

# BENEFITS OF GEOTHERMAL HEAT PUMPS

The heat used in the vast majority of buildings is today generated by burning fossil fuels such as natural gas and heating oil. In some European countries even coal is largely used for heating purposes. Therefore, the heat sector heavily contributes to costly fossil fuels imports, exposure to price volatility as well as to harmful greenhouse gas (GHG) emissions.

Geothermal heat pumps are the perfect solution to replace fossil fuels, thereby reversing these unsustainable trends. With their wide range of applications they strongly contribute to stabilise energy prices, to reduce emissions and to save primary energy. Geothermal heat pumps are:

## RENEWABLE

Geothermal heat pumps make use of local renewable energy, the heat from the earth, which is inexhaustible. This technology can supply **heating and/or cooling 24 hours a day**, all throughout the year and all over Europe, with minor land use.

Any geothermal heat pump substantially contributes to the reduction of (GHG) emissions: combined with renewable electricity the technology is totally carbon free! Geothermal heating systems produce zero emissions.



## EFFICIENT



Geothermal heat pumps are the most efficient heating technology and amongst the few to achieve the highest category A+++ in the new EU labelling system.

The typical efficiency of a geothermal heat pump, expressed as Seasonal Performance Factor (calculated as the ratio of the heat delivered to the total electrical energy supplied over the year), is today well above 4. This means that for each kW of electricity consumed, geothermal heat pumps generate 4kW of thermal energy. And with continued improvements, average values in the order of 5 can be achieved. Such high efficiency implies tremendous reduction in electricity consumption and, in turn, increased economic savings.

## SAFE



Geothermal heat pump a proven durable technology, reliable independent of the season, climatic conditions, and time of day. They have been used for more than 50 years for heating and cooling purposes.

Geothermal heat pumps have the lowest number of failures per installed unit compared to similar technologies, significantly bringing down any additional maintenance costs.

## COMPETITIVE

Despite its higher upfront cost, geothermal heat pumps guarantee a quick return on investment. This technology shelters consumers from volatile fossil fuels prices, which have been significantly rising over time: between 2004 and 2011 average household gas prices have increased by 77%, and are expected to increase further in the long-run.

Case studies demonstrate that a gas boiler becomes more expensive than the geothermal heat pump after less than 3 years of operation: this indicates that savings of a geothermal system can quickly compensate the costs of installation.



## HIGHLY VERSATILE



A high performance technology, adaptable for space heating and cooling, sanitary hot water, and energy storage. Geothermal heat pumps can be adapted and modulated according to type of resource, to the size and nature of equipment, and to meet any kind of demands.

All geothermal heat pumps and their components are buried beneath the ground, making them independent from external environmental conditions and assuring zero visual impact even in the most demanding architectural designs, historical landmarks or scenic settings.

### CASE STUDY: REPLACING GAS BOILERS WITH GROUND SOURCE HEAT PUMPS IN RESIDENTIAL BUILDINGS

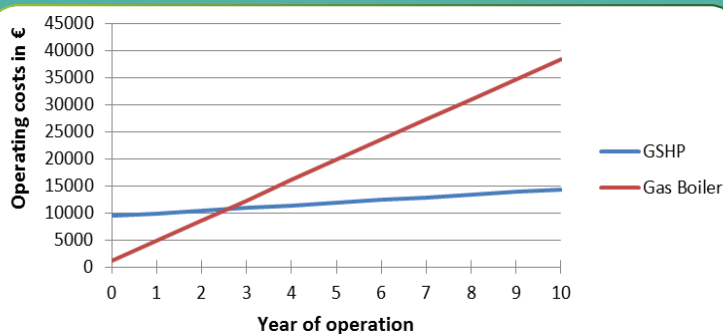
In a study published in 2012 by the Lithuanian Energy Institute both a GSHP and a gas boiler were installed in the same single family house (180m<sup>2</sup>) in Kaunas, Lithuania. With a coefficient of performance (COP) of 3.95, the GSHP had a heating capacity of 13 kW compared to 24kW of the gas boiler. Between October and April, the average ambient temperature was as low as -4.64°C.

Results:

- **Electricity consumption** of the GSHP was on average of 732kWh/month and 24kWh/day;
- **Installation costs** amounted to 9372 € for the GSHP and 1000 € for the gas boiler;
- **Operating costs** of the GSHP are 494 €/year, while operating costs of the gas boiler amounted to 3735 €/year

In conclusion:

- ✓ In spite of lower installation costs, **the gas boiler becomes more expensive than the GSHP** after less than 3 years of operation.
- ✓ After 10 years of operation, **total expenses related to the gas boiler are 2.7 times higher** than the ones related to the ground source heat pump.



Source: Zinevicius, F. and Aleksandravicius, T.A., "Single family house: Heat Pump or Gas Boiler?", *Energetika, Vilnius*, 58(4), pp.195-199