

## Technology Fact Sheet

Technology Name	Wind systems for water and space heating <sup>i</sup>
Subsector GHG emission	<p>2005 year: Category 1A1-Energy Industry (Stationary fuel burning for electricity and heat production). CO<sub>2</sub> emission:: 2986,6·10<sup>3</sup> t [<i>Comunicarea Națională Doi a Republicii Moldova elaborată în cadrul Convenției-cadru a Organizației Națiunilor Unite privind schimbarea climei./ Ministerul Ecologiei și Resurselor Naturale / Programul Națiunilor Unite pentru Mediu; Coord.: Violeta Ivanov, Geogr Manful; Grupul de sinteză: V. Scorpan, M. Țăranu,, P. Todos, I. Boian.-Ch.: „Bons Offices” SRL, 2009-323 p. ISBN 978-9975-80-313-7, tab. 2.11, pag. 105]</i></p>
Background/Notes, Short description of the technology option	<p>The proposed technology is different from the other by thermal generator that converts the induced eddy currents energy by a multi pole permanent magnet inductor directly into heat. The power of air flow is proportional to the cube of wind speed. Wind energy conversion system must work effectively across the range of variation of wind speed in the given site, for example, from 3 to 20 m / s. However, rated power of small wind power systems, (up to 30 kW) corresponds to wind speed of 11-12 m/s. In other words, at the wind speed of 20 m/s wind energy conversion system should have an overload factor of 5-6. In reality, this factor is equal to 1,2-1,3 [<a href="http://www.urbanwind.net">www.urbanwind.net</a>. <i>Catalogue of European Urban Wind Turbine Manufacturers</i>; <a href="http://www.urbanwind.net">www.urbanwind.net</a>. <i>Urban Wind Turbines Technology Review: A Companion Text to the Catalogue of European Urban Wind Turbine Manufacturers</i>]</p> <p>, being limited, primarily, by permanent magnet electrical generator. The permanent magnet generator overload factor is limited by properties of using materials: insulation, enamelled copper wire and permanent magnets. The conversion efficiency increases when using eddy current generator. In short terms, we can extract more energy from available wind potential. Moreover, the eddy current generator must have an overload factor equal minimum to 2. There are not technical or economic difficulties to produce of such eddy current heater. It does not contain electrical insulation, copper, electrical sheet steel or other expensive materials that would limit the overloads.</p> <p>Sources: Xiaohong Liu et all., <i>The Study of The Heat Device in Wind-Magnetic Water Heater</i>, <i>Advanced Materials Research</i>, Vol. 201-203, 2011, pp. 460-464.</p> <p>I. Dirbal, J. Kleperis, <i>Practical Application of Eddy Currents Generated by Wind</i>, <i>Annual Conference on Functional Materials and Nanotechnologies–FM&amp;NT</i>, 2011, Series: <i>Materials Science and Engineering</i> 23, pp. 1-5.</p>
Implementation assumptions, How the technology will be implemented and diffused across the subsector? Explain if the technology could have some improvements in the country environment.	<p>There are several reasons why wind energy conversion systems should be used more widely for the production of heat or hot water for residential using. Arguments are as follows:</p> <ol style="list-style-type: none"> <li>1. Energy consumption structure of a country. As an example the Republic of Moldova: the total energy consumption in 2009, equivalent to 2,071 million t.o.e., only 16 % was consumed in the form of power [12], and other resources that constitute 84 % were consumed in the form of heat and mechanical energy. The heat is used mainly for space heating and hot water housing. Of total gas consumption in 2010 which is 1090 million m<sup>3</sup>, 31,2 % was consumed by households [13]. In other words, was consumed to produce heat.</li> <li>2. In 2010 the share of natural gas in a Gcal cost was 712 MDL and will keep upward trend. Wind equipment for heat production is simply and cheaper than for power production.</li> <li>3. The problem of accumulation of heat and its use during periods when the wind doesn't blow is solved simply and cheaply. The ratio between the cost of electric battery and a heat accumulator with the same capacity is more than 10, and exploitation period for heat accumulator is greater.</li> </ol>

Implementation barriers	Lack of investments. The legal framework is ambiguous and is not completed.
Reduction in GHG emissions (megatonnes CO <sub>2</sub> -eq)	Assuming that the next 20 years will be installed 52 MW wind power for water & space heating, by 2030 CO <sub>2</sub> emissions will be reduced by 16,7·10 <sup>3</sup> t annually.
<b>Impact Statements - How this option impacts the country development priorities</b>	
Country social development priorities	Increase leaving confort for rural sector
Country economic development priorities – economic benefits	Increased energy security, Establishment of an integrated and stable agricultural system
Country environmental development priorities	Less pollutant air
<b>Other</b> considerations and priorities such as market potential	
<b>Costs</b>	
Capital costs	1400 Euro/kW
Operational and Maintenance costs	20 \$/kW-yr
Cost of GHG reduction	Cost of GHG reduction is 124,7 USD /tCO <sub>2</sub>
Lifetime	20 years
Other	-

<sup>i</sup> This fact sheet has been extracted from TNA Report - Technology Needs Assessment for climate change mitigation - Republic of Moldova. You can access the complete report from the TNA project website <http://tech-action.org/>