VIESSMANN

Single house equipped with an air-water heat pump.

7.9%

the decrease of the heat pump market in the European Union between 2011 and 2012

A study carried out by EurObserv'ER.

Demand on the European heat pump market has been a series of peaks and troughs since 2008 after several years of very strong growth. These fluctuations in annual sales affect the whole of Europe, and its individual countries. Sales have been hit by a blend of economic slowdown, financial uncertainties and low new construction figures. The 2012 trend pointed to further decline, because of tighter conditions in some of the key markets. The assessment made by EurObserv'ER of the air source and ground source HP market for domestic heating and cooling shows that sales decreased from 1.79 million units in 2011 to 1.65 million units in 2012, i.e. a 7.9% drop.

HEAT PUMPS BAROMETER

6.2 Mtoe

the renewable energy provided by heat pumps in the European Union in 2012

1.65 million HPs

sold in the European Union in 2012

HEAT PUMPS BAROMETER – **EUROBSERV'ER** – OCTOBRE 2013

Drilling for the installation of vertical collectors for a geothermal heat pump

Awareness of heat pump technologies has shot up by leaps and bounds, especially since the mid-2000s. HPs have claimed their place in the sphere of renewable energy production technologies through major innovations to their energy efficiency, and particularly to their compressors.

In the first instance, only ground source heat pumps (GSHP) that capture the earth's or the water heat were admitted to the circle. They were likened to the great geothermal renewable energy family, and classed as "shallow geothermal energy", to distinguish them from "low and intermediate enthalpy geothermal energy", used to supply district heating networks, and "high enthalpy geothermal energy" whose temperature gradients are high enough to produce electricity.

Air source heat pumps (ASHP) officially entered the renewable energies technologies circle in 2009 through the Renewable Energy Directive, which ruled that all types of HPs (tapping the ground, water or air as their heat source) could be included in renewable energy output calculations.

The heat pump market is hard to monitor statistically because it covers such a wide range of technologies and applications, be it for the domestic, tertiary or industrial sectors. Their main application is to produce heat, but some also produce hot water or provide cooling in summer, in which case they are known as reversible HPs. Others exclusively produce domestic hot water and are known as Sanitary hot water heat pump (SHW).

The only estimates for SHW segment come from EHPA (the European Heat Pump Association). Their annual report claims that it was the only HP segment to enjoy high growth with 49 600 units sold in 2011 in the 19 countries of the European Union covered by EHPA, compared to 61 400 units in 2012. France was a driving force in this market segment, generating 70% of the increase between 2011 and 2012 (see paragraph on France, p.7).

Previous editions of the EurObserv'ER heat pump barometer only monitored the geothermal heat pump market. A number of statistical issues were raised by including ASHPs in the renewables club because it was hard to differentiate between those ASHPs that fulfilled the Directive's criteria from those that did not. A typical example was whether or not to include air-air reversible ASHPs installed in Southern Europe that are primarily used for cooling rather than heat production. Lastly extracted ASHPs (exhaust air) were not formally accepted as using a renewable source under the terms of the Directive.

As most of the methodological problems surrounding renewable energy production calculations have been overcome by the European Commission's decision (see further on), EurObserv'ER will now monitor all HPs that can provide building heating, regardless of energy source or whether or not they additionally heat domestic hot water. Air-air reversible HPs, primarily used for cooling, are also accounted for, but in their case, renewable energy production is calculated using specific values set by the European Commission. Their inclusion has analytical consequences, as their sales figures are very high in a number of Southern European markets, and much higher than those of HPs whose main function is to produce heat.

1.653 MILLION HPS SOLD IN THE EUROPEAN UNION

ASHPS CLEARLY HAVE THE UPPER HAND

The momentum of the European Union heat pump market for heating buildings has been exceptional since mid-2005. EHPA comments that it surged until 2008, then after a very difficult year in 2009 when the European market was hit head on by the financial crisis, it took off again in 2010 and managed to stay buoyant through 2011. The EurObserv'ER study findings show that the European Union market plunged in 2012 as HP sales tumbled by 7.9%.

The drop was indiscriminate as it hit the air source HP sector, whose unit sales dropped by 7.8%, from 1.686 million to 1.554 million **(table 1)**, and the ground source HP sector which contracted by 8.9%, with sales dropping from 108 477 in 2011 to 98 807 in 2012 **(table 2)**.

On closer examination, it emerges that some of the market's technologies fared better than others. In the air source HP segment, the sales volume of the air-water type (connected to an under-floor or central heating system to emit heat) increased slightly (from 185 475 to 187 945 units sold), while the sales in the remaining air source HP technologies that use fan coils (air-air HPs) plummeted.

In the ground source HP segment (which now includes hydrothermal HPs), the drop was felt right across the board. The

Methodological note

Heat pumps (HPs) are generally classified by two components. The first is the energy source used (ground, water or air), the second is the heat distribution mode, be it hot water circulating in an under-floor heating circuit, conventional central heating system (water), or pulsed air (air).

*• **Ground source HPs (GSHP)**: the term applies to the various technologies that use the ground's energy, i.e. all ground-water and ground-air HPs. They can also be described by their operating mode and the fluid they use, being referred to as brine water HPs, direct expansion or direct expansion-water HPs.*

*• **Hydrothermal HPs** are heat pumps that use water as their heat source; namely water-to-water HPs and water-air HPs. In their case, the water is pumped directly from the water table or from rivers to a heat exchanger, then returned to source. For the purpose of simplification, they are counted as GHSPs in this barometer.*

*• **Air source HPs (ASHP):** the term applies to technologies that use air as the heat source. They are said to be air-air, air-water, exhaust air-air and exhaust air-water. The latter two technologies use the exhaust air (indoor air) of dwellings whereas the first two use ambient air (outside the building).*

In the first place HPs are designed to produce heat, and thus are distinguished from air-conditioning systems that are designed to cool buildings. These systems offer much lower energy performance levels, and thus do not fulfil the Directive's requirements. Accordingly, air-air air-conditioning systems are not considered to be ASHPs and do not produce renewable energy as defined by the European Directive. Another technical point to bear in mind is that HPs need auxiliary energy to operate. More often than not they use electricity, while some are thermally driven. The latter, which are less widespread, are generally built to higher capacities and designed for tertiary or industrial use. They were not singled out for monitoring during our survey.

A couple of methodological details of the published indicators need to be explained.

