



Best Practice	OTHERS: BIOMASS – GEOTHERMAL ENERGY	RENE-03
Application	Use of renewable energy production technologies	
SME sector	Industrial	
SME Sub-sector	All	
Technical description	<p>Biomass - organic material of non-fossil origin, such as organic waste - can be converted into bioenergy through various processes (combustion, anaerobic digestion, gasification, etc.), directly or through derivative products. Around 64% of the total primary energy production of renewable energy in the EU-28 in 2016 is generated in this way. Technologies to produce heat and electricity from biomass are well developed in many applications. Biomass heating systems range from small stoves for households with capacities ranging from 5 kilowatts (kW) to 100 kW (often powered by wood and wooden pallets), to large boilers for farms, commercial buildings or in industry, which reach a capacity of 100 kW to 500 kW (powered by a variety of raw materials such as wood chips and miscanthus). Large heating systems for district heating or industrial use have a capacity of 1 MW to 500 MW and can use various biomass raw materials, including wood chips, straw and miscanthus. Biomass can also be converted into cogeneration plants that produce both electricity and heat (CHP) with a typical ratio of 1:2 to 1:3, with a possible overall efficiency of 70-90%. Cogeneration plants have substantially higher capital costs than thermal energy-only plants of the same scale, and on a smaller scale (less than 10 MW) the electrical efficiency of the plant is typically lower. It is therefore important to find a constant heat demand to ensure the economic profitability of the investment.</p>	
Recommendation for optimisation	<p>The factors to be evaluated to optimize and promote the installation of biomass plants are closely linked to the strengthening of the local supply chain and the simplification of legislation relating to the installation of biomass-based technologies.</p>	
Technical considerations	<p>It is important to underline that the European Commission has issued non-binding recommendations on sustainability criteria for biomass. These recommendations are meant to apply to energy installations of at least 1MW thermal heat or electrical power. They:</p> <ul style="list-style-type: none"> • forbid the use of biomass from land converted from forest, and other high carbon stock areas, as well as highly biodiverse areas • ensure that biofuels emit at least 35% less greenhouse gases over their lifecycle (cultivation, processing, transport, etc.) when compared to fossil fuels. For new installations this amount rises to 50% in 2017 and 60% in 2018 • favour national biofuels support schemes for highly efficient installations 	



	<ul style="list-style-type: none"> encourage the monitoring of the origin of all biomasses consumed in the EU to ensure their sustainability
Schemes and diagrams	<p>Primary energy production, EU-28, 2016 (% of total based on tonnes of oil equivalent)</p>
Economics	<ul style="list-style-type: none"> Average cost of a biogas plant: 4,000-8,000 EUR/kW Average cost of a solid biomass plant for heat generation: 2,200-2,800 EUR/kW Average cost of a biomass cogeneration plant: 2,200-6,000 EUR/kWeI <p>The average costs depend on the size of the plant.</p> <p>Unit prices of the raw material:</p> <ul style="list-style-type: none"> Bulk firewood M20-25: approx. 50 EUR/MWh Pellet A1 Enplus in bags (15kg): about 60 EUR/MWh Methane: 65 EUR/MWh Heating oil: 109-146 EUR/MWh
Energy savings	Annual savings (biomass plant): from 45% up to 65% (in some cases)
Economic savings	Several factors affect investment costs, and a case-by-case assessment is necessary.
Average Payback Time	<p>6-10 years</p> <p>The payback time is influenced by several factors affecting the performance of the plant, including the efficiency of the installed technology, the quality of the biomass feedstock and by eventual presence of feeding tariffs.</p>
Emissions	The use of woody biomass for heat production makes it possible to reduce CO _{2eq} emissions by between 89% and 94% compared to traditional fossil fuels.
Environmental benefits	Reducing CO ₂ emissions



Main NEBs (Multiple benefits)	<input checked="" type="checkbox"/> Environmental benefits <input type="checkbox"/> Increased productivity <input type="checkbox"/> Work environment/ Health/Safety <input checked="" type="checkbox"/> Increased competitiveness <input type="checkbox"/> Maintenance	The measure can increase the competitiveness of the organization through a better corporate image, a reduction in energy costs and an increase in independence from non-renewable energies.
Replicability	Medium	
Related measures	<ul style="list-style-type: none"> • RENE-01: Photovoltaic • RENE-02: Solar Thermal Plant 	
Case study	<p>Cogeneration from solid biomass of local supply chain (Calenzano, FI, 2010)</p> <ul style="list-style-type: none"> • Initial Situation: raw material used: virgin wood chips produced locally. Average consumption of raw materials: 13,000 t/year. Origin of the biomass: <ul style="list-style-type: none"> - pruning of vineyards and olive groves (about 2,000 t/year) - maintenance interventions in riverbeds (about 1,500 t/year) - forest care and thinning (about 8,000 t/year) - residues of the first wood processing (about 1,500 t / year) • Description of the optimisation: there are three storage points: external square for medium/large size biomass and logs; undercover storage for wood chips; plant feed silos. The thermal cycle consists of a mobile grid boiler of BONO Sistemi (Italian company) of 5.9 MW_{th} of power, a diathermic oil recovery boiler with a yield of 4.5 MW_{th} and an economizer on the oil circuit for further heat recovery. The electrical production is guaranteed by an ORC turbo generator of TURBODEN (Italian company) with a nominal power of 800 kW_{el} that uses diathermic oil as a heat transfer fluid. • Implementation costs: the cogeneration plant and the district heating network were realized exclusively thanks to investments of a public nature since Biogenera Srl is a company entirely with public capital. Through the funding line 3.2 of the DocUp 2005 call of the Tuscany Region (with EU funds) a capital loan of € 739,000 was obtained, equal to about 10% of the admitted costs. • Payback Time: 7-8 years 	
References	<p>Eltrop, Ludger, 2018</p> <p>AIEL</p> <p>https://www.progettobiomasse.it/it/pdf/casidistudio/CS17.pdf</p>	