



Small-scale CHP for autarky farms

Project partners



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The aim of this project was to research the opportunities and effects to replace fossil fuel boiler of the farm with a biomass CHP. Specifically, the farm intends to install a wood gasification CHP. CHP suitable for the farm has capacity of 45kW electric and 120 kW heat. It is not common to install CHP plants in Estonia, despite that these solutions can be viable for numerous companies in Estonia. Therefore, introducing these technological solutions and best practices of working plants is innovative for local companies. In the case of economic profitability, the market is open towards implementing technology.

Partners

Taarapõllu farm is officially certificated organic farm that grows berries, fruits and vegetables in Võru County hills. Tartu Regional Energy Agency (TREA) has best competence and cooperation abilities in renewable energy solutions and energy efficiency in South-Estonia. TREA hired external consultant Pavel Bogdanov from Märja Monte OÜ for pre-study of technical solutions and profitability calculations. Märja Monte have had over 40 years of experience in thermal energy sector and P. Bogdanov has been in lead of that company from the beginning.

Background and objectives

Farm has an organic processing recognition, they products are marked and sold with eco-label, therefore is important to use as much as possible renewable energy to cover energy demand for production process. Farm leaders are interested of these solutions that are energy efficient, environmental friendly and that work at the local wood or other renewable energy sources. Pre-study of project addresses the following energy technologies as development scenarios: the local boiler plant wood working on woodchips for heat supply (Scenario I), woodchips-based boiler plant with local heating grid connecting all premises (Scenario II) and combined heat and power (CHP) plant running on woodchips (Scenario III). Company's heating and electricity consumption volumes were calculated based on forecast seen on Company's development plans. Calculated annual energy demand is 340 MWh of electricity and 625 MWh heat energy. Today they use light oil for heat production, by company's development forecast they will need 62 tons of oil.



Choice of Taarapõllu products

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SecureChain partner



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Actions and results

In the framework of the project meeting in Estonia international experts visited Taarapõllu farm in January 2018 and there was discussion how to use Life Cycle Analysis to market Taarapõllu's eco-label products even better. Project team hired external expert by using of SecureChain IV for making of pre-feasibility study for biomass-based energy system for Farm. Suitable CHP plant for the farm was selected by considering heat demand. Three different scenarios were studied and compared if investment is made with and without national grant of 50%. The investment was evaluated by simple payback time, Internal Rate of Return (IRR) and Net-Present Value (NPV) that was calculated for 15 years – minimum lifespan of new boiler. Cash flow and the profitability analysis has demonstrated that from the three energy supply alternatives are equally profitable two: wood chips-based boiler and construction of cogeneration plants. For all scenarios a simple payback period was from approximately 3,5 years (with financial support of 50%) to 8 years (without of financial support).

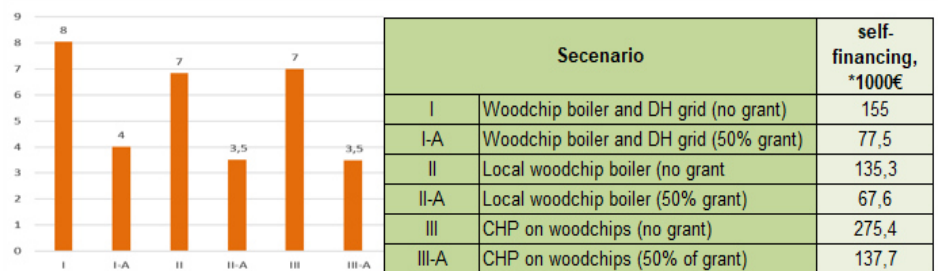


Figure: Alternative simple payback times in years and self-financing volume for different scenarios

CHP scenario has equally good payback period compared with other plants, but initial investment would be about 2 times higher than other technologies and increased requirements for fuel quality and is somewhat more complicated to operate. Wood chips fired boiler is a simple technology that does not require a very high-quality fuel and is well-established practice. Project calculated impact on CO₂ emissions reduction is 485 tCO₂ per year and over 4000 GJ renewable energy produced annually if CHP plant is installed.

State of implementation (May 2018)

Despite the fact that actions were stopped for while in Taarapõllu because of management and ownership changes in progress and previously planned national grants are not open yet, Taarapõllu is still looking to involve investments. Next meeting with investors will held on June 2018.s