Market and energy production monitoring is provided by two types of source data – the official statistics bodies of the Member States and the industry associations, most of which are members of EHPA (European Heat Pump Association). Every year, EHPA produces a European market follow-up report, the "European Heat Pump Market and Statistics Report", on the basis of the data disclosed by its members. Wherever possible, this barometer is based on the official member country monitoring, taking into account their individual market and installed base monitoring methods. However we have observed that many official bodies do not monitor their market very accurately and for this reason, we have occasionally fallen back on the data disclosed by industry associations or EHPA, and thank them for their cooperation.

main brine-water HP segment dropped by 8.5%, while its water-water counterpart dropped by 15.1%.
As for the spread between ASHPs and GSHPs, the former clearly had the upper hand, as in 2012 ASHPs accounted for 94% of the units sold **(table 3 and graph 1),** following the pattern set in 2011. The reason for this very clear lead by ASHPs is that all reversible air-air HPs have been factored into the figures, including those installed in Southern Europe that are mainly used for cooling.
Furthermore, GSHPs gave way to ASHPs in the specific segment of systems that use water as the heat transfer medium. In this segment of hydronic distribution who represents 286 752 units sold in 2012 compared to 293 952 in 2011, GSHP sales represent only 34.5% in 2012 as opposed to 36.9% in 2011 and air-water ASHP represents 65.5% in 2012 as opposed to 63.1% in 2011 **(graph 2)**.
There are a number of ways we can interpret this trend... while ASHPs offer lower performance ratios than GSHPs, they have the huge advantage of being easier to install. There is no need to call on a drilling company or contract major earthworks to bury the heat exchangers and thus they are much more suitable for the renovation sector which has a significantly higher number of projects than new construction. Another powerful argument is that ASHPs are cheaper to install, because they require less equipment and labour. The economic advantage of a GSHP only comes into its own over the long term.

WHAT IS BEHIND THIS DRAMATIC MARKET DECLINE?

The European HP market for heating dropped sharply between 2011 and 2012, yet the drop did not pervade the whole of the European Union with the result that there is no clear market trend. Half of the countries witnessed market development (of the 23 markets monitored, 12 increased and 11 contracted), yet in 2012 some of these markets varied wildly. Contraction was particularly severe in Spain, Portugal, Italy and Bulgaria and also in Sweden, Finland, France and Hungary. The reverse is true in Denmark, Estonia, Belgium, Germany and Austria that enjoyed double digit growth.
If we recall the main HP market variation factors we arrive at the main reasons for these fluctuations. Firstly the health of the new construction market, the change in the price of electricity compared to the energy used by other heat producing systems and secondly political developments, including statutory changes (e.g.: thermal regulations) or incentive mechanisms (e.g.: grants, tax concessions).
The HP market, and in particular the GSHP market is still highly dependent on the new construction market. In many European Union countries the latter is at its lowest point or slipped again in 2012. According to Euroconstruct, which monitors this market in 19 European countries, there were 4.7% fewer new build projects in 2012 and they are set to dip by another 2.8% in 2013. The organisation forecasts that the number of new dwellings constructed will drop by 125 000 to 1.3 million in 2013. The construction slump hit Spain and Portugal particularly hard in 2012, and also Sweden.
In the renovation sector, where ASHPs play a major role, the sharp increase in the price of electricity across Europe hit the market, primarily where the rises were sharpest (France, Germany, Portugal, Italy, the UK and Belgium). The severity of this impact can be put down to the funding of renewable energies, the increase in the price of gas, but above all the investments in infrastructures. Finally, some markets such as Finland saw their incentive system overhauled, which led to a mechanical drop in sales volume.
The penetration rate of HPs for heating requirements fluctuates from country to

Tabl. n° 1

Market of aerothermal heat pumps ***designed for heating with or without cooling function in 2011 and 2012 (number of units sold)***

	2011				2012			
Country	Air-water	Air-air[1]	Exhaust air	Total Aerothermal HP	Air-water	Air-air[1]	Exhaust air	Total Aerothermal HP
Italy[2]	15 800	1 120 000	0	1 135 800	14 600	1 057 000	0	1 071 600
France	55 300	96 900	0	152 200	52 800	81 350	0	134 150
Sweden	8 958	55 000	11 433	75 391	6 384	55 000	9 203	70 587
Spain	2 090	72 658	0	74 748	1 374	48 251	0	49 625
Finland	992	55 286	2 048	58 326	1 000	45 000	1 900	47 900
Germany	27 500	0	0	27 500	33 300	0	0	33 300
Netherlands	32 403	0	0	32 403	30 849	0	0	30 849
Denmark	2 421	15 655	2 386	20 462	2 350	22 384	2 457	27 191
Bulgaria	6 898	39 608	1 070	47 576	3 893	22 352	604	26 849
United Kingdom	12 765	0	3 480	16 245	14 455	0	1 050	15 505
Estonia	710	10 050	26	10 786	790	11 450	55	12 295
Portugal	430	13 642	0	14 072	521	7 514	0	8 035
Austria	5 393	167	0	5 560	7 083	115	0	7 198
Belgium	4 631	0	0	4 631	5 135	0	0	5 135
Czech Republic	4 631	0	0	4 631	5 128	0	0	5 128
Slovenia	2 100	0	0	2 100	4 950	0	0	4 950
Poland	1 240	160	105	1 505	1 680	160	155	1 995
Ireland	646	0	32	678	886	0	19	905
Slovakia	277	72	8	357	395	105	11	511
Hungary	97	470	41	608	177	189	36	402
Lithuania	193	0	0	193	195	0	0	195
Luxembourg	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0
European Union	185 475	1 479 668	20 629	1 685 772	187 945	1 350 870	15 490	1 554 305

1. Air-Air heat pumps with heating function, including reversible heat pumps and VRF systems (capable of providing heating and cooling at the same time).
2. The high figure for the air-air reversible heat pump market in Italy can be explained by the fact that systems with cooling as main function are included.
Source: EurObserv'ER 2013.

Tabl. n° 2

Market of geothermal heat pumps ***designed for heating with or without cooling function in 2011 and 2012 (number of units sold)***

	2011				2012			
Country	Water-water	Brine-water	Others[1]	Total Geothermal HP	Water-water	Brine-water	Others[1]	Total Geothermal HP
Sweden	0	31 384	0	31 384	18	24 502	0	24 520
Germany	2 500	17 700	0	20 200	2 600	18 200	0	20 800
Finland	0	13 941	0	13 941	0	13 000	0	13 000
France	3 065	4 550	2 750	10 365	1 840	4 080	2 310	8 230
Austria	976	5 018	705	6 699	1 029	4 724	659	6 412
Netherlands	1 527	3 945	386	5 858	1 324	3 936	526	5 786
Poland	250	4 295	220	4 765	145	4 634	342	5 121
Denmark	0	4 172	0	4 172	0	3 072	119	3 191
Czech Republic	0	2 361	0	2 361	0	2 529	0	2 529
United Kingdom	0	2 255	0	2 255	0	2 294	0	2 294
Belgium	0	1 300	0	1 300	0	1 418	0	1 418
Estonia	0	1 020	0	1 020	0	1 200	0	1 200
Italy	0	1 050	0	1 050	0	1 050	0	1 050
Bulgaria	1 071	0	0	1 071	604	0	0	604
Spain	387	0	0	387	511	0	0	511
Ireland	24	524	0	548	17	462	0	479
Slovenia	67	179	0	246	145	330	0	475
Lithuania	15	385	4	404	5	445	0	450
Hungary	78	158	0	236	184	109	0	293
Slovakia	74	106	0	180	100	145	0	245
Romania	0	0	0	0	0	160	0	160
Portugal	0	24	0	24	0	39	0	39
Luxembourg	0	11	0	11	0	0	0	0
European Union	10 034	94 378	4 065	108 477	8 522	86 329	3 956	98 807

