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Summary

The European heat pump market is still growing progressively in most European countries (see figure 1). Most significant growth is found in the larger markets of Italy (33%), France (30%), Norway (+27%), Finland (+25%) and Austria (+15%) while the markets in Germany (+1,5%), and Switzerland are consolidating. After long years of extraordinary growth, the Swedish market saw a decline of 23%. This decline has long been foreseen and is the consequence of an overheated heating market. The market for residential heat pumps in single-family houses is close to saturation. Heat pumps are by now the most common heating system in single-family houses in Sweden (approx. 34%). The existing opportunities of market development are likely to be found in the segment of multi-family homes and commercial applications as well as in the segment for renovation. The market in Germany came to a sudden halt 2007 with only 1,5% increase of sales. The slow down of the market is believed to be the consequence of an increase of the value added tax that came into force 1 January 2007. Developing markets like Ireland, the UK, the Netherlands and the Eastern European markets see steep increases, albeit from a very small base.

While markets in Germany, Austria and Switzerland still see large sales of ground source heat pumps, those in Norway and Finland are dominated by air-air heat pumps. This is due to a high percentage of houses equipped with direct resistance heating. Air-air heat pumps are marketed as heating devices with additional comfort cooling functionality in all Scandinavian countries. Heat pumps using ambient air as heat source have shown the strongest growth in recent years. When considering total sales figures, air source heat pumps are dominating the European heat pump markets in 2007.

Figure 1: Changes in heat pump sales for 8 European countries

The total market size for the 8 countries surveyed here has reached 392,756 units in 2007, a 6% increase over last years 370,447 units. The outlook for 2008 is very positive with an expected two digit growth for all countries but Sweden.
1 European market statistics

As heat pumps are not counted in the different national energy statistics, the European Heat Pump Association as an industry association has been compiling market statistics since 2002. While the quality of data has been improving step by step this process is still far from being complete. The difficulties in creating EU wide statistics range from a pure lack of data in some countries to differences in the definition of different types of heat pumps in others. As an example: The major issue for the use of air source heat pumps in southern European countries – from a statistics perspective – is the distinction between reversible heat pumps (HPs) primarily used for heating purposes and air-conditioners with heat pump function. Consequently, air source units have been treated differently depending on the heat distribution system and on the country where they are installed. Details are given in the country examples. This aspect has gained in importance with a better overview of reversible heat pumps used in southern European countries.

Currently, only Austria, Finland, France, Germany, Italy, Norway, Sweden and Switzerland are able to provide a reliable data set while no comprehensive data exists from Southern European countries (besides Italy). The existing data from these countries is used to compile a comparative overview. For countries, where estimates exist, these are presented in the country overview. In order to allow for a comparison of data from 2006 and 2007 the statistics from 2006 were recompiled. Those data that had to be considered »educated guesses« were eliminated. Consequently, the number of heat pumps sold in 2006 – as stated in this document - is lower than that stated in previous reports.

1.1 General market trends

Heat pumps have seen a favorable market development in 2007. More and more decision makers – from the policy level to the house owner – know about the technology and include it into their respective reasoning. **Heat pumps are not only acknowledged as heat source for buildings but also as a contribution towards the reduction of exhaustible primary energy, the use of renewable energy sources and the reduction of greenhouse gas emissions.** Most prominently, heat pumps have been included as a technology that uses renewable energy sources from air, water and shallow ground in the Commission proposal for a new Directive on the promotion of the use of energy from renewable sources.

The total market for all space heating heat pumps including reversible units, has reached 392,756 units in 2007 (see figure 2). This is an overall growth of 6% over 2006’s 370,447 units. This number should be understood as the most cautious assessment of the total EU market. Based on expert estimates the total market most likely exceeds this number by 80,000 to 100,000 units. Thus the market for 2007 can be assessed to be close to 500,000 units.

**Figure 2: Space heating heat pump sales by country: 2007**

![Figure 2: Space heating heat pump sales by country: 2007](image)
The rather modest increase of the total market can be explained by a decline in Sweden. This national market has been growing much stronger than all other markets for the last years and seems to have reached a peak in 2006. Other markets like Germany, France, Finland, Switzerland, Austria and Norway still see increasing sales volumes and many smaller markets such as Ireland, the UK, the Netherlands are following suit (see figure 3 for an overview). Entry markets can be found in Eastern Europe, where newly established Heat Pump Associations indicate increasing interest in this technology.

Figure 3: Changes in space heating sales 2006 to 2007

Heat pumps are a small but growing segment in the much larger but stagnating market for heating, ventilation and air conditioning (HVAC). While heating only heat pumps compete directly with established technologies such as gas and coal fired burners, heat pump based systems with cooling functionality compete also with electric air-conditioning and cooling devices. Exhaust air/heat recovery heat pumps complement additional heat sources by providing an efficient way of heat recovery to reduce energy losses to the buildings ventilation system thus increasing overall energy efficiency.

The overall market can be distinguished into the segment of new buildings and that of renovation. In turn, both segments can be distinguished in residential and non-residential building classes (see table 1).

Table 1: Market segments for smaller units (Nowak 2006: 13).

<table>
<thead>
<tr>
<th>Segment</th>
<th>New building</th>
<th>Renovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential: single/double family house</td>
<td>Mass market currently developing</td>
<td>Largely undeveloped (besides Sweden, Switzerland)</td>
</tr>
<tr>
<td>Residential: Multi-family residency</td>
<td>Small market developing</td>
<td>Initial steps are made</td>
</tr>
<tr>
<td>Non-residential (commercial)</td>
<td>Minority share in currently sold heat pumps. Several demonstration projects available, potential for heating and cooling projects by far not exploited.</td>
<td>Initial steps, increasingly important with owners that value low operating cost.</td>
</tr>
</tbody>
</table>

These segments show different development states:

1. The segment for new residential one/two family houses is best developed. Markets like Sweden and Switzerland show a market penetration of 95% and 75% respectively. In developing markets like Austria, Germany, Finland, Norway heat pumps have reached a share greater than 20%.
2. The segment for renovation of one/two family houses is currently gaining importance. Still, the efficient use of heat pumps in this segment often requires large extra investments in new windows, heat distribution system or insulation.
3. The segment for residential multi-family residencies is only slowly developing.
4. The segment for non-residential buildings is characterized by individual projects. Heat pumps are employed where the planner/builder or architects know about the technology and where the investors value low operating costs, thus requesting the new technology. Figure 4 provides a rough estimate of market shares and development states for residential markets.

