Rue d'Arlon 63-67
B-1040 Brussels
phone +32 24 00 10 17
fax +32 24 00 10 18
email info@ehpa.org
www.ehpa.org
ING Bank
IBAN: BE25 3630 2691 2082
SWIFT/BIC BBRUBEBB
Registration-Nr.
0893.797.590
Brussels, Belgium

President
Karl Ochsner

Contact
Thomas Nowak
Secretary General
Phone +49 176 63201140
thomas.nowak@ehpa.org

Heat pumps: a gem in energy efficiency and renewables use!

With the Directives on the use of Renewable Energy (RES), on the Energy Performance of Buildings (EPBD) and on Energy related products (ErP) European policy is setting a framework of requirements for the use of environmentally friendly technologies using renewable energy. Since the publication of the Directive on the promotion of the use of energy from renewable sources (2009/28/EC | RES Directive, § 2) heat pumps are officially part of this development. The Directive recognizes the technology as using renewable energy sources from air, water and ground. This recognition is not yet entirely reflected in the market place, where the benefits and possible contribution of heat pumps to overall energy demand in the heating and cooling sector is still underestimated or overlooked.

A triple dividend

1. Heat pumps use renewable energy from air (aerothermal), water (hydrothermal) and ground (geothermal);

2. They reduce final and primary energy demand; and,

3. They reduce greenhouse gas (GHG) emissions.

How do heat pumps work?

Heat pumps transform renewable energy from air, ground and water to useful heat. They also utilise waste energy from industrial processes and exhaust air from households. **A heat pump system consists of a heat source, the heat pump unit and a distribution system to heat/cool the building**. A transfer fluid transports the heat from a low-energy source to a higher energy sink. Auxiliary energy – usually electricity or gas – is needed to run the compressor and the pumps. The direction of this cycle can be switched so the same machine can be used for heating and cooling giving it an additional economic advantage in cases where both services are needed. In heating mode, ambient energy is the heat source and the building is the heat sink. In cooling mode, the cylce is reversed: the building is cooled down using the outside as heat sink (see figure 1).

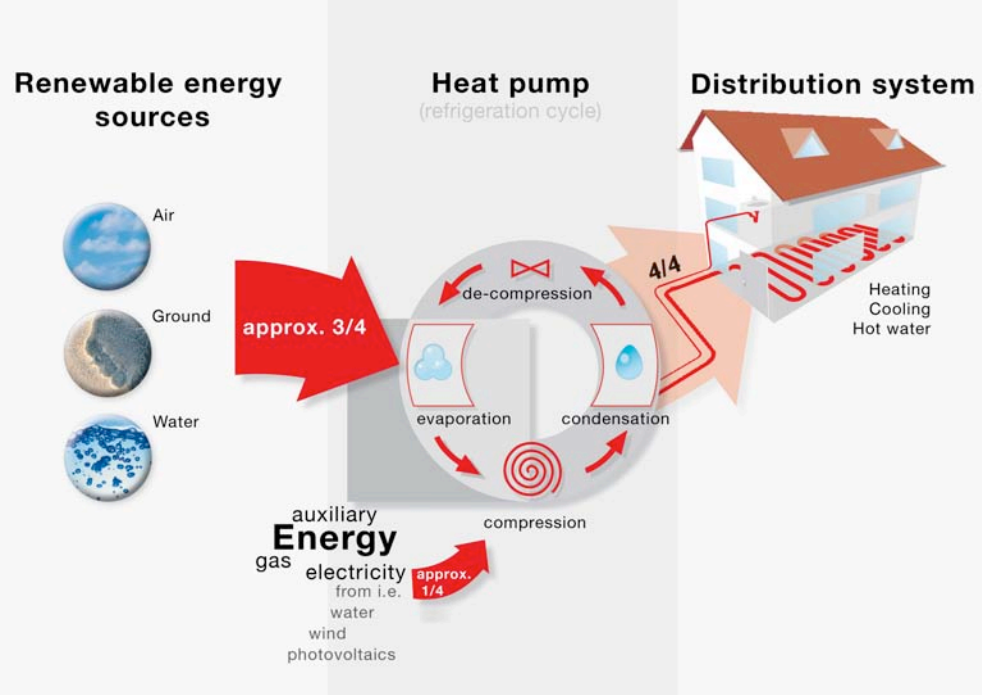

Figure 1: Operation principle of a heat pump (Source: EHPA/Alpha Innotec)

Application potential of heat pump technology

Heat pumps provide heating and cooling as well as hot water. Heat pump units can provide heating alone as well as heating and cooling. They can also provide a combination of the aforementioned and hot water (combi-units). They can lastly provide energy as stand alone systems or integrating other technologies and energy sources into hybrid system. Consequently, the technology provides solutions for nearly 100% of market requirements.

The market is usually divided in six segmentts (single family and multi family residential buildings and industrial applications are further distinguished in new and existing buildings) which have reached different stages of development (See table 1)

	New building	Renovation
Residential: single/double family house	Mass market currently developing	Increasingly recognized market (France, Germany, Sweden, Switzerland), importance of domestic hot water units increasing
Residential: Multi-family residency	Small; market developing	Initial steps are made
Non-residential (commercial)	Minority share in currently sold heat pumps. Several demonstration projects available, potential for heating and cooling projects by far not exploited.	Increasingly important with owners that value low operating cost. Special application in sewage systems, subways and tunnels.