1. including direct expansion systems and direct expansion-water systems. ***Source: EurObserv'ER 2013.***

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Medium sized heat pump designed to be used in the residential or tertiary sector.

country and is much lower in the major countries of the European Union such as Germany, France, Italy and Spain, with the upshot that the growth potential is higher there. The explanation is simply one of country size. In contrast, HP technology enjoys a high profile in Nordic countries and thus very high installation levels.

FOCUS ON THE MAIN MARKETS

FRANCE SITTING ON THE FENCE

In 2012, the French HP market was one of the best performers across Europe for heating applications. Data from Observ'ER puts sales of HPs for heating (excluding thermodynamic water heaters) at 142 380 units in 2012 down from 162 565 in 2011. The drop hit all market segments. The GSHP segment contracted by 20.6% to 8 230 units sold, the ASHP segment dropped by 11.9% to 134 150 units, while the air-water HP segment was the most resilient, dropping by 7.6%. France was the EU's biggest air-water HP market and accounted for 52 800 unit sales in 2012. The size and relative strength of this segment in France can be explained by the current tax credit mechanism that reimburses part of the investment by subtracting the amount from income tax (and carrying over a credit if the amount exceeds payable tax). Air-air HPs are not eligible for the mechanism. In 2013 the tax credit rate was pegged to that of 2012. For GSHPs, the rate is 26% for HP equipment purchase, rising to 34% if the project is part of an energy-saving works package, for example when the HP installation is combined with insulation work. The installation cost of the underground heat exchanger also grants entitlement to a tax credit whereas installation costs are normally excluded from the incentive mechanism. Air/water heat pumps are covered by the same mechanism, but the rates are lower, 15% for HP equipement purchase, rising to 23% if combined with an energy saving measure.

While this aid is important, its effect is limited, as the new construction market whose fortunes dictate air-water and GSHP sales, is at an all-time low in France. The recession is largely to blame for the French market's sluggishness. It has discouraged homeowners from embarking on new heating system investments. On a brighter note, sales of HPs for domestic hot water production only (not included in the previous statistics) are increasing sharply in France (from 26 700 units sold in 2011 to 34 900 in 2012, according to Uniclima). One of the reasons for this success is the implementation of a new thermal regulation in France, the RT 2012, which enables certain buildings that are borderline cases for meeting insulation standards to do so by installing a HP for hot water production. The building energy efficiency constraints of RT 2012 so far do not force householders to install a more powerful renewable heat production system.

GERMANY STAYS AFLOAT

The German market's return to growth was confirmed in 2012. AGEE-Stat, which monitors renewable energy trends for the Environment Ministry, says the market expanded by 13.4% in 2012, i.e. 54 100 systems sold (61.6% of which were ASHPs).

The resilience of the German market is good news, as has to be viewed against the fact that the already exorbitant price of electricity continued to rise. This is one of Europe's most successful HP markets, because German households espouse environmental and energy efficiency issues when they have to choose a new heating system. In this respect, HPs are gaining recognition as a credible alternative to fossil fuel-fired heating systems.

When it comes to choosing a technology, there are no surprises in store. Once again preference lies on air-water systems whose sales increased by 21.1% (33 300 units sold in 2012). Ground-water GSHP sales only picked up very slightly (2.8%), at 18 200 units sold. Statistics from the BWP (German heat pump association) are a little different, for while they register a significant rise in air-water HP sales of 14.4% to 37 300, they note a marked drop in GSHP sales (9%, all technologies taken together) to 22 200. Neither the BWP, nor AGEE-Stat count air-air HP sales.

The German HP market is stimulated by two main mechanisms. Since 2008, HPs have been eligible for the Marktanreizprogramm (MAP) incentive system, that grants aid for the most efficient systems (technology premium), and so therefore do not apply to all the systems sold on the market.

Installation grants can be awarded for air-water HP systems whose annual performance ratio (also known as seasonal performance factor) is 3.5 and GSHPs whose SPF is a very stringent 3.8. Householders can also take up a 1 300-EUR

Tabl. n° 3

Geothermal and aerothermal heat pump market[1] in 2011 and 2012 (number of units sold)

	2011				2012			
Country	GSHP	ASHP	*includ. air-water HP*	Total heat pumps	GSHP	ASHP	*includ. air-water HP*	Total heat pumps
Italy	1 050	1 135 800	*15 800*	1 136 850	1 050	1 071 600	*14 600*	1 072 650
France	10 365	152 200	*55 300*	162 565	8 230	134 150	*52 800*	142 380
Sweden	31 384	75 391	*8 958*	106 775	24 520	70 587	*6 384*	95 107
Finland	13 941	58 326	*992*	72 267	13 000	47 900	*1 000*	60 900
Germany	20 200	27 500	*27 500*	47 700	20 800	33 300	*33 300*	54 100
Spain	387	74 748	*2 090*	75 135	511	49 625	*1 374*	50 136
Netherlands	5 858	32 403	*32 403*	38 261	5 786	30 849	*30 849*	36 635
Denmark	4 172	20 462	*2 421*	24 634	3 191	27 191	*2 350*	30 382
Bulgaria	1 071	47 576	*6 898*	48 647	604	26 849	*3 893*	27 453
United Kingdom	2 255	16 245	*12 765*	18 500	2 294	15 505	*14 455*	17 799
Austria	6 699	5 560	*5 393*	12 259	6 412	7 198	*7 083*	13 610
Estonia	1 020	10 786	*710*	11 806	1 200	12 295	*790*	13 495
Portugal	24	14 072	*430*	14 096	39	8 035	*521*	8 074
Czech Republic	2 361	4 631	*4 631*	6 992	2 529	5 128	*5 128*	7 657
Poland	4 765	1 505	*1 240*	6 270	5 121	1 995	*1 680*	7 116
Belgium	1 300	4 631	*4 631*	5 931	1 418	5 135	*5 135*	6 553
Slovenia	246	2 100	*2 100*	2 346	475	4 950	*4 950*	5 425
Ireland	548	678	*646*	1 226	479	905	*886*	1 384
Slovakia	180	357	*277*	537	245	511	*395*	756
Hungary	236	608	*97*	844	293	402	*177*	695
Lithuania	404	193	*193*	597	450	195	*195*	645
Romania	0	0	*0*	0	160	0	*0*	160
Luxembourg	11	0	*0*	11	0	0	*0*	0
European Union	108 477	1 685 772	*185 475*	1 794 249	98 807	1 554 305	*187 945*	1 653 112

