

Interreg



EUROPEAN UNION

Grande Région | Großregion

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Fonds européen de développement régional | Europäischer Fonds für regionale Entwicklung

Sub action 3.1

Investigation on the current heating systems in the GR

REPORT

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1. Partners of the action 3

Operational partners:

- ULg/BEMS (sub action 3.1 leader);
- TUK/ESEM;
- Uni-Lu.

Methodological partners:

- VSE;
- ENOVOS;
- STIEBEL ELTRON;
- DTC.

2. Objectives of the action

The aim of action 3 is to identify the current situation of the Greater Region according to two important aspects of the project:

- The current state of the various heating systems, in particular heat pumps (penetration rate, types of heat pump, technological developments, installation potential, etc.);
- The situation and organization of the electricity network: existing transmission lines, market organization, connection between areas of the Greater Region, evolution of the status of the network (monitoring of control actions carried out in recent years, production of renewable electricity, evolution of demand in the different regions, etc.).

The aim of sub action 3.1 is to answer to the first point: estimate the current state of the various heating systems.

3. Approach

Before starting to describe the heating systems market of the four concerned countries, we have to have a foreword on the data sources that have been used for this section. Figures on the heating systems are difficult to find and practically only on a European and/or national scale. It is thus even more difficult to find regional data.

Different data sources have been found and used for this part of the report:

- A DG Energy study assessing the installed heating technologies in Europe in 2012 [1];
- Several executive summaries from EHPA (European Heat Pump Association);
- Different papers of Euroobserver, which is an observatory of renewable energies in Europe;
- Various national public institutions or statistic agencies:
 - Statec Luxembourg;
 - German's Ministry of economy and energy;
 - Energyagentur Rheinland-Pflaz;
 - Belgian heat pump facilitator;
 - Wallonia's public service of energy;
 - ATTB (Belgian heating techniques association);
 - AFPAC (French heat pump association);
 - PAC&CLIM info (French climatisation).
- Diverse building and energy specialized websites or papers.

If most of these data sources are well known and beforehand reliable/trustable, the analysis of their figures bring out sometimes big differences in the exposed figures especially in those studied for heat pumps.

Moreover, these sources often give only partial data on the installed systems, e.g. they do not provide the number of installed systems as well as their installed capacity at the same time or only explains the growth/decrease of the sells instead of the absolute figures.

Therefore, many assumptions or estimations had to be done for some numbers.

4. Results: Heating systems market share and estimation of the heat pump stock installed in the Greater Region

In this part of the report, we will discuss the market shares, the number of installed units and the installed capacity of the heating systems in France, Germany, Belgium and Luxembourg.

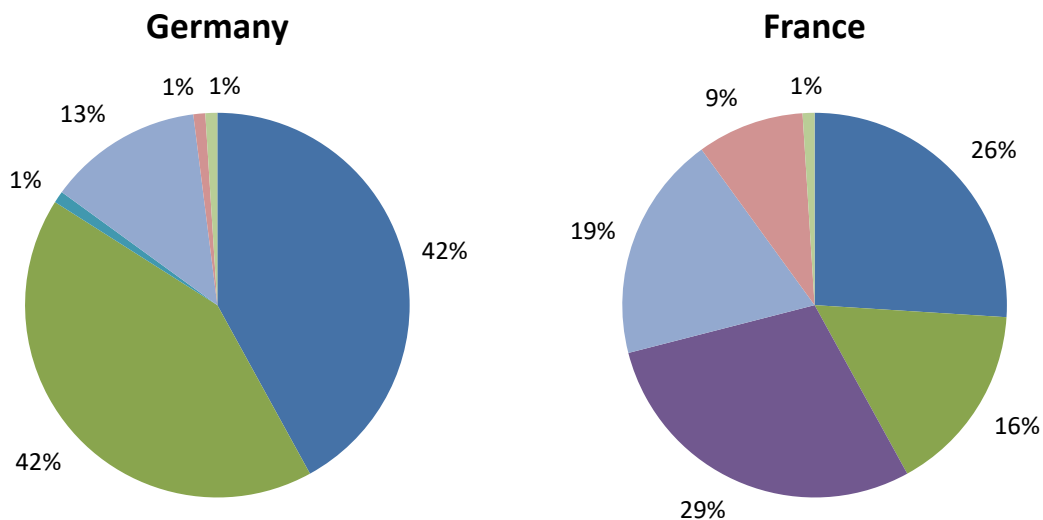
A focus will be made on the heat pumps market by estimating the installed units and capacity in those countries and more specifically in the Greater Region.

