Biomass	Agricultural waste	7.5	
	Firewood	4.3	
	Wastes from wood processing	4.7	
	Biogas	2.9	
	Biofuel	2.1	
	Biomass Total	21.5	0.5
Total availability of RES		113.4	2.7
Energy sources with reduced thermic power		>80	>1.9

Note: RES - Renewable Energy Source
TEP - Tons Equivalent Petroleum

president of the Wind Energy Association, and they operate on small businesses and farms, vineyards, sheep farms [4].

II. Current situation and legal framework

In 2007, the Government of the Republic of Moldova submitted the Energy Strategy 2020 that [1] "is primarily aimed on providing with energy of good quality at reasonable prices to all consumers in the country and achieving the concept of sustainable development of the national economy. That objective will be achieved on the basis of competitive and liberalized energy markets. Competition will ensure transparent rules for all actors of the energy market, which in turn, will enhance the energy security of the country; rational pricing indicating correct signals of all the market players that would ensure the needed investments in the sector; the enhancement of the energy efficiency; and by disposing a relevant legislation reducing the environmental impact."

According to this strategy, a number of related issues need to be considered and solved in order to achieve this purpose, which are: the state poor energy infrastructure, reduced effectiveness of all the energy sectors, large energy losses etc.

In Moldova, a number of steps are taken for the development and for the increase of the role of renewable energy in the national energy consumption balance. Thus, under the Government's strategy mentioned above, by Law no. 160 from 12.07.2007 of the renewable energy (with later modifications): the State defines its policy and principles related to renewable energy, namely it aims to increase the production of the renewable energy and reducing the negative impact of the energy sector on the environment by harnessing resources of renewable energy. And about this impact, a significant reduction of energy consumption in 1990-2001, from 10.4 million. tep down to 1.9 milion tep, taking into account its increase up to 2.52 mil. tep in 2005, led to a decrease in overall energy sector and also a decrease of impact on the environment since 1990, so the value of the indicators of CO_2 emissions in the mentioned period decreased by about 70%. [1] However, there is still room for reducing these emissions and according to the above law, the state aims to achieve this goal.

The principles that will serve as basis for these policies would be the promotion of the most efficient renewable energy programs and their choice by competition, promoting the production of electricity from renewable sources by compulsory acquisition by suppliers of electricity produced by these sources and administrative actions, stimulating renewable energy development through economic instruments and state control of the usage of these resources also enabling the access to the information related to the harnessing of renewable energy for individuals and businesses.

By Article 16 of the same law, the Government establishes the Energy Efficiency Fund which is responsible for managing the funds intended for energy efficiency and the use of renewable energy. Also, we mention here the Energy Efficiency Agency established under decision no. 1173 of 21.12.2010 by the Government, that "has the mission to monitor the developments in energy efficiency and renewable energy sources, to ensure the preparation and submission of the programs summaries, evaluation of the investment projects in the field, drafting of legislation and the creation of an informational base in this area of activity."

However these steps come into effect more or less formal, since the results are somewhat anemic, so far, no major projects are conducted to justify the effectiveness of these steps, although intentions were, for example in 2011, it was announced that Summa, a Turkish company, intends to invest in the installation of wind turbines with power of 75 MW but this did not materialize. Also other companies, including GasNatural Fenosa expressed the same intentions but with the same fate.

III. The financial framework

According to the European Bank for Reconstruction and Development (EBRD), Moldovan companies consume three times more energy to produce in the same way and the same amount of production as companies in the European Union, in other words, the country's energy intensity which is about three times higher, demonstrates a very low energy efficiency in Moldova so EBRD launches a financing line for the energy efficiency in 2009 (MoSEFF) [2] which aims to support the investments in energy efficiency businesses in Moldova. This credit line consists of 42 million euro in combination with a 5-20% grant component is provided as loans for Moldovan companies, also they offer consulting services through the German company Fichtner.

In Moldova are available also other sources for renewable energy projects [3], sources coming from the European Investment Bank (EIB), the Global Environment Facility (GEF), the World Bank and International Finance Corporation (IFC) United States Agency for International Development (USAID), the National Fund for Regional Development (NFRD) and in the subsequent years, the Government will allocate 1% of state budget revenues for energy efficiency.

IV. Wind energy reserves in RM

Wind potential map, (Fig. 1) shows the variation of the energy resources provided by wind and also the fact that these resources are spread relatively homogeneous over large areas. This map is calculated on the basis of data provided by the Atlas of Winds and is adjusted to the particularities of the areas, also it represents a map of an estimated wind energy potential of the republic, calculated at the height of 70 meters above the ground. It should be noted that this map shows only the areas with the highest wind potential and cannot be used as a base for a decision regarding a possible investment in the territory determined by a method such as for example the proposed by the source [5, p. 422]. Institutions do not have systematic data of wind speeds at heights greater than 12 m, there are only

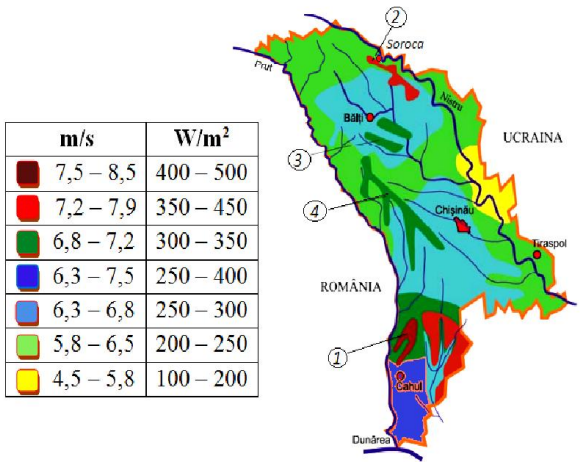

Fig 1. Map of the wind energy potential in RM [5, page 423]

some measurements made by State Meteorological Service using weather balloons that estimates the amount of the wind above 12 m, but for design/construction of wind farms, there is required data of wind speeds at heights greater than 50 meters that doesn't exist.

V. Possibilities of Wind Power Implementation in Moldova

There are more people that manufacture their own systems for wind energy conversion [6] [7] identified by the program Moldova Eco Energetică, and at the moment this is the most secure, available, viable energy recovery path of using the wind power, but not only, because state institutions mentioned above support financially these actions, and the know-how part is fully available on platforms like Youtube or specialized sites. It is true that lack of expertise (which is expensive) to build wind turbines will result in less efficient realization of a turbine, but instead, it will be less expensive, and lack of expertise will be mitigated over time because new knowledge about installations can be accumulated when providing maintenance. These types of actions would result in decrease or loss of dependency of the households on the market energy monopoly. It would be necessary a somewhat more aggressive and active campaign to promote these types of technologies and resources, to educate society to build and implement fully renewable energy conversion installations at home, because if the state does not look like having a real political will for large projects, at least it's possible to promote the production and installations of the wind turbines in households and this would be entirely possible under current funding conditions and availability of natural renewable sources mentioned above. This would result in a decrease of the critical needs that society faces, especially the rural part.

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