1. designed for heating with or without cooling function. ***Source: EurObserv'ER 2013.***

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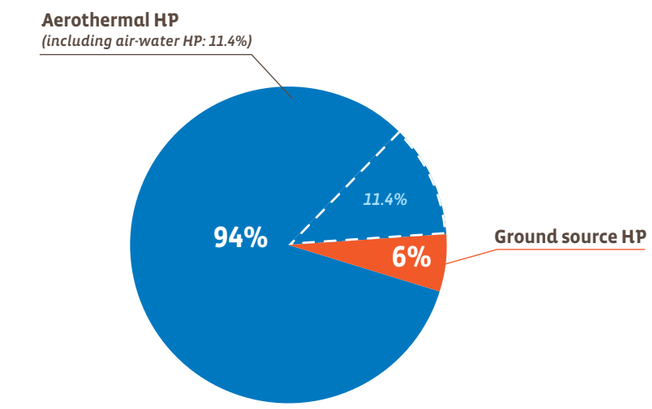
Graph. n° 1

Breakdown of the heat pump market ***between aerothermal and geothermal heat pumps in 2012***

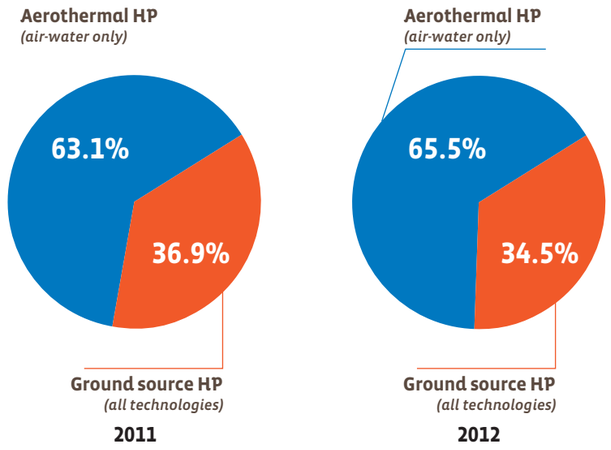


Source: EurObserv'ER 2013.

subsidy for air-water systems with a capacity of <20 kW and 1 600 EUR for systems with 20 to 100 kW design capacity, while GSHP systems with <10 kW of capacity benefit from a 2 800-EUR subsidy. The higher rated systems attract further aid of 120 EUR for each additional kW of capacity up to 20 kW, rising to 100 EUR for each additional kW of capacity between 20 and 100 kW. Lastly, a further 500-EUR premium is granted if the HP is coupled to a solar thermal domestic hot water production system. The other major lever of German policy is the Renewable Energies Heat Act (EEWärmeG) which has set a minimum percentage of renewable heat in new build, and that counts HPs as eligible technologies.

Graph. n° 2

Breakdown of the aerothermal or geothermal heat pump market ***between systems connected to underfloor heating and those connected to radiators in 2011 and 2012***



Source: EurObserv'ER 2013.

THE CONSTRUCTION SLUMP DEPRESSES THE SWEDISH MARKET

The Swedish market stands out in that it is a mature market where for many years now HP technology is and has been fully recognized and accepted by the general public. Heat pumps are the population's preferred heating method, both in the new build sector and for replacing existing heating systems. More than half of the country's individual houses are equipped with heat pumps.

According to EHPA data, the HP market for building heating slipped down by 10.9%, from 106 775 in 2011 to 95 107 in 2012. Yet again the drop was sharper in the GSHP segment whose sales decreased by 21.9% to 24 520 units. This drop in unit sales is particularly dramatic (6 864 fewer units sold between 2011 and 2012), because the country is Europe's leading GSHP installer.

As only the air-water and extracted air HPs have been hit, the drop is less visible in the ASHP segment (6.4%), while the sales volume of reversible air-air HPs – the main technology used in the country – remained static (about 55 000 units sold in 2011 and 2012).

The slump in the new build sector explains the contraction in the market for HPs that use water to distribute the heat (air-water and ground-water), and also for extracted air HPs. The market contraction in 2012 was primarily caused by a tougher economic environment and thus families postponed their construction projects. For its part, the government continues to encourage HP installations, which attract tax concessions on renovation or home extension work. Depending on the system, individual home owners may thus recover up to 50% of the labour costs for this kind of work, capped at 50 000 SEK (about 5 000 EUR).

DENMARK, THE FASTEST-GROWING MARKET IN 2012

The Danish HP market is one of 2012's headline stories. According to the Danish Energy Authority's estimates, the HP market for heating grew by 23.3%, increasing by 24 634 units sold in 2011 to 30 382. Once again the GSHP segment shrank significantly (from 4 172 to 3 191 units). This drop has been very largely offset by the rise in the air-air HP segment, whose sales volume increased by 42.9% in the course of the year, rising from 15 655 to 22 384.

One of the reasons for this success is that the energy companies are obliged to make energy savings every year combined with individual homeowners' ability to invest in a renewable heating system and convert the energy savings they make into cash through these energy companies. The use of electricity as the main energy in buildings is also encouraged by the introduction of tax reductions on electricity from a set consumption threshold, again with the aim of limiting fossil-fuelled energy consumption. What this boils down to in practice is that the price of electricity came down by 2 DKK/kWh (€ 0.27/kWh) to 1.5 DKK/kWh (€ 0.20/kWh), for annual consumption in excess of 4 000 kWh p.a. However the tax concession system that applied to renovation work was curtailed in 2012 and by mid-2013 still had not been reintroduced. Negotiations are under way to revive the mechanism.

The Danish market's growth prospects are excellent as the government has simply banned the installation of gas- and oil-fired heating systems in new buildings from 2013 onwards. Furthermore, the ban will extend to any old housing stock that is in an area covered by a district heating network from 2016 onwards. EHPA says that this means that 180 000 houses are likely to change their heating system for a renewable energy system – HP or wood-fuelled boiler.


RÉMY DELACLOCHE/OBSERV'ER – ARCHITECTURE CONCEPT

In this house, an exhaust air heat pump (dual flow thermodynamic CMV) uses energy from the building exhaust air to inject fresh heated air in the rooms.