We terminate this section by having a quick overview of the market progression and trends.

4.1. Share of installed heating systems

According to [1], we can see in the Figure 1 that, except for France, the market in 2012 is led by the gas fired boilers (42-50%), directly followed by oil fired boilers (34-43%). There is between 7 and 13% of biomass furnaces and only 2% or less heat pumps in those 3 countries. Only Belgium has a share of 2% of coal fired boilers. Direct electrical heating is used up to about 5% in Belgium and Luxembourg.

The French market is completely different. The leading technology is the direct electrical heating (up to 29%) followed by the gas and oil fired boilers (respectively 26 and 16%). There is an important share of 19% biomass furnaces and up to 10% of heat pumps.



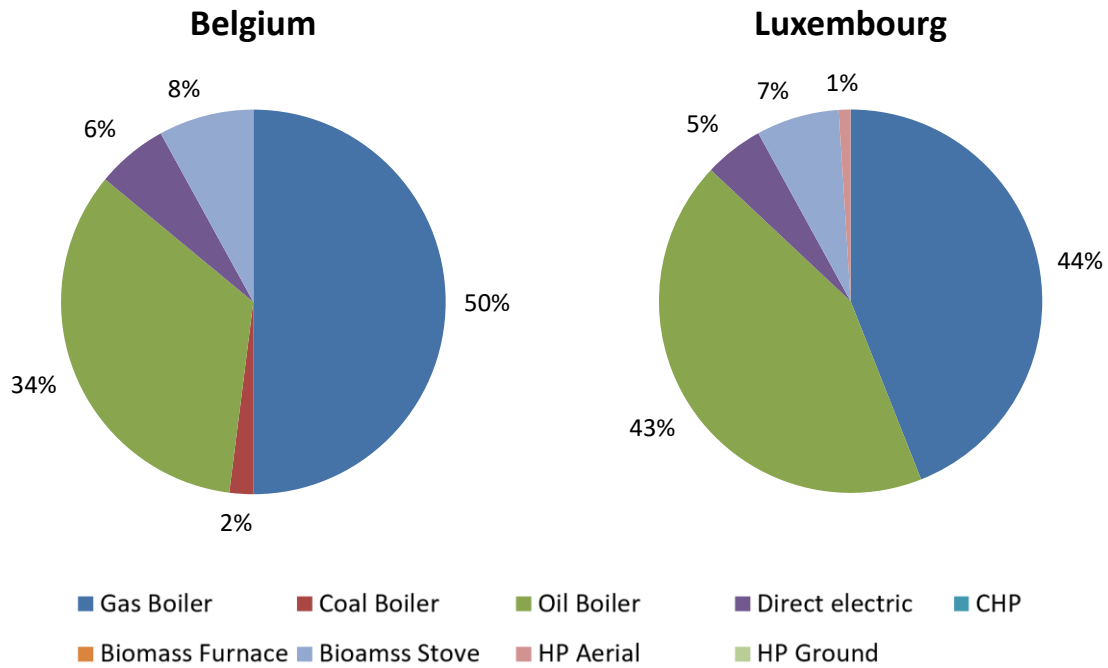


Figure 1: Share of heating systems

4.2. Number of installed units

Still according to [1], in 2012, there was more than 10 million fossil fuel fired boilers in France and Germany, more than 4 millions in Belgium and less than 130.000 in Luxembourg. France stands out in terms of installed direct electrical heating systems with about 9,5 million units. Regarding the installed heat pumps, we have more than 5.000.000 heat pumps in France, about 500.000 in Germany, 22.000 in Belgium and less than 1000 in Luxembourg (see figures 2 to 5). The major part of the heat pumps are air source based with a share of 80-90%, except in Germany where we have more or less 50% of it.