Figure 4: Market status for selected EU countries – data for 2007 (source: EHPA).

While only a few large companies dominate the market for Heating, ventilation and cooling (Bosch Thermotechnik, 2006), the segment for heat pumps is fragmented. Several smaller companies, that continued operation after the market slump of the early 80s, spent considerable effort to develop a market for heat pumps. Recently, increasing interest in this market segment by the larger European companies from the HVAC segment can be seen and there are significant signs of a growing interest for the technology from large companies. Large players in the market for heating, ventilation and air-conditioning (HVAC) have acquired heat pump manufacturers (e.g. IVT (SE) was purchased by BBT Thermotechnik GMBH (DE, part of Bosch Group) in 2004, Thermia (SE) and Avenir Energy (FR) were acquired by Danfoss (DK). In general, all leading heat pump manufacturers have increased their production capacity significantly in 2007.

There is an ever-present debate whether the small reversible air-air heat pumps should be included in the statistics. These units are however installed in very large numbers all over Europe, but used in different ways depending on the climate and existing heating systems in the building stock. For heating purposes this product group offers one of the most cost efficient energy improvements that can be achieved for houses equipped with direct electricity heating and is for that reason sold in large quantities in Sweden, Norway and Finland where direct electricity is common. The cooling mode offered by these products is most commonly marketed as an added value on these markets, whereas the opposite applies to Southern Europe, where the need for cooling is more pronounced. As a result there is no consensus among the national heat pump associations whether these products should be included in the national heat pump statistics or not.

The official market statistics for countries in Europe that are revealed below have been compiled by the European Heat Pump Association (EHPA) and are presented in the form of tables and diagrams. The statistics are based on an inquiry that was sent to 23 national heat pump associations and experts. As the quality of the statistical data provided differ considerably, the EHPA has decided to only publish the statistics from those 8 countries that have been provided for 2005 and 2006 alike and that are considered to be accurate.
Table 2: Sales figures space heating for 8 European countries (source: EHPA)

<table>
<thead>
<tr>
<th>2007</th>
<th>Austria</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Italy*</th>
<th>Norway</th>
<th>Sweden</th>
<th>Switzerland</th>
<th>Subtotals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating only HPs (excl. heat recovery &amp; reversible HPs)</td>
<td>10,398</td>
<td>5,750</td>
<td>18,600</td>
<td>44,649</td>
<td>0</td>
<td>5,500</td>
<td>41,661</td>
<td>16,622</td>
<td>143,180</td>
</tr>
<tr>
<td>air/water</td>
<td>2,110</td>
<td>450</td>
<td>0</td>
<td>17,762</td>
<td>0</td>
<td>3,200</td>
<td>13,705</td>
<td>9,181</td>
<td>46,408</td>
</tr>
<tr>
<td>water/water</td>
<td>1,413</td>
<td>0</td>
<td>2,500</td>
<td>3,350</td>
<td>0</td>
<td>2,300</td>
<td>0</td>
<td>344</td>
<td>6,907</td>
</tr>
<tr>
<td>brine/water</td>
<td>5,601</td>
<td>5,300</td>
<td>6,500</td>
<td>21,672</td>
<td>0</td>
<td>0</td>
<td>27,956</td>
<td>7,097</td>
<td>74,126</td>
</tr>
<tr>
<td>dir. expansion/water or dir. condensation</td>
<td>1,274</td>
<td>0</td>
<td>2,600</td>
<td>1,051</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4,925</td>
<td></td>
</tr>
<tr>
<td>dir. exp./dir. cond.</td>
<td>0</td>
<td>0</td>
<td>7,000</td>
<td>814</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7,814</td>
<td></td>
</tr>
<tr>
<td>Heat recovery HPs*</td>
<td>4,264</td>
<td>2,400</td>
<td>0</td>
<td>7,354</td>
<td>0</td>
<td>800</td>
<td>17,107</td>
<td>100</td>
<td>32,025</td>
</tr>
<tr>
<td>Reversible HPs</td>
<td>0</td>
<td>38,000</td>
<td>51,000</td>
<td>827</td>
<td>28,901</td>
<td>64,000</td>
<td>35,023</td>
<td>0</td>
<td>217,551</td>
</tr>
<tr>
<td>Total 2007</td>
<td>14,662</td>
<td>46,150</td>
<td>69,600</td>
<td>52,630</td>
<td>42,630</td>
<td>28,901</td>
<td>93,791</td>
<td>16,722</td>
<td>392,756</td>
</tr>
</tbody>
</table>

* For Italy, the numbers for heating only HPs are included in reversible HPs.

** Heat recovery heat pumps are mostly used for domestic hot water and include the numbers previously shown as an individual category.

In order to allow for a comparison, the 2006 statistics has been re-arranged according to these 8 country statistics. The previously taken distinction in reversible heat pumps used for heating or heating and cooling has been abandoned. The numbers must be understood as follows:

1. Reversible heat pumps employed in the Scandinavian countries are predominantly used for heating purposes.
2. Reversible heat pumps employed in Southern France and Southern Italy are predominantly used for cooling. However, reversible heat pumps used in central and northern France as well as in northern Italy are used for heating and cooling alike.
3. Exhaust air/heat recovery heat pumps are often, but not exclusively, used for the production of domestic hot water (DHW) (this is the case for Germany and Sweden). Thus the number of DHW-HPs, that in some countries are listed as an independent category, are included in the category of exhaust heat pumps here.