THE ITALIAN MARKET TUMBLED IN 2012

The general market trend in Italy is downwards. Data provided by the Ministry of Economic Development shows that the market shrank by 5.6%, dropping from 1.14 million units sold in 2011 to 1.07 million in 2012. The air-water and reversible air-air HP segments were particularly badly hit. The Ministry claims that the GSHP segment was stable, but other sources (primarily EHPA) claim that it too declined in 2012.

These figures, which are high compared for countries with a temperate climate, can be explained by the fact that the vast majority of HPs sold in Italy are primarily used as a cooling use. Sales of HP designed to primarily produce heat are much lower. The country's official classification poses a few problems because, by their very nature, the Italian market figures cannot be directly compared with those of the other EU countries.

In the reversible air-air HP segment in question, the Ministry puts the market at 1 057 000 units. EHPA, which only factors in HP capable of producing heat in winter when temperatures drop below – 7 °C, proposes a figure of 92 800 units sold in 2012. Thus the difference is accounted for by the units that require mild winter conditions to operate, as they only go into heating mode for a limited period of the year.

The market decline is entirely ascribable to the harsh economic situation which led to an overall slump of about 10% in the heating and cooling markets in 2012. According to EHPA, the accumulated drop is as much as 40% over the past six years. In terms of aid, only high-performance systems, namely those designed to produce heat, are eligible for tax deduction of up to 55%. However the system is not as generous as its French counterpart for example, as only

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one tenth of the total deduction can be applied per annum, meaning that householders have to wait 10 years to recoup the tax deduction entirely.

RENEWABLE ENERGY PRODUCTION PUT AT 6.2 MTOE IN 2012

Heat pumps (HP) produce renewable energy because they capture the heat in the ground, air and water and then re-inject it into buildings in the form of heating, cooling and/or domestic hot water. However, HPs need electricity or some other auxiliary energy to operate, in order to reach a useful temperature level. Therefore the energy used to make them run must be deducted from the total usable heat. The European Union laid down its conditions for including the aerothermal, geothermal or hydrothermal energy source when calculating the energy produced from renewable sources in the Renewable Energy Directive 2009/28/EC. In particular, the Directive stipulates that the final energy yield of the HP must significantly exceed the input of primary energy required to make it operate. This particular point thus raises questions about the production of renewable energy when the HP refrigerates, because the yields are significantly lower for this usage.
The Directive developed a method to calculate the renewable energy provided by HPs (in Annex VII) that establishes the basic formula. It defines three parameters that must be included in the calculation – system energy efficiency (η), the estimated quantity of useful energy delivered by the HP (Qusable), obtained by multiplying the number of running hours on full load by the installed capacity, and the estimated mean seasonal performance factor (SPF) that theoretically assesses the heat pump's annual performance.
The Directive left it up to the European Commission to set the guidelines for the modalities used by the Member States to estimate the Qusable and SPF values for the various HP technologies and applications taking into account the differences in weather conditions, and making particular reference to very cold climates. That has been achieved since 1 March 2013, when a European decision (2013/114/EU) established the guidelines for these calculations **(table 4),** setting the default values for three types of climate (cold, average and warm), for the mean number of hours of use on full load (to calculate Qusable) and for the seasonal performance factor. These values are given for each HP technology, broken down by energy source and heat transmitting fluid, and depending on whether they run using electricity or are thermally driven. Some values have been adjusted for specific technologies. In the case of reversible ASHPs, the value of usage length was broadly decreased for HPs installed in hot climates to take into account that the main use made of them is for cooling, not heating. Turning to HPs running on exhaust air, the usage length was also decreased, because the heat differential between the ambient air and exhaust air is not deemed renewable under the terms of the Directive.
The European Commission methodology guide is a useful aid for calculating renewable energy production in the terms of the Directive. However the difficulty for the Member States comes when accounting for the capacity of the HPs installed within their boundaries by individual heat pump type (the guide lists about twenty), and doing so exclusively for HPs with at least the minimum efficiency level required for eligibility under the Directive. Thus a considerable share of the ASHPs base of outdated design and certain GSHPs built using old technologies should be excluded.
As the guide was published only in March this year, it stands to reason that very few countries have already adapted their calculation methodology to take factor in the latest European Commission recommended values. Most of them are in the process of doing so, while others intend to do so in the very near future. Some results should be available at the end of this year, but most of