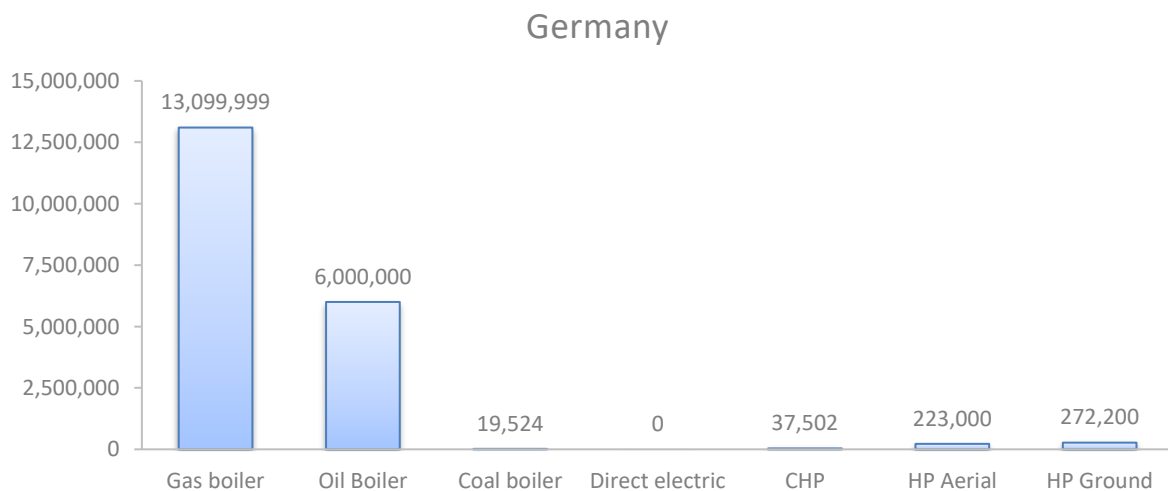


Figure 2: Installed units in Germany [1]

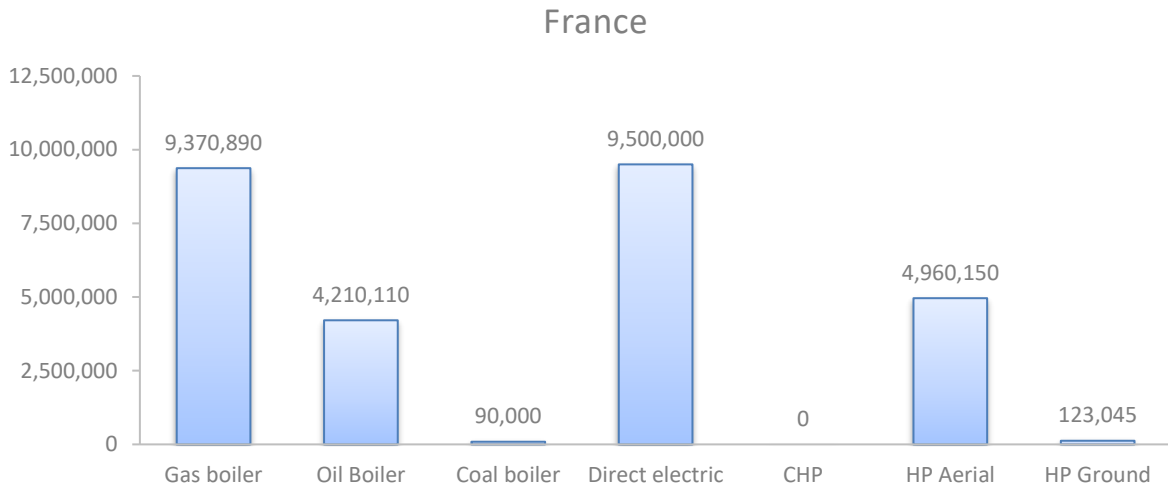


Figure 3: Installed units in France [1]