Table 3: Sales figures space heating for 8 European countries (source: EHPA)

<table>
<thead>
<tr>
<th>2006</th>
<th>Austria</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Norway</th>
<th>Sweden</th>
<th>Switzerland</th>
<th>Subtotals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating only HPs (excl. heat recovery &amp; reversible HPs)</td>
<td>9,383</td>
<td>4,900</td>
<td>13,060</td>
<td>40,511</td>
<td>4,500</td>
<td>4,500</td>
<td>54,774</td>
<td>15,740</td>
<td>146,838</td>
</tr>
<tr>
<td>air/water</td>
<td>1,118</td>
<td>480</td>
<td>0</td>
<td>13,202</td>
<td>2,100</td>
<td>2,100</td>
<td>17,757</td>
<td>6,610</td>
<td>66,777</td>
</tr>
<tr>
<td>water/water</td>
<td>495</td>
<td>540</td>
<td>4,401</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5,301</td>
<td>6,167</td>
<td></td>
</tr>
<tr>
<td>brine/water</td>
<td>4,714</td>
<td>4,500</td>
<td>3,850</td>
<td>21,544</td>
<td>2,500</td>
<td>2,500</td>
<td>40,017</td>
<td>6,829</td>
<td>86,454</td>
</tr>
<tr>
<td>dir. exp./dir. cond.</td>
<td>1,576</td>
<td>1,920</td>
<td>1,069</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,671</td>
<td>3,610</td>
<td></td>
</tr>
<tr>
<td>dir. exp./dir. cond.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Heat recovery HPs*</td>
<td>3,863</td>
<td>2,050</td>
<td>10,304</td>
<td>1,000</td>
<td>17,699</td>
<td>0</td>
<td>66</td>
<td>35,282</td>
<td></td>
</tr>
<tr>
<td>Reversible HPs</td>
<td>30,000</td>
<td>40,650</td>
<td>712</td>
<td>17,165</td>
<td>50,000</td>
<td>30,000</td>
<td>0</td>
<td>0</td>
<td>193,327</td>
</tr>
<tr>
<td>Total</td>
<td>38,383</td>
<td>30,650</td>
<td>35,100</td>
<td>51,329</td>
<td>21,665</td>
<td>55,500</td>
<td>122,375</td>
<td>15,806</td>
<td>370,747</td>
</tr>
</tbody>
</table>

1.2 The segment of air-source heat pumps

Air source heat pumps are mainly brought to market as air-air and air-water units. Today most air source units are reversible units – they can be used for heating & cooling alike (see figure 5).

Air-water units that are connected to a hydronic distribution system or are employed in northern Europe (where cooling is of less importance) are largely accepted as heating systems but there is currently no consensus on how to deal with the even larger number of air-air systems (single/dual split) that are mostly used in southern Europe. This is particularly true as no clear
distinction is possible. While such heat pumps are often entirely used for cooling, in southern France and northern Italy the heat demand in winter is about equal to the cooling demand in summer. So heat pumps are economically and ecologically feasible options to provide the required energy for heating and cooling.

Figure 5: Distribution of air source heat pumps for 8 European countries (2007)

When comparing all heat pump systems it becomes obvious that systems that can be used for heating only make up for less than 50% of the total units sold and the predominant system is that of reversible systems. Air-source systems dominate the market due to their large penetration in Southern Europe (see figure 6).

Figure 6: Heat pumps by heat source for 8 European countries (2007)

In addition, the trend towards an overall lower energy demand for buildings makes the employment of air source units economically and ecologically feasible. Particularly in passive houses exhaust air/heat recovery heat pumps with capacities of around 2kW are used as the only heat source. As the passive house has been declared as the building standard of the future by the EU commission (see COM (2006) 545 final), this technology is likely to see increasing importance in the next years. Thus, air-water heat pumps increase their share of the total market for heat pumps (see figure 7).
Figure 7: Development of market share of heating only HPs (by heat source).

The segment of air source systems is clearly dominated by reversible air source heat pumps, followed by air-water units. Heat recovery heat pumps have only a small share in some countries.

1.3 The segment of ground source heat pumps

Ground source heat pumps comprise closed (brine-water) and open (water-water) systems as well as direct expansion/direct condensation systems. The benefits of the heat pump technology and the substantial market growth in Sweden have been recognized and highlighted as a tremendous example of successful development of a renewable energy source by the commission (Renewable Energy Road Map, COM(2006) 848 final). This type of application has the advantage of utilizing a heat source that has the ability to store large quantities of solar energy until wintertime, thus enabling favorable working conditions throughout the heating season, even in areas with cold winter climate. The use of ground source heat pumps was already foreseen by the early works of Ingersoll (Ingersoll et al, 1954), who in his work on adjusting the cylindrical heat source method stated that future use of heat pumps is highly dependent on the development of methods to utilize the energy stored in the ground. The work of Ingersoll is still of great importance as it serves as a basis for several design software solutions. The use of heat pumps and particularly ground source heat pumps has been hampered by the premium costs that embrace the installation. However, the overall increase on the price of energy has by now increased the acceptance for higher investment costs and ground source heat pumps are by now much more competitive than they used to be only 10 years ago.
The sales figures for ground source heat pumps in the eight most significant markets in Europe are shown in Figure 8. Although the market for ground source heat pumps in these markets indicates a small market decline, there has been an increase in several other European countries which leads to the conclusion that the overall ground source heat pump market in Europe is still growing. Considering the large number of buildings in Europe the total sales of ground source heat pumps is still at a low level. There are however vast variations in terms of market penetration in the European countries.

