Technology Fact Sheet

Technology Name	**Short term large scale Combined heat and power plants of large capacity, larger than 1 MW of installed capacity**[i]
Subsector GHG emission (Mt CO2-eq)	**7,7248 Million t CO2 from energy sector in 2005**
Background/Notes, Short description of the technology option	Co-generation is the combined production of useful thermal energy and electricity (Combined Heat and Power, CHP) from the same primary fuel. CHP can take on many forms and encompasses a range of technologies, but will always be based upon an efficient, integrated system that combines electricity production and heat recovery. By using the heat output from the electricity production for heating or industrial applications, CHP plants generally convert 75-80% of the fuel source into useful energy, while the most modern CHP plants reach efficiencies of 90% or more (IPCC, 2007). CHP plants also reduce network losses because they are sited near the end user. large CHPs will be defined here as power plants using internal combustion engines and gas-turbine based CHPs with capacity higher than 1MW of electrical capacity. Using such large power units results in a range of benefits, including reduced air pollution and greenhouse gases and better service for end user. Its main drawback compared to large conventional power plants, less capital intensive, is that its efficiency depends greatly of the heat load and good knowledge of the heat and electric load result in good performance of such technology and larger per unit investments. **(source: climatetechwiki.org)**
Implementation assumptions. Explain if the technology could have some improvements in the country environment.	It is assumed that CHPs of large capacity may be built in cities where there is heat load during the whole year or at industrial sites, or may be used to replace the existing capacities at CHP that are old and does not correspond to actual requirements. It is envisaged that this technology will use natural gas as fuel.
Implementation barriers	Lack of information regarding benefits, lack of experience in this field and skepticism to implement such a technology. Of course one psychological impediment is the centralized heat supply system in the capital, based on CHPs of old design that is considered inefficient and with high tariffs.
Reduction in GHG emissions (MtCO2-eq)	If implemented the technology will result in annual reduction of 134000 tones of CO2 for 2030
Impact Statements	Increase country energy security
Country **social** development priorities	Increased efficiency of energy conversion and use; • Lower emissions to the environment, in particular of CO2, the main greenhouse gas; • Large cost savings, providing additional competitiveness for industrial and commercial users, and offering affordable heat for domestic users; • An opportunity to move towards more decentralized forms of electricity generation, where plant is designed to meet the needs of local consumers, providing high efficiency, avoiding transmission losses and increasing flexibility in system use. This will particularly be the case if natural gas is the energy carrier; • Improved local and general security of supply - local generation, through cogeneration, can reduce the risk that consumers are left without supplies of electricity and/or heating. In addition, the reduced fuel need which cogeneration provides reduces the import dependency - a key challenge for Europe's energy future; • An opportunity to increase the diversity of generation plant, and provide competition in generation. Cogeneration provides one of the most important vehicles for promoting liberalization in energy markets; • Increased employment - a number of studies have now concluded that the development of cogeneration systems is a generator of jobs. Using this technology there will result in at least 10 % less fuel used to use the same

	quantity of electricity from the grid and hest produced by heat only boilers.		
Country **economic** development priorities – economic benefits	A well-designed and operated cogeneration scheme will always provide better energy efficiency than conventional plant, leading to both energy and cost savings. A single fuel is used to generate heat and electricity, so cost savings are dependent on the price-differential between the primary energy fuel and the bought-in electricity that the scheme displaces. However, although the profitability of cogeneration generally results from its cheap electricity, its success depends on using recovered heat productively, so the prime criterion is a suitable heat requirement. As a rough guide, cogeneration is likely to be suitable where there is a fairly constant demand for heat for at least 4,500 hours in the year. The timing of the site's electricity demand will also be important as the cogeneration installation will be most cost effective when it operates during periods of high electricity tariffs, that is, during the day. Less fuel used means less natural gas imported and less paid for it as well as the decrease of energy dependency.		
Country **environmental** development priorities	In addition to direct cost savings, cogeneration yields significant environmental benefits through using fossil fuels more efficiently. In particular, it is a highly effective means of reducing carbon dioxide (CO2) and sulphur dioxide (SO2) emissions. Oxides of nitrogen (NOx) are also generally reduced by the introduction of modern combustion plant. CO2 savings The assessment of the carbon savings from a cogeneration project is hotly debated, as it is very difficult to prove what electricity it displaces. This issue has been at the heart of a long running discussion in European markets, with no agreement. Does the cogeneration scheme displace: a. The mix of electricity production in the country? b. The most marginal power plant on the system? c. The next power plant to be built by the power industry? d. The best theoretical power plant available? Increased efficiency of energy conversion and use; • Lower emissions to the environment, in particular of CO2, the main greenhouse gas; Reduced air pollution: By replacing of 855 million kWh of electricity to be produced in conventional thermal power plant it will result in reduction of about 134000 tons of CO2 per year.		
Other considerations and priorities such as market potential	It is estimated that the market potential of such a technology is about 150000 kW.		
Costs			
Capital costs	The typical investment costs in the large scale CHP is about 1000 $/kW, but it may depend on site and on used technology gas turbine or internal combustion engine CHPs.		
Operational and Maintenance costs	Operational and maintenance costs excluding fuel for gas-turbine CHPs is typically about 40 $/kW per year. For internal combustion engine the O$M costs may be doubled. The cost of fuel component depends on the natural gas price.		
Cost of GHG reduction	The cost of electricity produced by such CHP is lower than the cost of electricity produced by thermal power plant electricity of which will be replaced, using the same fuel. In such a case the GHG reduction does not have any cost.		
Lifetime	Economic lifetime is 20 years. Technical lifetime is 20-25 years.		
Other	Total energy efficiency is approximately 80-85 %.		
		Old	**New**
Efficiency	%	36	50
Fixed O&M costs	$/kW*month	2	40

Variable O&M costs	$/MWh	3	0
Investments	$/kW	0	1000
Fuel price	$/tcc	552	552
Time of use of rated capacity	h/an	6000	5700
Fuel consumption	gcc/kWh	341.67	246
Fuel price	$/kgcc	**0.552**	**0.552**
Fuel used	kgcc/kWh	**0.34**	**0.246**
Cost of used fuel	$/kWh	**0.189**	**0.136**
Annual capital costs	$/kW*an		50.000
Per unit fixed O&M costs	$/kWh	**0.004**	**0.009**
Per unit variable O&M costs	$/kWh	**0.003**	**0.007**
Total costs	**$/kWh**	**0.196**	**0.152**

[i] 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/**