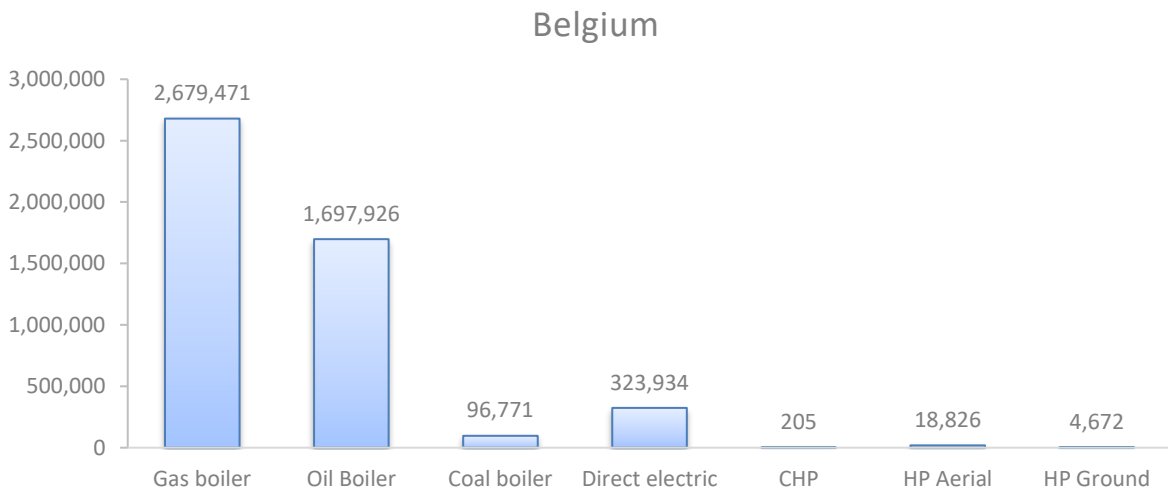


Figure 4: Installed units in Belgium [1]

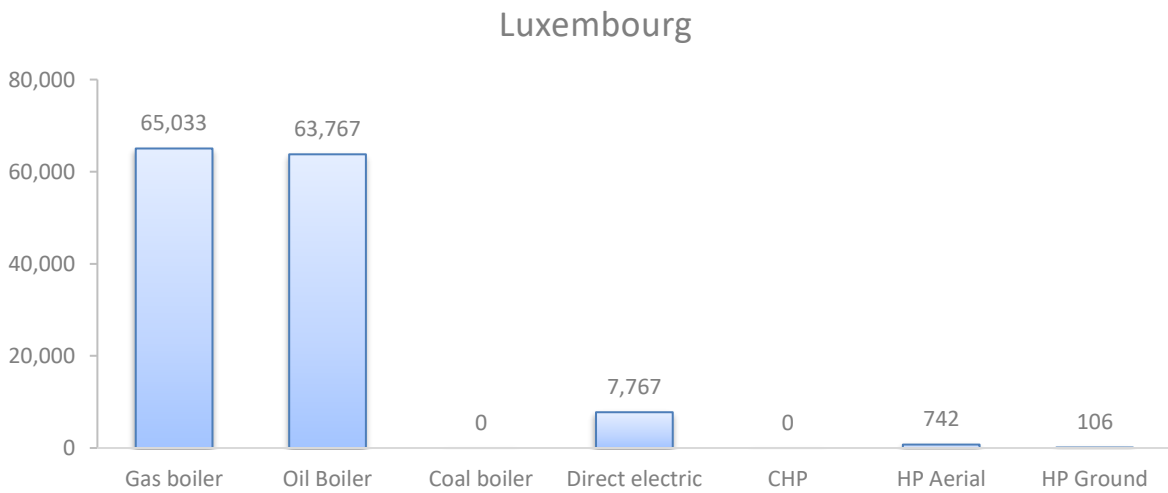


Figure 5: Installed units in Luxembourg [1]