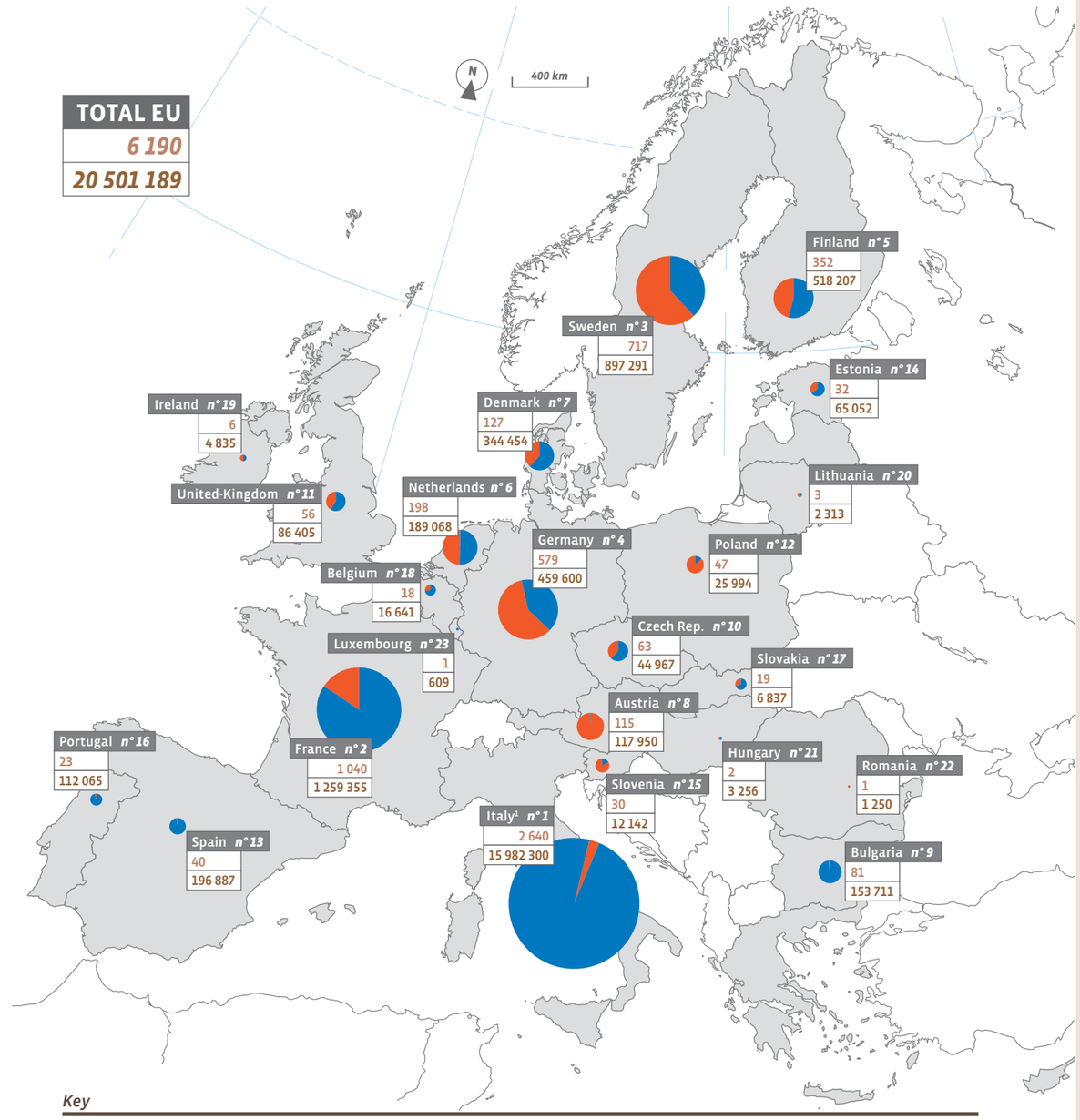
Tabl. n° 4

Default values for annual equivalent heat pump hours (HHP) and seasonal performance factor (SPF) ***for main technologies of electrically driven heat pumps as set out by the European Commission***

Energy source	Energy source and distribution media	Climate conditions					
		Warmer climate		Average climate		Colder climate	
		HHP	SPF	HHP	SPF	HHP	SPF
Aerothermal energy	air-water	1 170	2.7	1 640	2.6	1 710	2.5
	air-air	1 200	2.7	1 770	2.6	1 970	2.5
	air-air (reversible)	480	2.7	710	2.6	1 970	2.5
	exhaust air-air	760	2.7	660	2.6	600	2.5
Geothermal energy	ground-water	1 340	3.5	2 070	3.5	2 470	3.5
Hydrothermal energy	water-water	1 340	3.5	2 070	3.5	2 470	3.5

Source: European Commission (March 2013).

Renewable energy production from heat pumps (in ktoe) ***and total number of heat pumps in operation in 2012 in the Europen Union countries***



1. The high figure for the air-air reversible heat pump market in Italy can be explained by the fact that systems with cooling as main function are included.
Source: EurObserv'ER 2013.

them will not be ready before the end of next year.
In the meantime, EurObserv'ER has chosen to publish its own output indicators. Most of this data comes from official but partially preliminary estimates based on the calculation methods currently being used by the Member States, and applies to Germany, Italy, Austria, France, the United Kingdom, the Netherlands, Czech Republic, Finland, etc. Where necessary, EurObserv'ER either resorted to using the estimates made by the national experts contacted during the study, or made its own estimates by reconstructing the total installed capacity of the various types of HP. We decided only to take into consideration HP sold since 2005 for the purposes of the task. Two factors came into this choice – we limited inclusion to modern HPs with high yields and furthermore estimates of HP sales since 2005 broken down by technology, which we consider to be relatively reliable. To reconstruct capacity by HP type, EurObserv'ER has used EHPA's hypotheses that define mean unit capacity for each technology and type of climate (from 15 kW for air-water HPs installed in cold climates to 2 kW for exhaust air HPs). The renewable energy is then calculated using the default values provided by the European Commission's methodological guide. By applying this calculation method we arrive at an estimate of renewable energy HP output of 6.2 Mtoe in the European Union for the year 2012, which represents 11.5% growth over 2011 **(tables 5 and 6)**.

THE HP INDUSTRY HAS MANY FRONTS

The HP industry has changed radically since the start of the millennium. It was from that era that sales figures began to rise, at the same time as environmental awareness came to the fore, and that a growing body of homeowners started to invest in environmentally-friendly, comfortable heating systems. The industrial landscape of the day was extremely fragmented with myriad of small players working at local level. Today, all the major heating and air-conditioning manufacturers have HPs in their product catalogue. The major European specialist air-conditioning and electric heating groups are in the field such as Nibe, Stiebel Eltron and Danfoss, and also the major heating groups (Viessmann, Bosch Thermotechnik, Vaillant, BDR Thermea, etc.). The latter were quick to realise that the growth prospects for their conventional heating solutions were limited and that they would have to diversify into less energy-thirsty, more environmentally-friendly heating systems.
The major groups drew on their financial might and set about buying up specialist firms, both to gain local market share and also to tap into their skills.
Viessmann was one of these early pioneers, and as early as 1998 bought up the Swiss manufacturer Satag Thermotechnik (which merged with the group in 2004). The group further accentuated its presence in the HP market by purchasing the Swiss firm, KWT, in 2008.
Bosch Thermotechnik claimed its foothold in the market by purchasing one of the major Nordic HP leaders, the Swedish firm IVT, in 2004. The same strategy applied to the purchase of the French manufacturer Sofath by De Dietrich Remeha in 2008, which a year later formed the BDR Thermea Group with Baxi.
A new consolidation phase is under way but is more inspired by the need to cut costs, the cost advantages offered by mass production, coupled with the requirements for design, installation and maintenance quality that are easier for larger corporations to achieve. A point in case is Nibe Industrier AB's July 2011 buy-out of the Swiss Schulthess Group, which included Alpha-InnoTec, one of Germany's major HP manufacturers. The group thus consolidates its European positioning, as Nibe bought into another major Austrian HP manufacturer, KNV in 2008. This strategy paid off in terms of activity as the 2012 net sales of Nibe Energy Systems branch (3 088 employees

Tabl. n° 5

Total number of heat pumps in operation in 2011 in the European Union ***and associated renewable energy production (in ktoe)***