Sweden, for many years the leading market for installation of ground source heat pumps, faced a 23% drop in sales during 2007. The market decline in Sweden is due to several reasons of which the most important one is the fact that the heat pump market for several years has been overheated. The intensive Swedish market has been caused by high energy prices and in 2006 pushed further by a subsidy scheme for phasing out of oil-boilers. The subsidy scheme was originally planned to be running for 5 years, but as all of the funds earmarked for the scheme were spent in less than 1,5 years the scheme was stopped in March 2007. The German market came to an unexpected halt in 2007. One of the explanations was the raise of the VAT in January 2007 by the German government leading to increased demand at the end of 2006. Given the considerable magnitude of the German heating market, which is still dominated by oil and gas boilers, it is expected that the German market will become the most important market in the years to come. This belief is strengthened by the fact that the German market is growing on its own merits in contrast to e.g. the French market that is presently profiting from a
generous subsidy scheme. The subsidy scheme in France has led to 13% market growth 2007. The lack of reliable market statistics for a majority of the member states yields in a somewhat blurred European market view. Much of the reason to the lack of statistics for the other countries is given by the fact that these markets are fairly small and scattered. There is however a number of countries with a small but notable and increasing market. Among these countries it is worth mentioning Ireland, United Kingdom, Poland and the Netherlands.

Figure 10: Country shares of installed stock of ground source heat pumps by the end of 2007

Table 4: Installed stock of ground source heat pumps by the end of 2007

<table>
<thead>
<tr>
<th>Stock of GSHP</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>30.577</td>
<td>35.810</td>
<td>43.049</td>
<td>50.280</td>
</tr>
<tr>
<td>Estonia</td>
<td>1.475</td>
<td>1.985</td>
<td>2.739</td>
<td>3.485</td>
</tr>
<tr>
<td>Finland</td>
<td>20.000</td>
<td>33.500</td>
<td>38.000</td>
<td>42.300</td>
</tr>
<tr>
<td>France</td>
<td>49.950</td>
<td>63.150</td>
<td>81.600</td>
<td>100.200</td>
</tr>
<tr>
<td>Germany</td>
<td>48.662</td>
<td>60.061</td>
<td>77.879</td>
<td>114.389</td>
</tr>
<tr>
<td>Sweden</td>
<td>195.531</td>
<td>230.094</td>
<td>270.111</td>
<td>310.128</td>
</tr>
<tr>
<td>Switzerland</td>
<td>33.000</td>
<td>38.128</td>
<td>45.258</td>
<td>52.988</td>
</tr>
<tr>
<td>Total</td>
<td>398.757</td>
<td>475.090</td>
<td>581.686</td>
<td>690.432</td>
</tr>
</tbody>
</table>

2 Selected European markets

2.1 Austria

General trend
The introduction of heat pumps in Austria started in the beginning of the 1980’s. It was the early oil crises that made policy makers and politicians aware that something had to be done in order to decrease the dependency on imported fossil fuels. Heat pumps were one of those technologies that were easy to pick up. However the lack of skilled installers led quickly to bad reputation of this technology due to poor performing installations. Owing to the bad reputation and declining oil prices the market dropped during the last years of the 1980’s. The recovery of the market that could be seen in the beginning of the 1990’s was related to growing interest from a small group of electric utilities. The utilities were at this time divided in two groups. The majority perceived heat pumps as a competitor to direct electricity heating, whereas some realized the market opportunities to compete with the oil and gas boilers. One of the smaller utilities located in Upper Austria, Energie AG formerly OKA, had been involved in an energy conservation campaign for school buildings. This program covered improvements of insulation as well as refurbishment of heating systems. OKA took special interest in heat pumps and some of the top management group even installed heat pumps themselves. OKA started to promote
heat pumps in Upper Austria and encouraged installers to take on the technology. As a consequence of the activities from OKA the Austrian market has for long time had it strongest position in Upper Austria. The market growth in recent years had not been possible without the strong emphasis on high quality products and ambitious training schemes for installers. The role of the electric utility companies has by now become of less importance and replaced by initiatives from the authorities.

Figure 11: Austrian heat pump market development 1997-2007

In 2007, the Austrian heating market is characterized by undecided buyers that are hesitant to equip their houses with fossil fuel based burners. As a consequence, the sales figures for traditional heating systems were down by 20% while the demand for heat pumps still increased. Approx. 70% of all heat pumps sold were employed in the new housing segment. New products enabling efficient operation at higher distribution temperatures are gradually being introduced and opening up the market for retrofit installations in the existing building stock. Ground source systems with horizontal flat collectors and vertical boreholes have for many years been dominating the Austrian heat pump market. The direct expansion systems have had a large market share for many years but are in recent years slowly decreasing in favor of the indirect systems (brine-water). The reason to this shift of dominance is due to the general trend towards reduced charges of refrigerants. Alike other European heat pump markets air-water heat pumps are rapidly gaining interest.

For 2008, a re-vitalization of the building activities and super-proportional increase in the demand for heat pumps is expected.

Figure 12: Heat pump market segmentation 2007
The Austrian heating market is still dominated by oil and gas. Renewable technologies such as wood pellet boilers, solar thermal and heat pumps are getting more interest from policy makers as well as consumers. The domestic hot water heat pumps have lost market shares in favor of solar thermal systems.

**Institutional and financial support**

**Subsidies** exist in Austria on the level of the individual states. They are generally paid whenever heat pumps are installed in new and renovated houses. Public funding for the renovation segment is higher than for the segment of new houses and in some states no support is given for heat pumps in new buildings at all. Typically a maximum amount is defined as a fixed amount, a percentage of the total investment, or based on the heated floor area. Requirements are set with regard to the efficiency of the heat pumps, usually measured as its coefficient of performance. Most often, requirements vary depending on the heat source used.

### 2.2 Denmark

The Danish market started to develop in the early 1970s. Similar to several other European markets, the limits of technology and installation quality led to a quick stop. In 1980 government subsidies for the use of heat pumps and the creation of the Test center for heat pumps (PST-VP) resulted in increasing demand. While governmental subsidies and financing of the test center where reduced (and finally phased out) between 1985 and 1988, the quality assurance part was taken over by industry. Today, a quality program for installers exists and the test centers operation is paid for by industry. A Danish Heat Pump Association exists and the Danish Technical Institute has recently been accepted as a test center within EHPA’s Quality label program.

**Total estimated sales** are around 40,000 units in 2007 with a split into 5,000 ground coupled and 35,000 air-air units.