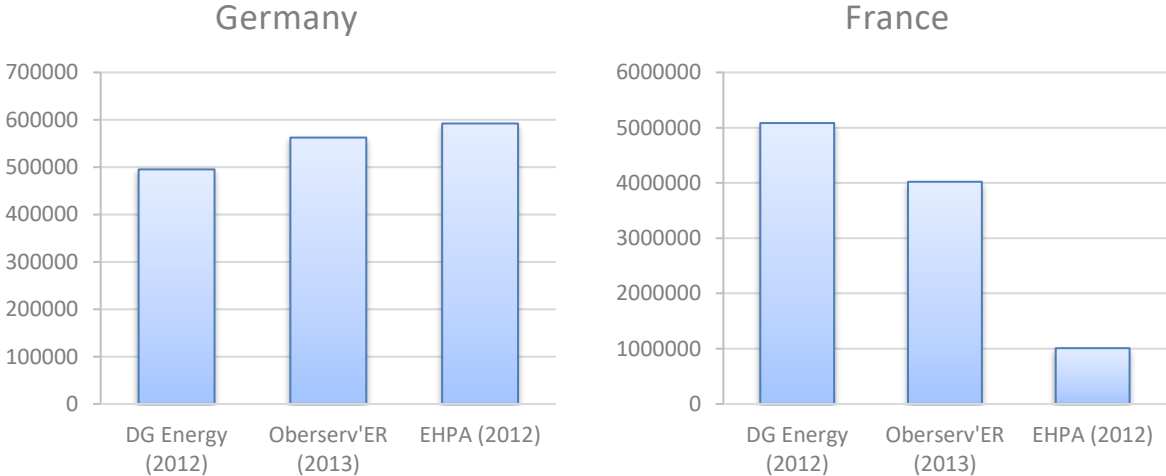
As already mentioned, there are big differences in the figures cited from one source to another and especially for the heat pumps. The Figure 6 shows the comparison of heat pumps figures of DG Energy, Euroobserver and EHPA. We can see important differences in the numbers and in particular for France where the figures vary between about 1 and 5 million of heat pump units installed. For this particular case, the explanation comes from a different counting methodology. On the one hand some countries such as for France consider that every reversible heat pump that meet the European energy efficiency has to be counted, on the other hand EHPA only counts 10% of such heat pumps as they're mainly used for cooling [1] [2].

Taking this into account and compared to other sources [3], the heat pumps (principally used for heating purpose) installed in France in 2012 is more likely to be around 1.000.000. Based on the figures of EHPA [4] and the annual growth of the heat pump sells between 2013 and 2015([4], [5], [6]), there could be approximately **1.464.000 heat pumps in 2015 in France**.

There are less big differences in the figures of Germany for those three sources (between 495.000 and 592.000), but if we compare to the figures provided by the German Ministry of economic affairs and energy (based on AGEE-stat data) these figures could be underestimated. According to the Ministry, there were about **728.000 heat pumps in 2012, growing to 904.800 units in 2015 and 971.500 in 2016** [7].

The figures of Belgium are between around 24.000 and 29.000 in 2012. But looking at others sources ([8], [9]) with more recent figures the market has probably evolved significantly. Despite the low growth or even decline of heat pump sells announced by EHPA [4], Euroobserver counts up to 57.700 heat pumps in 2014 and estimates that there could be 92.273 in 2015 [2], meanwhile the Wallonia's public service energy counts **about 24.000 heat pumps in Wallonia in 2014**.

No difference is observed between the three sources for Luxembourg (except that there is no data available from EHPA). But by contacting Statec (National Luxembourgian statistics agency), there were a bit more than 1.000 heat pumps in 2012, and about **1.600 heat pumps in 2015 in Luxembourg**.