	Aerothermal HP	Renewable heat aerothermal (ktoe)	Geothermal HP	Renewable heat geothermal (ktoe)	Total HP in operation	Total renewable heat (ktoe)
Italy[1]	14 950 000	2 388	9 300	53	14 959 300	2 442
France	849 960	795	114 815	150	964 775	945
Sweden	583 646	248	218 538	398	802 184	646
Finland	399 833	169	60 631	104	460 464	273
Germany	161 500	196	244 000	319	405 500	515
Denmark	297 619	76	34 216	45	331 835	121
Netherlands	118 080	86	36 048	87	154 128	174
Spain	146 364	29	387	0	146 751	29
Bulgaria	125 798	61	3 146	1	128 944	62
Austria	4 202	1	101 058	104	105 260	105
Portugal	103 340	21	652	1	103 992	21
United Kingdom	53 140	26	15 366	20	68 506	45
Estonia	46 802	16	4 755	9	51 557	25
Czech Republic	21 599	31	15 711	21	37 310	52
Poland	3 450	3	15 500	31	18 950	34
Belgium	7 460	8	2 628	3	10 088	11
Slovenia	2 523	2	4 194	23	6 717	25
Slovakia	4 133	9	1 974	4	6 107	13
Ireland	1 627	2	1 824	2	3 451	4
Hungary	1 805	1	756	1	2 561	2
Lithuania	495	1	1 173	2	1 668	2
Romania	0	0	970	1	970	1
Luxembourg	503	1	106	0	609	1
European Union	**17 883 879**	**4 170**	**887 748**	**1 381**	**18 771 627**	**5 551**

1. The high figure for the air-air reversible heat pump market in Italy can be explained by the fact that systems with cooling as main function are included.
Source: EurObserv'ER 2013.

Tabl. n° 6

Total number of heat pumps in operation in 2012 in the European Union ***and associated renewable energy production (in ktoe)***

	Aerothermal HP	Renewable heat aerothermal (ktoe)	Geothermal HP	Renewable heat geothermal (ktoe)	Total HP in operation	Total renewable heat (ktoe)
Italy[1]	15 972 000	2 580	10 300	61	15 982 300	2 640
France	1 136 310	879	123 045	161	1 259 355	1 040
Sweden	654 233	274	243 058	442	897 291	717
Finland	445 787	212	72 420	140	518 207	352
Germany	194 800	235	264 800	344	459 600	579
Denmark	308 119	79	36 335	48	344 454	127
Spain	195 989	39	898	1	196 887	40
Netherlands	147 815	100	41 253	98	189 068	198
Bulgaria	149 962	79	3 749	2	153 711	81
Austria	4 317	1	113 633	114	117 950	115
Portugal	111 374	22	691	1	112 065	23
United Kingdom	68 645	34	17 760	23	86 405	56
Estonia	59 097	21	5 955	11	65 052	32
Czech Republic	26 727	39	18 240	24	44 967	63
Poland	5 373	6	20 621	41	25 994	47
Belgium	12 595	13	4 046	5	16 641	18
Slovenia	7 473	5	4 669	25	12 142	30
Slovakia	4 616	13	2 221	6	6 837	19
Ireland	2 532	3	2 303	3	4 835	6
Hungarie	2 207	1	1 049	1	3 256	2
Lithuania	690	1	1 623	2	2 313	3
Romania	–	0	1 250	1	1 250	1
Luxembourg	503	1	106	0	609	1
European Union	**19 511 164**	**4 636**	**990 025**	**1 554**	**20 501 189**	**6 190**

1. The high figure for the air-air reversible heat pump market in Italy can be explained by the fact that systems with cooling as main function are included.
Source: EurObserv'ER 2013.

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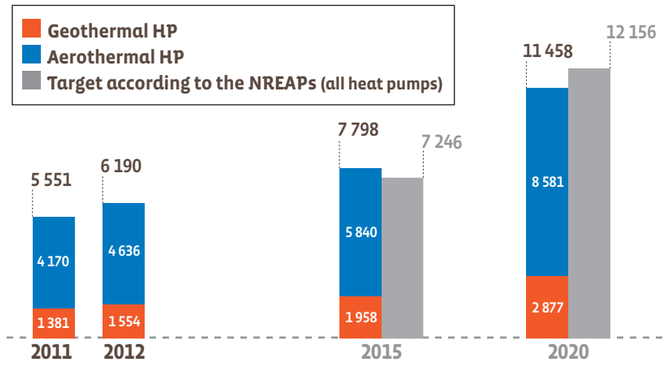
Graph. n° 3

Current trend for renewable energy production from heat pumps ***compared to the NREAP (National Renewable Energy Action Plan) roadmaps (in ktoe)***



Source: EurObserv'ER 2013.

in 2012) were around 5 901.1 million SEK (791 million EUR), which is 18.3% up on the previous year (growth was 34% between 2010 and 2011). It made an operating profit of 13.7%, namely 810.8 million SEK (108.7 million EUR), compared to 771 million SEK in 2011 (103.4 million EUR).

More recently, we can mention the approach of Germany's Stiebel Eltron, the largest German HP manufacturer (sales worth 483 million EUR, all activity sectors, 3 000 employees) and the biggest Austrian HP manufacturer, Ochsner, in August 2013 (sales worth 26.1 million EUR in 2012 in the HP sector, 160 employees). Through the terms of the partnership Stiebel Eltron acquired 35% of the share capital in Ochsner Wärmpumpen GmbH. The aim of this transition, which hopes to bring these two major independents together, is to combine their technological expertise and give them a wider technological portfolio geared to high-capacity HPs, a segment in which Ochsner has also taken up position. Henceforth they have a capacity range covering 1.5 to 1 000 kW. The partnership also spawned the creation of a joint subsidiary, in which each has 50% of the shares, whose role will be to develop the high-capacity market for the commercial buildings segment. The industry considers this to be a major development priority for the sector, bolstered by European regulations on energy efficiency.

While these strategic tie-ups have been taking place, we have observed the affirmed presence of Asian air-conditioning specialists in the heating market

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Geothermal heat pump manufacturing unit. 'Enthalpie', company in L'Herbergement, Vendée (France).

Tabl. n° 7

Companies[1] representative of the heat pump market ***in the European Union in 2013***

