



Technical Feasibility Study Report

RINA Consulting

Downlands School & Windmills Junior School Ground Source Heat Pump

Executive Summary

The following feasibility study report examines the case for introducing a ground source heat pump (GSHP) system to supply heat to Downlands Community school, the sports centre building and The Windmills Junior school in Hassocks, West Sussex, in place of heat currently being supplied by gas boilers. Should the project go ahead the intention is for the installation to be funded and operated as a community energy project, and administered through HKD Energy ('HKD'). The feasibility study is funded through the government Rural Community Energy Fund ('RCEF') programme.

The results of the study have determined the following main conclusions.

- None of the heat pump project options considered are financially viable under current conditions. This is due to the high capital cost of both a closed loop multiple borehole ground collector or open loop with abstraction and re-injection boreholes to the underground aquifer and connection of heat supplies to each local plantroom. This is compared to the net revenues including Renewable Heat Incentive ('RHI') payments, and low level of heat sales due to the current low gas price being paid by the schools.
- In order for the heat pump project to be financially viable the gas price paid by Downlands school will need to be between 8.2 and 7.2p/kWh depending on whether the heat pump uses a closed loop or open loop system.
- Heat supply from heat pumps will require connection to all space heating systems supplying all buildings in order to provide a project of sufficient scale to warrant investment.
- There is insufficient land area available for a horizontal ground collector to supply the largest project.
- Due to the design conditions of the existing heat distribution systems at Downlands and Windmills schools, heat pumps would need to operate alongside existing boilers as a bivalent system. Higher contributions of heat from heat pumps would require larger, low temperature radiators and possibly also distribution pipework to be installed in place of existing equipment.
- The heat distribution systems at Downlands and Windmills schools require upgrading in some areas in order for a heat pump system (as bivalent) to be able to operate effectively and efficiently.
- The electrical supply capacity at the site is severely restricted and the project will require a significant upgrade to supply the heat pumps.

A summary of the relevant figures is provided in the following table.

Item	Closed Loop Boreholes	Open Loop Aquifer
Heat supply from heat pumps [kWh/year]	778,082	778,082
Heat pumps capacity [kW]	556	556
Electricity consumption to provide heat [kWh/year]	250,353	250,353
Project capex	£1,399,273	£1,242,871
Project opex – year 1 [£k]	(£108.13)	(£101.25)
Project revenue – year 1 [£k]	£83.01	£83.01
Net revenue - year 1 [£k]	(£25.12)	(£18.24)
Interest payments to shareholders 5% [£k/year]	(£71.71)	(£63.70)
Earnings before depreciation - year 1 [£k]	£30.85	£31.48
Project Internal Rate of Return (IRR)	-5.1%	-4.0%
Project Net Present Value (NPV) at 5.0% [£k]	(£947.65)	(£781.67)
CO ₂ emissions savings based on current emissions factor for electricity [tonnes/year]	44.8	44.8
CO ₂ emissions savings based on average emissions factor for electricity over next 20 years [tonnes/year]	108.2	108.2
CO ₂ emissions savings based on average emissions factor for electricity over next 20 years [tonnes]	2,164	2,164