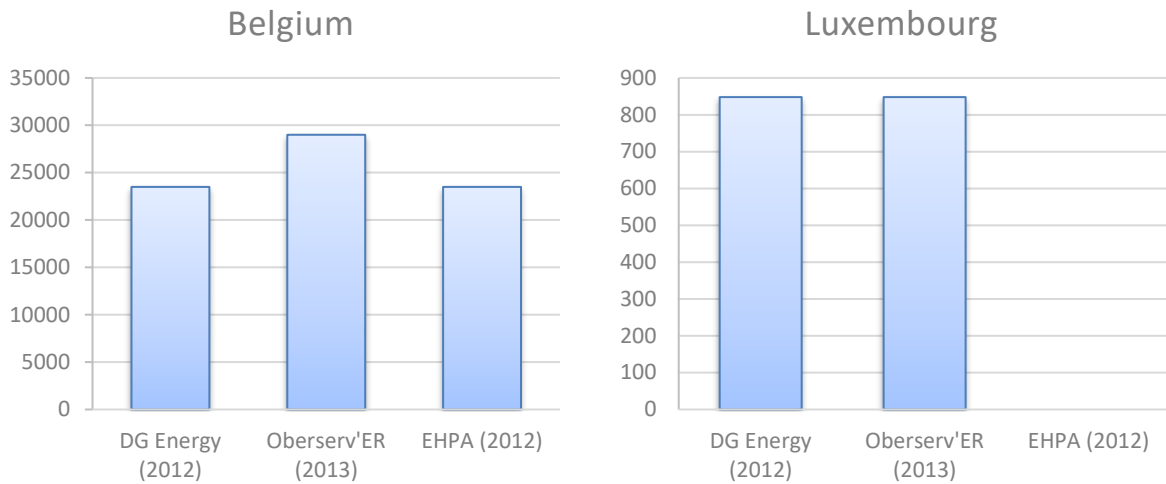


Figure 6: Heat pumps stock sources comparison

4.3. Heating systems installed capacity and estimation for heat pumps

Again according to DG Energy [1], in terms of installed thermal capacity in 2012, we have more than 250.000 MWth of fossil fired boilers in Germany against 120.000 MWth in France, 44.000 MWth in Belgium and less than 8.000 MWth in Luxembourg (see table 1). And we also have an important capacity of 88.000 MWth of direct electrical heating in France. No figures are cited in this source concerning the installed capacity of heat pumps in the four countries.

Installed capacity in 2012 [MWth]	France	Germany	Belgium	Luxembourg
<i>Gas Boilers</i>	76000	128000	24000	< 4000
<i>Oil Boilers</i>	48000	132000	20000	< 4000
<i>Coal Boilers</i>	-	-	< 4000	-
<i>Direct electrical</i>	88000	0	4000	< 2000
<i>CHP</i>	-	1680	-	-

Table 1: Installed thermal capacity (2012) [1]

EHPA only provides some global installed thermal capacity figures for the 21 countries they are analyzing in their annual executive summaries ([4],[5],[10]). So the installed capacity has evolved from 66,3 GWth in 2014 to 73,6 GWth in 2015 and 82.7 GWth in 2016. Based on these figures and on the assumption that the capacity is proportionally distributed according to the number of heat pumps installed per country, a national capacity has been estimated in table 2. Beware that a first estimation had been based on the figures of 2013 with a capacity announced of 224 GWth [11], but this figure is considered having some mistakes in the calculation still according to EHPA [10]. As there are no figures available for Luxembourg, the estimation is based on the number of installed units with an assumption of an average thermal power of 10kW.

	Total Capacity [GW]	Germany [MW]	France [MW]	Belgium [MW]	Luxembourg [MW]
2014	66.3	6532	11132	259	12
2015	73.6	7251	12357	288	14
2016	82.7	8148	13885	323	16

Table 2: Estimated national thermal capacity

At last, some figures have been found in some public institutions and national statistics agencies in table Table 3.

	Germany [MW]	France [MW]	Wallonia [MW]	Luxembourg [MW]
2014	8400	-	156	24
2015	9200	-	-	34
2016	10000	-	-	-

Table 3: Capacity installed estimated by public institutions ([7], [9] and [12])

4.4. Heat pumps estimation for the Greater Region

As no sufficiently recent figures (for 2016 or 2017) have been found for every country and even less at the regional level, a lot of assumptions have to be done in order to estimate the number of heat pumps as well as their installed capacity in the Greater Region:

- For Rhineland-Palatinate and Saarland, the estimations are based on the national figures (Ministry of economic affairs and energy) distributed proportionally in these regions according to their population.
- The figures of Luxembourg are all based on Statec's figures except those of 2016 which are an estimation based on the figures of 2015 with an average European sales growth of 12.2%.
- The most precise figures in terms of installed units and capacity for Wallonia are from 2014. Moreover, some Belgian sells figures from 2009-2016 have been found from ATTB [13] (Belgian heat pump association). The estimation has been based on these two sources with the assumption that one third of the Belgian sales happen in Wallonia.
- By lack of precise and/or recent numbers that can be cross-checked with other sources for France, the estimation is based on the EHPA's figures of 2012 to which we added a sales estimations based on the yearly growth of the French market.