Company	Brand	Country	Type and capacity range
BDR Thermea	De Dietrich	France	ground/water: 7 – 17 kW
	Baxi	United-Kingdom	ground/water: 4 – 20 kW
	Brötje	Germany	ground/water: 6 – 21 kW air/water: 7 – 20 kW
	Sofath	France	ground/water: 5.8 – 31.5 kW water/water : 5.4 – 21.4 kW air/water: 5.7 – 15 kW
Bosch Thermotechnik	IVT Industrier (Bosch Thermotechnik)	Sweden	ground/water : 6 – 70 kW
	Buderus	Germany	ground/water: 6 – 60 kW air/water: 6 – 31 kW
Daikin Europe	Daikin	Japan	air-air: capacity range not specified air-water: capacity range not specified
	Rotex	Germany	air/water: 4 – 16 kW
Danfoss	Thermia Värme AB (Danfoss)	Sweden	ground/water: 4 – 45 kW
	KH Nordtherm (Klimadan)	Denmark	ground/water: 5 – 42 kW water/water: up to 42 kW
Nibe	Schultess Group	Switzerland	ground/water: up to 160 kW
	Alpha-InnoTec	Germany	ground/water: 6 – 160 kW air/water: 7 – 31 kW water/water: 10 – 430 kW
	Nibe Energy Systems Division	Sweden	ground/water : 5 – 17 kW air/water: up to 12 kW
	KNV	Austria	ground/water : 5 – 60 kW air/water: 12 – 48 kW
Vaillant Group	Saunier Duval	France	air/water (reversible): 6 – 15 kW
	Vaillant	Germany	ground/water: 6 – 46 kW air/water: 3 – 64 kW air/water: 3 – 14 kW
	Bulex	Belgium	air/water: 5 – 15 kW
Viessmann	Viessmann	Germany	ground/water: 1.5 – 117 kW large systems (up to 2 000 kW)
	Satag Thermotechnik	Switzerland	air/water: 3 – 18.5 kW ground/water: 5 – 240 kW air/water: 7 – 110 kW
	KWT	Switzerland	ground/water : 6.2 – 17.6 kW air/water: 8.0 – 21.6 kW large systems (up to 2 000 kW)
Ochsner Wärmepumpen		Austria	water/water: 7 – 91 kW ground/water : 5 – 65 kW aerothermal HP: 5 – 60 kW large systems (up to 1 000 kW)
Stiebel Eltron		Germany	aerothermal HP: 6 – 11 kW ground/water: 6 – 13 kW
Waterkotte		Germany	air/water: 4 – 14 kW ground/water : 6 – 484 kW
CIAT		France	water/water: 5 – 9 kW air/water: 6 – 19 kW ground/water : 6 – 36 kW

1. Liste non exhaustive. Decimals are written with a comma. ***Source: EurObserv'ER 2013.***

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KWT air-water heat pump of high capacity that provides heating and cooling to the headquarters of air conditioning manufacturer Otto (Dortmund suburb).

for a number of years now. In this vein we mention the Japanese Daikin, Mitsubishi, Panasonic and Hitachi, and also the Koreans LG and Samsung who are already selling their second or third-generation HPs. These manufacturers are naturally positioned on the air-air HP segment, where the crossover point with air-conditioning systems is closest, but they are starting to diversify by offering more powerful air-water HP systems.

ONE OF THE BEST PLACED SECTORS FOR THE FUTURE

In 2013, market development should improve. EHPA reckons that the European market should return to its 2011 (peak) level based on the first two quarters' sales figures, and posits expected growth of about 8%.

While players are cautious about the growth prospects for the coming years, they are generally more optimistic about the longer-term growth fundamentals. They say that HP technologies are among the best placed for potential growth in the individual residential sector, and also in the tertiary, collective and industrial sectors.

One of the grounds for this optimism is the current development of European legal framework on the subject of energy efficiency and renewable energy promotion (on a par with the other heating technology markets that operate using renewable energy sources). Accordingly, in the course of a few years the European Commission has adopted a raft of legislation that will have implications for the HP market's development. We should mention the 2009 Renewable Energy Directive that aims for a 20% share of renewable energies in total final energy consumption by 2020, the 2010 directive on the energy performance of buildings that stipulates minimum energy performance ratios for new and old buildings, the 2012 Energy Efficiency Directive to reduce the EU's primary energy demand by 20% by 2020, the framework directive on Ecolabels that promotes products that have a lower environmental impact during use, the Ecodesign framework directive that aims to reduce energy consumption during manufacturing and use of appliances, the directive on energy labels that guides consumers towards low energy-consumption appliances and has been applicable from September 2013 for heating and hot water production systems. The highest-performing HPs already have the best score for heating systems, namely A+++, and also the highest score for domestic hot water heating A+.

Obviously the effectiveness of these directives will largely depend on their transposition into each nation's domestic legislation, and above all their application by the Member States. If the work is properly done, economic activity should pick up, provided the construction market recovers and will immediately turn into strong market recovery for heat pumps.

Another advantage of HP technology that it does not require backup energy source, which is not true of a number of renewable technologies such as solar thermal. It can also be used in a hybrid system combining several technologies and energy sources, for instance, a HP coupled to a gas boiler or a solar thermal installation. There is also the possibility of connecting a heat pump to a PV system.

The compulsory exercise of forecasting imposed by this barometer is a hard task because it is dependent on different parameters that are unknown quantities for the time being, such as the recovery time and level of economic activity. Back in 2009, the European Commission asked the Member States to conduct this work under their obligations through the Renewable Energy Directive. In fact, each Member State had to draw up a renewable energy action plan setting itself specific targets for each technology including HP technology. A summary of these plans was made by ECN (Energy research Centre of the Netherlands). It showed that the Member States put the total contribution of renewable energy captured by HPs at 7.2 Mtoe in 2015 and 12.1 Mtoe in 2020. The contribution of each HP category by the 2020 time line is about 56.4% for ASHPs, 38.1% for GSHPs and 5.5% for hydrothermal HPs. This breakdown is just a magnitude of scale because some countries did not specify the breakdown between the three category types.

According to EurObserv'ER, a mean annual growth of 8% through to 2020 in unit sales is still realistic. The assumption is also made that all the HPs installed since 2005 will still be in service in 2020. These various factors bring us to estimate the European base at 37.9 million units in 2020 (including 1.8 million GSHPs). The renewable energy output of this base will be of the order of 11.5 Mtoe (including 2.9 Mtoe produced by GSHPs). If this scenario turns out to be true, the Member States will miss their targets. This forecast is indicative, as many Member States are trying to acquire a better understanding of their sector, which should lead to substantial statistical consolidations. Other factors could enable the sector to expand faster than forecast, such as earlier recovery of economic activity or a sudden surge in the price of gas and heating oil. □

Sources: BMVIT, Marktstatistik 2012 (Austria), AGEE-Stat (Germany), BWP (Germany), Observ'ER (France), SOeS (France), Uniclima (France), Ministry of Economic Development (Italy), Statistics Netherlands, Ministry of Industry and Trade (Czech Republic), ENS (Danish Energy Agency), Polska Organizacja Rozwoju Technologii Pomp Ciepła (PORT PC), Slovak Association for Cooling and Air Conditioning Technology, APEE Association of Producers of Ecological Energy (Bulgaria), Statec (Luxembourg), Econet Romania, Jožef Stefan Institute (Slovenia), Sulpu (Finland), Statistic Finland, SEAI (Ireland Republic), EHPA (European Heat Pump Association).

The topic of the next barometer will be solid biomass

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EurObserv'ER is posting an interactive database of the barometer indicators on the www.energies-renouvelables.org (French-language) and www.eurobserv-er.org (English-language) sites. Click the "Interactive EurObserv'ER Database" banner to download the barometer data in Excel format.

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