Table 1: Market segments of heat pumps

Heat pump technology is easiest to employ in the **segment of new buildings** as these can be optimized for an efficient heat pump operation. The application potential in this segment is nearly 100% and it is this segment where the technology has reached the largest market penetration. By now, heat pumps are a standard in new residential buildings and they are increasingly used in industrial applications.

Their application in the **renovation segments** provides a greater challenge: a simple like for like replacement (e.g. gas boilers with heat pump) will most likely result in a sub-optimal system. The energetic optimization of the building envelope is necessary to overcome this limitation. Technology development is also aiming at heat pumps that can efficiently provide output temperatures of 65° to 90°C to enlarge the possible field of efficient applications.

Efficiency and demand

State-of-the-art electric heat pumps can reach seasonal efficiencies (SPF) of one unit of electricity transformed to 3-5 units of heat. The efficiency of systems depends on the efficiency of the unit, the quality of installation and the building's energy demand. The higher the system's efficiency, the lower emissions. This is also largely influenced by the emission value of the electricity mix / fuel used. Consequently, electrically-driven heat pumps will profit from future improvements in efficiency and carbon footprint of the

European power mix. Installed and new units benefit from lower final energy demand and lower GHG emissions. On top, these pumps are emission free at the point of operation.

When using green electricity or thermal energy from renewable sources, heat pump systems provide a 100% renewable solution for heating and cooling of buildings. In systems where auxiliary energy is provided from conventional (fossil) sources the renewable energy used is the difference between the total final energy demand and the amount of auxiliary energy input.

The comparison of heat pump systems using air or ground as energy sources in residential buildings with a gas condensing boiler reveals a possible savings of between 20% and 49% in primary energy, 67% and 79% in final energy, and 49% to 68% in GHG emissions. Heat pumps use between 65% and 78% of renewable energy to meet their total final energy demand (see figure 2).

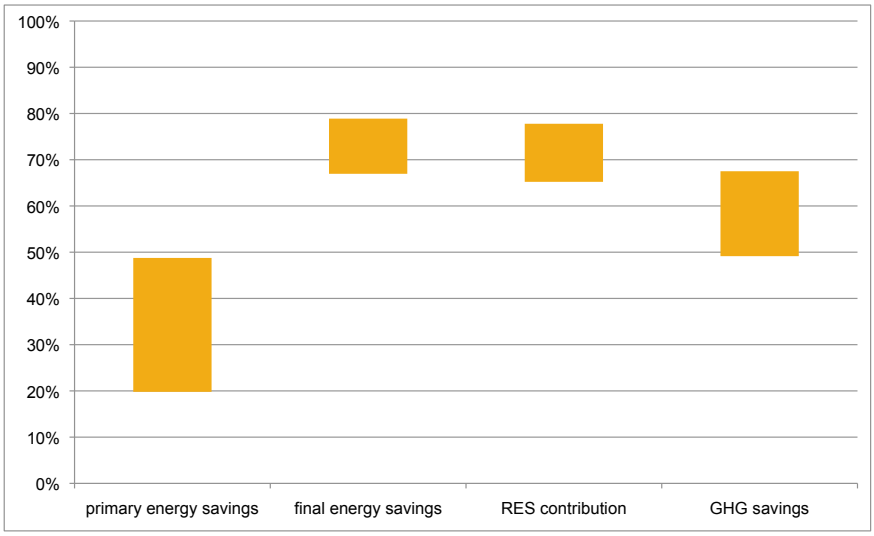

Figure 2: Contribution ranges of heat pumps compared to a gas-condensing boiler

Market development

Today, the majority of heat pumps is electrically driven with nearly 600 000 units sold in Europe in 2009 and an installed based exceeding 2 mio units. Due to the near complete standstill of the buildings market and supported by the low oil price, market development is stagnating. Results of the implementation of major pieces of legislation addressing the energy efficiency of the building and giving support to efficient system within are expected to lead to an increase in investment and heat pumps are foreseen to be used in more application fields (e.g. sorption technology for free solar cooling or heating of electric cars).

Outlook

The framework conditions for heat pump technology are improving. Their widespread implementation in the future will help to reach the EU's targets on energy savings and climate protection as well as paving the way towards an reliable, affordable and sustainable energy supply.

European Heat Pump Association
Thomas Nowak | Secretary General
Renewable Energy House
Rue d'Arlon 63-67
B-1040 Brussels
M: +49 176 6320 1140
E: info@ehpa.org
W: www.ehpa.org

The European Heat Pump Association
EHPA was established in the year 2000 to promote awareness and proper deployment of heat pump technology in the European market place for residential, commercial and industrial applications. EHPA today has 91 members representing the majority of actors in the European Heat Pump Industry. The association aims to provide technical and economic input to European, national and local authorities in legislative, regulatory and energy efficiency matters. All activities are aimed at overcoming market barriers and dissemination of information in order to speed up market development of heat pumps for heating, cooling and hot water production. The association coordinates the *European Quality Label for heat pumps* and the *EUCERT* education and training program for heat pump installers. It also compiles the annual *European Heat Pump Statistics*.