	Rhineland- Palatinate	Saarland	Lorraine	Wallonia	Luxembourg
2014	41730	10430	45269	23743	1428
2015	44538	11131	51424	25693	1615
2016	47839	11957	58317	27793	1812

Table 4: Estimation of the number of heat pumps in the Greater Region

Based on Table 4 there is an estimated number of around 147700 in the Greater Region in 2016.

[MWth]	Rhineland-	Saarland	Lorraine	Wallonia	Luxembourg
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Palatinat

2014	414	103	453	237	24
2015	453	113	514	257	34
2016	493	123	583	278	38

Table 5: Estimation of the installed thermal capacity in the Greater Region

The table 5 brings us to an estimated total thermal capacity of 1515 MWth in 2016. With an average seasonal COP of 2.7 this could make about 561 MWe1 for the whole Greater Region.

4.5. Short view on the market progression and trends

The heat pump market is a very fluctuating market and highly depends on the country. We have experienced a market acceleration between 2004-2008 followed by a stagnation between 2009-2014 (see figure 11). According to [8],the sells seem to grow again since 2015 with an average European rate of 12.2% [5] for this specific year and confirmed in 2016 [10].

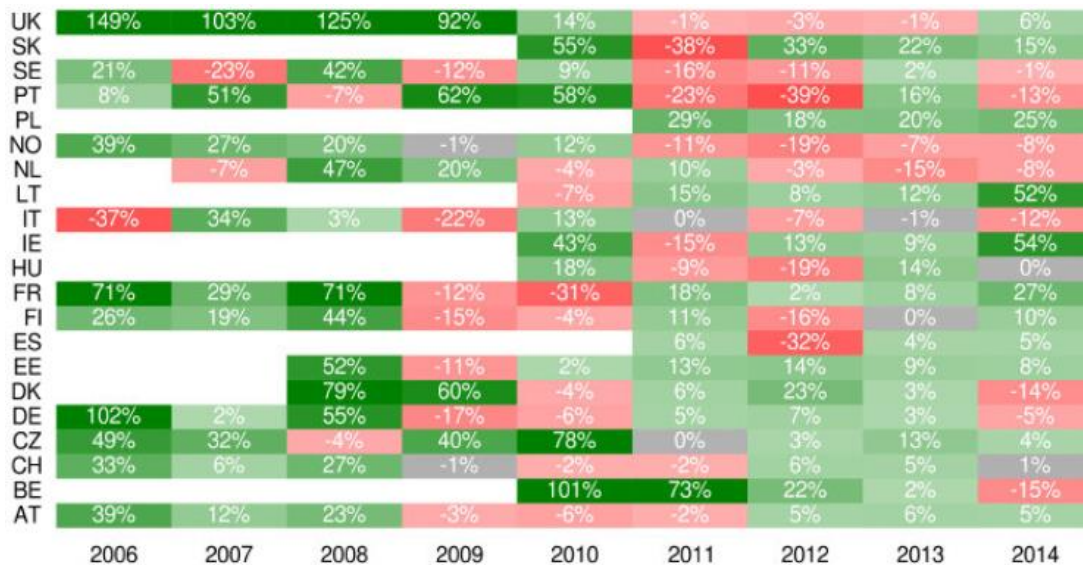


Figure 7: Market growth progression [4]

As we can see in Figure 8, the dominating technology is the air source heat pumps (48% air-air, 20.4% air-water); ground source heat pumps count only for 10%. Air-source heat pumps also grow faster than ground source heat pumps: +49000 air-air and +22000 air-water more units sold in 2014 against +3000 for ground source heat pumps. [5] The shares of ground source heat pumps is even literally decreasing in markets such as for France (-22% in 2016 [6]).