### 2.3 France

**General trend**

As for several other European countries, a first development of the market occurred in France between 1975 and 1985 in the frame of the oil crisis. After a promising start, this was finally a major failure. The main reasons were the lack of skilled installers and the poor quality of the machines that lead to poor performance systems and many breakdowns. This resulted in a durable lack of confidence for heat pump heating solutions among people, which, in combination with the oil counter-shock and the reduction of government encouragement to energy mitigation, lead to an almost complete extinction of the market during more than 10 years. The following graphic is showing the sales in France since 1976 for all types of heat pumps and this first peak of demand can clearly be seen.

---

**Figure 13: Market evolution for heat pumps in France**
In 1997, a new start of the market has been initiated by Electricité de France (EDF – the national French electricity company), in association with ADEME (French environment and energy management agency) and BRGM (French mining and geological research board). The focus has been set on a controlled development of the market based on quality, in order to avoid reproducing the mistakes of the past. In particular, the initial target was put on newly built single-family houses, with well understood thermal needs and the opportunity to install low temperature floor heating. This approach allows for a the maximal performance of the heat pump system.

**Institutional and financial support**

In 2005, the public authorities have implemented a strong subsidy scheme. It is scheduled to remain in force until the end of 2009. This subsidy is an income tax cut that takes the form of a reimbursement of 50% of the price of the machine only (not including the cost for the heat source collection system, the heating emission system or the labor costs for installation). The money is given as a reduction of the income tax of the family, or directly through a bank transfer in case the family is not submitted to an income tax.

This subsidy, in addition to a rise of environmental awareness among people and in combination with increasing prices of fossil energies, has resulted in a very strong acceleration of the heat pump market since 2005. Moreover it has strongly influenced the structure of the heat pump market: Prior the implementation of the income tax cut, about 98% of GSHP were intended for new dwellings. In 2007, about 13% were installed in existing dwellings.

Air to water technology benefits the most from the income tax as it is the easiest to install when replacing an old boiler (less impact on the garden and the house surroundings). In 2007, about 60% of the air/water sales have been installed in existing dwellings.

Table 5 summarizes the sales of heat pumps since 2002. The market is growing fast but is still small in comparison to the boiler market where approx. 700,000 boilers were sold in 2007. The growth of GHSP between 2006 and 2007 is practically zero. It is mainly due to the fact that this technology is strongly linked to the building of new houses and France has experienced a decrease in 2007. Moreover, the income tax cut is not correctly designed to favor these solutions with regard to the less expensive aerothermic units. Borehole heat exchangers and horizontal heat exchangers are indeed not considered in the calculation of the subsidy.

<table>
<thead>
<tr>
<th>Table 5: Heat pump sales evolution in France by type. Source: AFPAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Gnd direct exp / Water / Gnd direct cond / Water</td>
</tr>
<tr>
<td>Brine / Water / Water</td>
</tr>
<tr>
<td>Air / Water / Water</td>
</tr>
<tr>
<td>Air / Air (ADEME estimation)</td>
</tr>
<tr>
<td>Total (excluding Air/Air)</td>
</tr>
</tbody>
</table>

### General trend

The German heat pump market first started to develop after the first oil crises in the 1970s. The high price of heating oil and gas, which are dominating energy sources for the heating of buildings, made it interesting to look for substitutes. The market reached an early peak in 1981 before it started to drop and come to almost a complete stop in 1987. The reasons behind the market decline were several. The two most important reasons were the sudden fall of oil price and poor perception of heat pump quality. The latter was caused by a lack of competent installers and to some extent to the products poor quality. At this early stage of the market development, air-water and ground source heat pumps each had roughly 50% of the heat pump market. At the beginning of the 1990’s electric utilities and the federal governments as well as the local governments initiated developments of ground source heat pump systems and support schemes.
These actions in combination with the foundation of the German heat pump association, “Initiativkreis Wärmepumpe” 1983 and an overall energy price increase led to a slow but stable recovery of the market. The slow increase was fruitful in the sense that it gave industry time to build up knowledge and develop robust and reliable products. The significance of ground source systems increased gradually since this period of market development. Some barriers still exist in areas where the local authorities are reluctant to give permission for ground source collectors. This problem can be overcome by using environmentally friendly secondary refrigerants and improved communication with authorities. The strong product development in the field of air-water heat pumps in recent years have complemented the heat pump family with another competitive product that have added sales without loss for the ground source systems. The long winter 2006 in combination with a further increases of energy prices and the considerable media attention to climate change resulted in 120% growth of sales on the heat pump market.

The dramatic increase of sales 2006 could have been even higher if it wasn’t for some bottlenecks in drilling and production capacity. In 2007 a total of 52,630 heat pump units were sold in the German market. This was a small increase (1.55%) over 2006 when a total of 44,649 heat pumps units for heating only purposes were sold. Assuming that 80% of these units were employed in new one/two family houses and considering that a total of 112,592\(^1\) such houses were completed in 2007, the market share of heat pumps in this segment is estimated at around 30%.

Institutional and financial support

The German market has grown on its own merit without financial support from the authorities. The heat pump industry has a strong ally in many of the electric utilities that promote the benefits of heat pumps. The electric utilities have identified a business opportunity in a sector that formerly was ruled by the oil and gas industry. Several electric utilities offer special heat pump tariffs that are favorable for the consumer. Some of these programs are even available nation wide and one provider even offers a green tariff.

The new market incentive program, introduced in 2008 provides governmental support for all types of renewable energy systems. The scheme for heat pumps is summarized in table 6.

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\(^1\) Destatis (2007): Pressrelease Nr. 228 dated 26.06.2008
The used/inhabited area has to be shown based on technical drawings, cost for the heat pump installation have to be proven with invoices.

