

## **Solar district pre-feasibility study** Technical assistance for Symi, Greece

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This study investigated the techno-economic pre-feasibility of implementing a solar thermal hot water system in the main town area on an island in Symi, Greece. A model for the hot water demand was created using relevant literature, the population variance through the year and by considering the solar yield fluctuation on the island. The resulting demand curve is fairly consistent through the summer months, due to an increase in population from tourists, which translates into a higher attainable solar fraction without causing stagnation in the system.

A technical model was designed and simulated in Polysun to provide a proof of concept and to investigate the technology types and capacities that would be applicable. The system most suited to this application is centralised, distributed through a district network, and operated in a low-flow configuration. A sensitivity analysis of the solar factor revealed that 68% was optimum in reducing the Levelised Cost of Heating (LCOH). Back-up heat would come from a 150 kW heat pump. The system would have a large circulation loop (approximately 5 km) to distribute the hot water effectively and reduce lag time when consumers require hot water. Literature has shown that in these large-scale applications, the cost saving from economies of scale compensates for the additional costs of having a large network of piping. The system is designed in a way that every building would have access to hot water between 45 °C and 55 °C.

An initial financial model was also simulated in Polysun, revealing the economic viability of the project. The results show an initial capital investment of €1 694 259; and a LCOH of €0.15/kWh, which is very attractive when compared to the traditional cost of electricity in Greece (€0.17/kWh). Due to a recent large increase in electricity costs in Europe, a worst-case scenario was considered, which still yielded attractive financial indicators for the project. The current price of electricity (€ 0.30/kWh) would result in an LCOH of €0.22/kWh, assuming a further 15% increase in electricity costs every year for the next 20 years.

The results shown in this report indicate that the proposed solar thermal system may be a feasible option for the islands domestic hot water requirement. It is suggested that this system be investigated further in more detailed feasibility studies, which would further help decision making regarding its implementation.