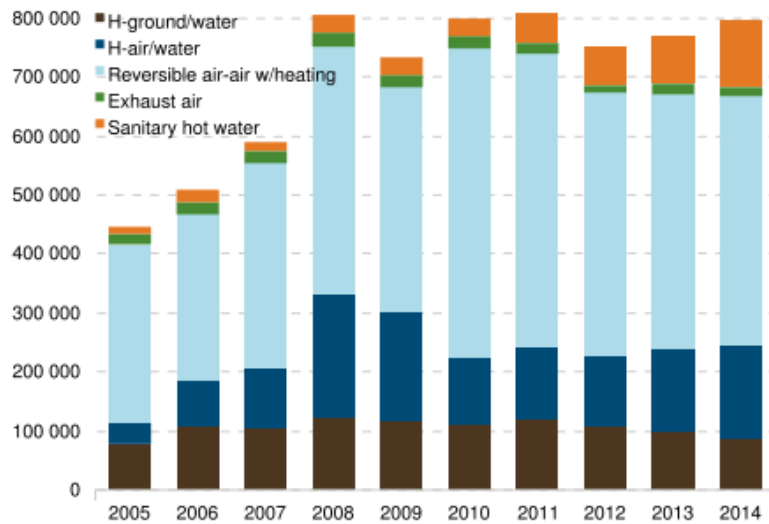
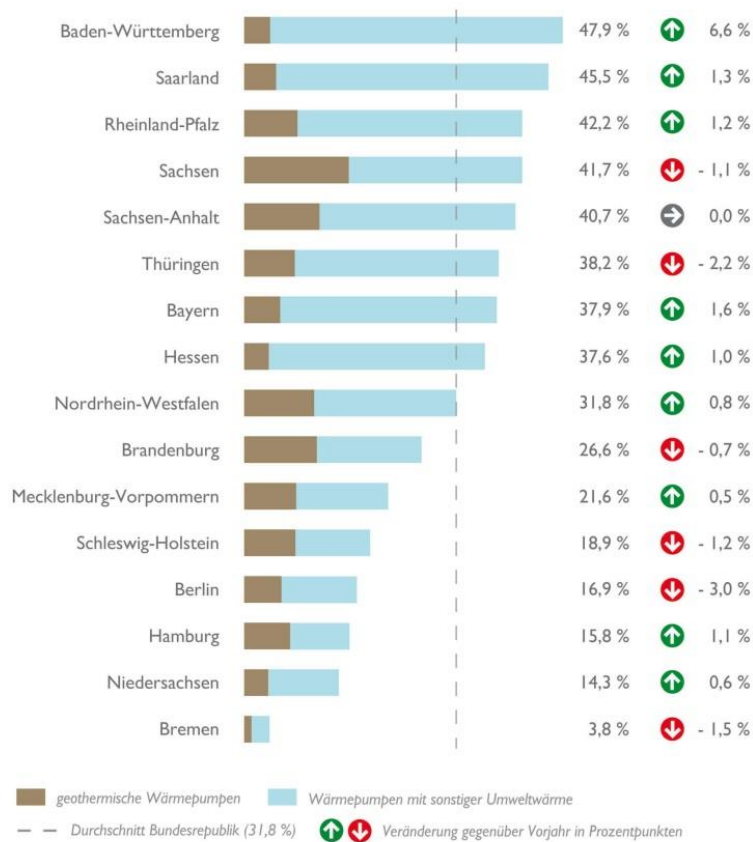


Figure 8: Technology share [5]

At last, after gas fired boilers (with 47%), heat pumps are more likely the preferred technology installed in new buildings with 31.8% in Germany [14] in 2016. This number can rise to 42.2% and 45.5% respectively for Rhineland-Palatinate and Saarland (See figure 9).

Anteil der Wärmepumpe in neugebauten Wohngebäuden in 2016



Quelle: Statistisches Bundesamt. Baufertigstellungen bei Wohngebäuden nach vorwiegend verwendeter primärer Heizenergie im Jahr 2016

bwp Bundesverband Wärmepumpe e.V.

Figure 9: Share of heat pumps installed in new buildings of 2016 in Germany [14]

5. Sources

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