Further requirements apply:
- installation of a heat & electricity meter for calculation of the SPF according to VDI 4650.
- Existence of a professional declaration explaining that:
  - heat pump will achieve an SPF in new houses of 4,0 (ground)/3,5 (air).
  - the heat pump will achieve an SPF in renovated houses of 3,7 (ground)/3,3 (air).
  - the hydronic balancing was executed
  - the heating curve was optimized to the demand of the building.
- The SPF will be calculated as: Division of heat produced by electricity used. The electricity measured has to include the use from a) the heat pump, b) peripheral devices: ground water pump, brine circulation pump and auxiliary heater (if applicable). The COP is calculated based on measurements according to DIN EN 255 or DIN EN 14511 based on the standard-measurement points A2/W35, W10/W35, B0/W35, and E4/W35. In residential buildings the supply water temperature is 55°C.

Several additional support programs exist on the state level and are run by utilities and other organizations. They range from direct subsidies to preferred interest rates for loans and favorable financing conditions. The German government has created an internet database that allows for a precise selection of the applicable programs according to the renewable technology used and the region where it will be installed.²

2.5 Ireland

General trend

Ireland has developed a small but growing market for heat pumps. The market is dominated by ground source heat pumps. However the demand for air source units is growing, as more competition enters the market. Identified growth areas are the segments for new houses, that can employ cheaper air source heat pumps as well as the retrofit market where packaged solutions with a reasonable COP can be used.

In Ireland the deployment of renewable energies is promoted by sustainable energy Ireland (SEI) and its renewable energy information office. In addition, the Geothermal Association of...
Ireland was founded in 1998 to raise awareness to the benefits of geothermal energy and promotes best practice.

In recent years the Irish housing market has been booming with a high of 83,000 new homes built in 2006, however, 2007 has seen a slow down in the building sector with just 27,500 new homes built in the first six months of the year. The target market for heat pumps includes the segments of detached houses and large buildings (> 4,000m²). This segment has been estimated by SEI at approx. 20,000 units a year.

| Table 7: Applications and support for heat pumps in Ireland |
|---------------------------------------------|-------------------------------|
| HP installed 26.3.06 - 31.12.06 | Installed in 2007 | Installed 1.1.08 until 31.7.08 |
|---------------------------------------------|-------------------------------|
| Air-water units | 44 | 388 | 216 |
| Ground source (horizontal) | 298 | 1,593 | 837 |
| Ground source (vertical) | 66 | 553 | 364 |
| Water-water | 7 | 47 | 20 |
| Total | 416 | 2,531 | 1,237 |

**Institutional and financial support**

To encourage people to green their homes the Irish Government, through SEI, introduced the Greener Homes Scheme (GHGS) in March 2006 offering grants to homeowners wishing to install a renewable energy heating system. The scheme was designed to stimulate a faster uptake of renewable heating systems that will underpin the development of a long term market, while enabling homeowners to play their part in reducing carbon dioxide emissions. As part of the Greener Homes Grant Scheme, a total of 22,000 applications for support have been made, with 26% or 5,720 of these being for heat pumps, 26% for biomass and 48% for solar thermal.

**Table 8: Overview of the Irish Greener Homes Scheme**

| | GHGS I | GHGS II | GHGS III (only retrofit) |
|---------------------------------------------|-------------------------------|
| Air-water units | 4,000 | 2,000 | 2,000 |
| Ground source (horizontal) | 4,300 | 2,500 | 2,500 |
| Ground source (vertical) | 6,500 | 3,500 | 3,500 |
| Water-water | 4,300 | 4,300 | 4,300 |

GHGS II ceased on 7.7.08 and GHGS III was launched 22.7.08. As from in Ireland the inclusion of renewable energy sources in new homes is compulsory, the GHGS III does only provide government support for existing houses older than one year!

Launched in March 2007, the Renewable Heat (ReHeat) Deployment Program provides grants for the deployment of renewable heating systems in industrial, commercial, public and community premises in Ireland. Among other technologies, it includes all types of heating heat pumps; cooling only HPs are excluded. Grants are given for up to 30% of eligible costs for Capital Investment projects and to 40% of eligible costs Feasibility Study projects. Installations can be in the commercial, industrial, services and public sectors and also include community organizations and Energy Supply Companies (ESCOs).

The use of refrigerant with a low Global Warming Potential and no Ozone Depleting Potential are favored. HCFC (e.g. R22) cannot be used in new equipment since 2001.

### 2.6 Portugal

Portugal is one of the Mediterranean countries that are entirely dominated by air-air heat pumps. For 2007 a total of 75,749 units has been reported compared to only 211 installed air-water units. A further strong market growth is expected for 2008. Due to limits in detail, this number is not included in the statistics presented in chapter 1.

No government subsidies for heat pumps exist.
2.7 Sweden

General trend

The market for domestic heat pumps in Sweden has for more than a decade shown strong growth and is still the most developed market. Due to escalating price of oil and electricity in conjunction with an increase of energy related taxes the competitiveness for heat pumps have improved significantly. The technology is by now fully recognized both by consumers and decision makers. It is since many years the number one choice for retrofitting as well as for new construction of single family houses. The rapid market growth for heat pumps is the most important reason behind the fact that Sweden has reduced the use of heating oil by more than 50% during the last 15 years. Today nearly 700,000 heat pumps supply Swedish homes with 15 TWh of renewable heat per year. Substitute products such as district heating and wood pellet burners that often benefits from lower initial cost, challenge the heat pumps. The Swedish heat pump market is now self-sustaining and has reached maturity in the segment of single family houses. Commercial and multi-family buildings is still dominated by district heating, but offer a great opportunity for large ground source heat pump systems. These are the two housings segments that continuous to grow, even though the numbers are still low. By reason of the high rate of replacements during the last couple of years the sales of ground source heat pumps reached a peak 2006. The market dropped by approximately 30% 2007 and is expected to drop an additional 20% 2008. Exhaust air/heat recovery heat pumps still hold a strong position in new construction of single family houses. Their market share in this segment is exceeding 90%. Recent developments for air-water heat pumps have resulted in a number of new highly efficient models, which have led to an increased interest for this type of heat pump. Due to the high rate of direct electricity heating in Sweden and improved products, air-air heat pumps have become the most obvious choice to improve energy efficiency in these houses. The competition among the actors in this segment is fierce, which has led to considerable price reduction. The strong market growth for air-air heat pumps has attracted new actors on the market, among which some do not uphold required competence or high quality products.

