Technology Fact Sheet

Technology Name	**Short term large scale Combined cycle combined heat and power plant of large capacity (natural gas)** [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	Combined cycle using a gas turbine, heat recovery steam generator and a steam turbine is one of the mature technology that can be applied in order to produce electricity at high energy efficiency. The efficiency may be increased if the heat from steam turbine is used. In this case the power plant will be CC CHP. CC 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, CC CHP plants generally convert 80-85 % of the fuel source into useful energy. Using such large power units results in a range of benefits, including reduced air pollution and greenhouse gases and better service for end users. Its main drawback compared to large conventional power plants, less capital intensive, is that the efficiency of 80 % and more can be reached in case there is heat load, otherwise the efficiency will be in the range of 50-60%. Of course to use heat that will result in the increase the 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, How the technology will be implemented and diffused across the subsector? Explain if the technology could have some improvements in the country environment.	It is assumed that combined cycle 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 (megatonnes CO2-eq)	If implemented the technology will result in annual reduction of 140000 tones of CO2 for 2030
Impact Statements - How this option impacts the country development priorities	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 more than 15 % 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 combined cycle CHP 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. 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 (CO_2) and sulphur dioxide (SO_2) emissions. Oxides of nitrogen (NO_x) are also generally reduced by the introduction of modern combustion plant. • Increased efficiency of energy conversion and use; • Lower emissions to the environment, in particular of CO_2, the main greenhouse gas; Reduced air pollution: By replacing of 900 million kWh of electricity to be produced in conventional thermal power plant it will result in reduction of about 140000 tons of CO_2 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 CC CHP is approximately 1300 $/kW.		
Operational and Maintenance costs	Operational and maintenance costs excluding fuel for gas-turbine CC CHP is typically about 60 $/kW per year. The cost of fuel component depends on the natural gas price.		
Cost of GHG reduction	The cost of electricity produced by such CC 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 25 years.		
Other	Total energy efficiency is approximately >80 %.		
		Old	**New**
Efficiency	%	36	50
Fixed O&M costs	$/kW*month	2	60
Variable O&M costs	$/MWh	3	0

Investments	$/kW	0	1300
Fuel price	$/tcc	552	552
Time of use of rated capacity	h/an	6000	7000
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		65.000
Per unit fixed O&M costs	$/kWh	**0.004**	**0.009**
Per unit variable O&M costs	$/kWh	**0.003**	**0.009**
Total costs	**$/kWh**	**0.196**	**0.154**

[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/**