Figure 15: Swedish heat pump market development 1997-2007

The number of replacements on the Swedish heating market has been considerably above normal the last few years. The skyrocketing price of heating oil and increased environmental concern has led to a rapid replacement of existing oil boilers. Heat pumps are not the only technology that has benefited from this. Approximately 32,000 Wood pellet burners were installed 2006 and more than 10,000 single family houses were connected to district heating. Installations of the three leading technologies exceeded 175,000 units 2006. In comparison to the normal rate of heating installations that amounts to somewhere in the range of 75,000-80,000 units. Although the sales of heat pumps have dropped quite significantly during 2007 and is expected to do so 2008, the market decline is not as dramatic as it has been for biomass.

The installations of wood-pellet burners that peaked during 2006 came to drastic halt 2007 and sales dropped by 70%.

**Subsidies**

Subsidies are available as tax reduction (program duration: 1.1.2006 to 31.12. 2010) for replacement of direct electricity heating. Subsidies are granted for 30%, up to a maximum of approx. 3.300 Euro, of the labor costs for installation of a hydronic heat distribution system and heating appliance. Approved heating appliances are district heating, ground source heat pumps, biomass boilers and solar thermal collectors. In order to fulfill the requirements an application for a heat pump installation must be accompanied by a calculation verifying that the use of electricity for heating will not exceed 35% of the electricity used prior the installation.

### 2.8 Switzerland

**General trend**

The Swiss heat pump market has since the beginning of the 1990’s grown constantly. Taking into account for the size of the country, Switzerland is by now one of the most developed heat pump markets in Europe. Heat pumps have for many years been recognized as an important technology to reduce the dependency on fossil fuel and green house gas emissions. The fact that the Federal Energy Office identified heat pumps as a renewable at an early stage, made the way for heat pumps to take part in the national energy program “Energie 2000” that was launched in 1993. The succeeding program “Energie Suisse” set an ambitious target aiming at a total stock of 100.000 heat pumps in operation by 2010. This target has already been surpassed. In 2007 heat pumps have reached a market share of 73% within the new housing segment and 2.692 units have been sold in the retrofit segment. For the total heating market, more heat pumps than oil- or gas boilers were sold.

The measures carried out by the Swiss federal government have played a vital role for the positive development of the national heat pump market. The activities stimulating the heat pump market within the energy program were focusing on 3 main tasks

- Assemble all major market players to concentrate marketing promotion and lobbying activities in a common association, - FWS
- Quality assurance
- Reduce economical barriers by financial incentives for consumers

A combination of the general price increase for fossil fuel and the successful execution of the tasks above made way for the progressive market development.

**Figure 16: Swiss heat pump market development (source: FWS)**

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3 Source: Swiss heat pump association, FWS: http://www.fws.ch/zahlen_04.html
Although heat pump sales are concentrated in the new housing segment, the retrofit market has been growing for several years. In 2006 the retrofit market was equal to 20% of all heat pumps sold. One of the explanations to the Swiss success in the retrofit market is the existence of building regulations for renovation. The sales of heat pumps are now at the same level as oil boilers and just slightly below that of gas boilers.

Table 9: Share of heat pumps in new built single family houses (source: FWS)

<table>
<thead>
<tr>
<th>Year</th>
<th>Share of HP in new, single family houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>30%</td>
</tr>
<tr>
<td>1998</td>
<td>30%</td>
</tr>
<tr>
<td>1999</td>
<td>32%</td>
</tr>
<tr>
<td>2000</td>
<td>39%</td>
</tr>
<tr>
<td>2001</td>
<td>40%</td>
</tr>
<tr>
<td>2002</td>
<td>45%</td>
</tr>
<tr>
<td>2003</td>
<td>53%</td>
</tr>
<tr>
<td>2004</td>
<td>61%</td>
</tr>
<tr>
<td>2005</td>
<td>72%</td>
</tr>
<tr>
<td>2006</td>
<td>75%</td>
</tr>
</tbody>
</table>

Institutional and financial support

Currently Switzerland allows for a tax reduction for investments supporting the use of renewable energies in the renovation sector only. This includes heat pumps. Several subsidies on a state level and run by utilities exist. An overview can be found on the website of the Swiss heat pump association.

2.9 The Netherlands

General trend

The heat pump market in the Netherlands is only slowly developing. This is partly due to the extensive gas grid and the dominance of this energy form for the provision of heating. However in the Netherlands there are quite a few prominent projects using heat pumps in commercial buildings, leveraging on the fact that heat pumps can be used for heating, cooling and hot water production alike. Another specialty is the development of bi-valent systems that combine air source heat pumps and gas boilers (to cover for peak demand).

The Netherlands does collect heat pump sales in the official statistics. As the categories used do not match with the questionnaire by EHPA and as the 2007 numbers are still missing, the tables are presented for information purposes here (See table 8 and table 9)

Table 10: New heat pumps in the commercial market (80% office buildings)
(source: stichtingwarmtepumpen.nl)

<table>
<thead>
<tr>
<th>Year</th>
<th>Standard &amp; combi</th>
<th>HP boilers (domestic hot water, not heating)</th>
<th>Reversible HP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>226</td>
<td>13</td>
<td>800</td>
<td>1.039</td>
</tr>
<tr>
<td>2004</td>
<td>664</td>
<td>10</td>
<td>3.801</td>
<td>4.455</td>
</tr>
<tr>
<td>2005</td>
<td>590</td>
<td></td>
<td>3.684</td>
<td>4.275</td>
</tr>
<tr>
<td>2006</td>
<td>753</td>
<td></td>
<td>6.422</td>
<td>7.175</td>
</tr>
</tbody>
</table>

Overview on subsidies for heat pumps in the Swiss market: http://www.fws.ch/zahlen_05.html (German only).
Table 11: Heat pump sales in the residential sector

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic houses</td>
<td>753</td>
<td>707</td>
<td>1481</td>
<td>2565</td>
</tr>
<tr>
<td>Standard &amp; combi</td>
<td>2.965</td>
<td>2.412</td>
<td>1.848</td>
<td>2.048</td>
</tr>
<tr>
<td>FP boilers (domestic hot water, not heating)</td>
<td>70</td>
<td>102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.888</td>
<td>3.221</td>
<td>3.329</td>
<td>4.613</td>
</tr>
</tbody>
</table>

2.10 United Kingdom

General trend

The market for heat pumps is dominated by ground source units. While ground source heat pumps are considered a proven technology and are thus well regarded, air source units do not yet have this image. However, current market development trends will increase the importance of air source units and may make it the dominant technology as the market develops.

The overall heat pump market is small, but has been growing at a strong growth rate for the last few years. Market growth is driven by legislation in a move to quickly reduce CO₂ emissions from new buildings. The UK heating market (as of yet) is dominated by gas boilers and there is little economic argument for replacement of heating systems in existing buildings. This might change with a further increase in energy prices.

With increasing sales growth of larger units (20-50kW), opportunities are developing in the social housing sector with slowdown in private development activity.

Table 12: Development of the UK market (units)

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008 (forecast)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground source total</td>
<td>1.800</td>
<td>2.750</td>
<td>3.500</td>
</tr>
<tr>
<td>Air source total</td>
<td>200</td>
<td>750</td>
<td>1.500</td>
</tr>
<tr>
<td>Market total</td>
<td>2.000</td>
<td>3.500</td>
<td>5.000</td>
</tr>
</tbody>
</table>

Subsidies

Under the Microgeneration certification scheme (MCS) a government grant of £1.200 against purchase of GSHP and £900 for air-source can be achieved in England and Wales. Only heat pumps that are certified and installed by a certified installer are eligible under this program. Heat pumps have to achieve a COP of 3,5 (GSHP at B0/W35) or 3,4 (ASHP at A7/W35). Scotland provides more generous support by granting up to £ 4.000 for Ground Source or Air Source units.

3 The quality programs of the European Heat Pump Association

The development of the heat pump markets in several European countries was characterized by a market uptake in the late 1970s/early 1980s caused by an increasing oil price. The same development came to a nearly complete stop after the oil price decreased in the mid 1980s and heat pumps suffered from technical and installation issues. In several countries, heat pumps – albeit being a proven and reliable technology today – are still suffering from this bad reputation.

The different heat pump associations and bodies active in developing the technology shared and share the view, that it is of utmost importance to guarantee the quality of the unit, the quality of the heat source and the quality of the installation. Consequently quality programs for these
parts of a heat pump based heating system were developed. Here, only the EHPA programs are presented.

### 3.1 The EHPA-DACH quality label for heat pumps

The EHPA-DACH quality label for heat pumps originates in activities of the heat pump associations of Austria, Germany and Switzerland to create a common set of requirements to ensure product and service quality for heat pumps. The idea is further developed in the European heat pump association and the country scope is currently extending. In addition to the founding countries the EHPA-DACH quality label will be granted in Sweden from this year onward and its use in Denmark, Finland and Ireland (among others) is under discussion.

The label can be granted to standardized space heating electrically driven heat pumps, with or without domestic hot water heating capability, with heat outputs up to 100 kW from air, geothermal or water heat sources. In order to qualify for the EHPA-DACH quality label, the heat pump in question must comply with EHPA-DACH heat pump test criteria and the distributor must provide a defined level of service. The key requirements are (list not exhaustive):

a) Conformity of all main components and compliance with the national rules and regulation (CE marking)

b) minimum efficiency values defined as follows:

<table>
<thead>
<tr>
<th>Operating points</th>
<th>Required COP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brine to water</td>
<td>B0/W35</td>
</tr>
<tr>
<td>Water to water</td>
<td>W10/W35</td>
</tr>
<tr>
<td>Air to water</td>
<td>A2/W35</td>
</tr>
<tr>
<td>Direct exchange ground coupled to water</td>
<td>E4/W35</td>
</tr>
</tbody>
</table>

c) Declaration of sound power level.

d) Existence of Sales & distribution, planning, service and operating documents in the local language of the country where the heat pump is distributed.

e) Existence of a functioning customer service network in the sales area that allows for a 24h reaction time to consumer complaints.

f) A two year full warranty which shall include a declaration stating that the heat pump spare parts inventory will be available for at least ten years.

The full set of requirements can be obtained from EHPA’s quality label committee or the associations website.

### 3.2 The European certified heat pump installer program

In 2004 the EU-Cert project was started by 7 partners from 10 nations to develop a joint curriculum for the education of heat pump installers. The project focused on training, certification and dissemination.

- **Training**: development of a European-wide Training Program for heat pump installers and the creation of the necessary infrastructure. This step included the organization of a first training course in all participating countries.

- **Certification**: development of a European Certification Program for heat pump installers and the pilot certification of installers from the participating countries. Each successful participant of the training course should receive a certificate. This certificate should provide customer confidence and identify competent specialists, who can design and install reliable, faultless and efficient heat pump systems.

- **Dissemination**: The trademark "Certified Heat Pump Installer" will be distributed on a national and international level via its own and the EHPA website as well as through dissemination channels of the respective installers associations. As a consequence awareness with installers and customers has been raised, giving the label increasing importance in the market place.
After the first pilot courses were successfully completed, the program has been included into the EHPA organization for further dissemination. An education committee was established that continues the projects work. All interested countries are invited to adopt the defined training and certification program.

Today, the training classes towards the European Certified heat pump installer are offered in Austria, Finland, France, Germany, Hungary, Sweden, Switzerland, and the UK.

4 Resources


EHPA was established in the year 2000 as a European Economic Interest Group to promote awareness and proper deployment of heat pump technology in the European market place for residential, commercial and industrial applications. EHPA 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.

More information can be found at http://www.ehpa.org

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