ProHeatPump

ProHeatPump

Project

Promotion of efficient heat pumps for heating

(ProHeatPump)

EIE/06/072 / S12.444283

Deliverable N°6

Preliminary report on market analysis in the determined regions and specified SME sectors

swb

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Work Package 2
Market analysis of heat pumps for heating and cooling of buildings

Intelligent Energy Europe

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1 Introduction

Every partner chose a rural target area to investigate during this project. The figures below show the energy prices in the different target areas in comparison. Due to rising energy prices people are thinking of alternatives to decrease their energy costs. A huge part of these costs are caused by heating. Using a heat pump could be a way to decrease the energy costs strongly.

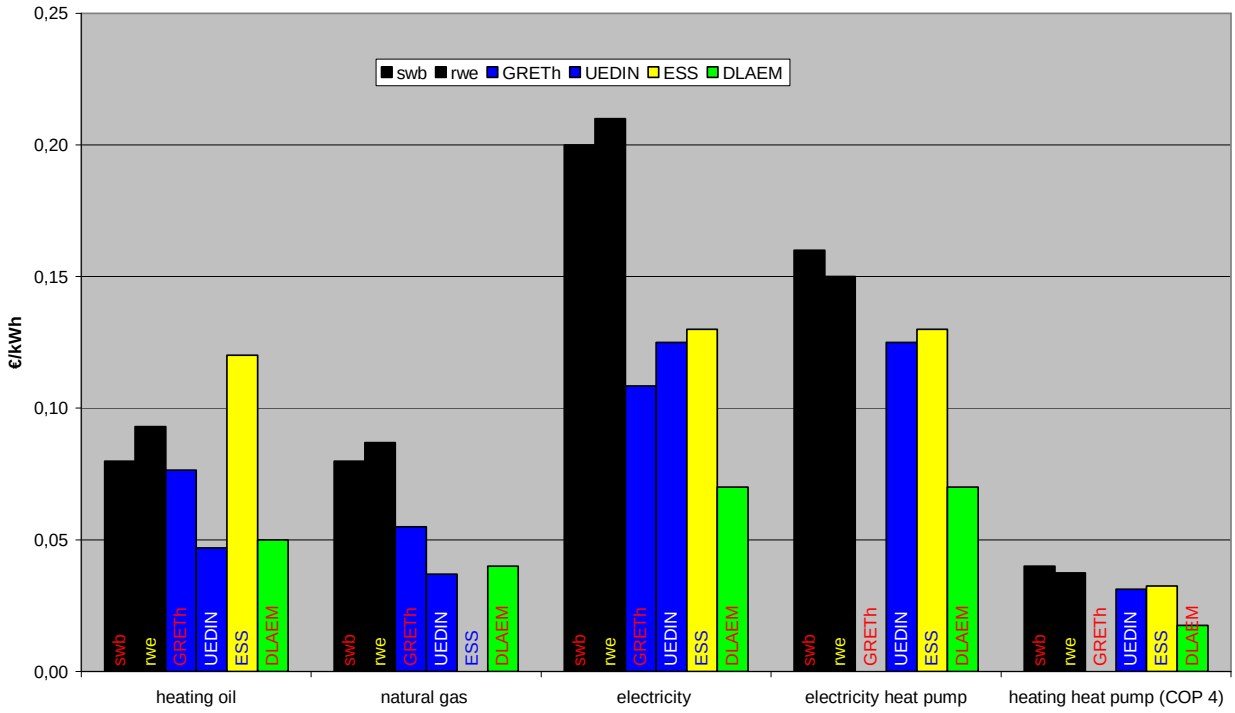


Chart 1.1: Fuel prices in each target region

Partner		swb	rwe	GRETh	UEDIN	ESS	DLAEM
target area		Osterholz	Rhein-Erft	Rhone-Alpes	Edin, EL, PK	Kal, Ble, Kro	Dob, Varna
		€/kWh	€/kWh	€/kWh	€/kWh	€/kWh	€/kWh
heating oil		0,08	0,09	0,08	0,05	0,12	0,05
natural gas		0,08	0,09	0,06	0,04	-	0,04
electricity		0,20	0,21	0,11	0,13	0,13	0,07
electricity heat pump		0,16	0,15	?	0,13	0,13	0,07
heating heat pump (COP 4)		0,04	0,04	?	0,03	0,03	0,02

Table 1.2: Fuel prices in each target region

2 Market analysis Germany (swb)

The lead partner swb Netze Bremerhaven chose the district „Osterholz“ as its target area. The district is placed north of the city of Bremen in the northwestern part of Germany.

Chart 2.0: Location of district “Osterholz” (brown area) in Lower Saxony in northwestern Germany

2.1 Energy supply

The energy supply in the district “Osterholz” is assured by three companies:

- Stadtwerke Osterholz-Scharmbeck
- Gemeindewerke Ritterhude/Lilienthal
- ewe

A huge amount of money has to be used every year to pay the energy consumption in this target area.

electricity: 42.300.000 €/a heat: 48.000.000 €/a

2.1.1 Current energy supply

There is electricity available everywhere in the target area and also the gas grid is especially well developed compared to other rural areas. In some minor urban centres district heating is also available so there are some different options of heat supply – using a heat pump is just one.

2.1.2 Energy prices

The table below shows the development of the energy prices over the last ten years in the different target areas.

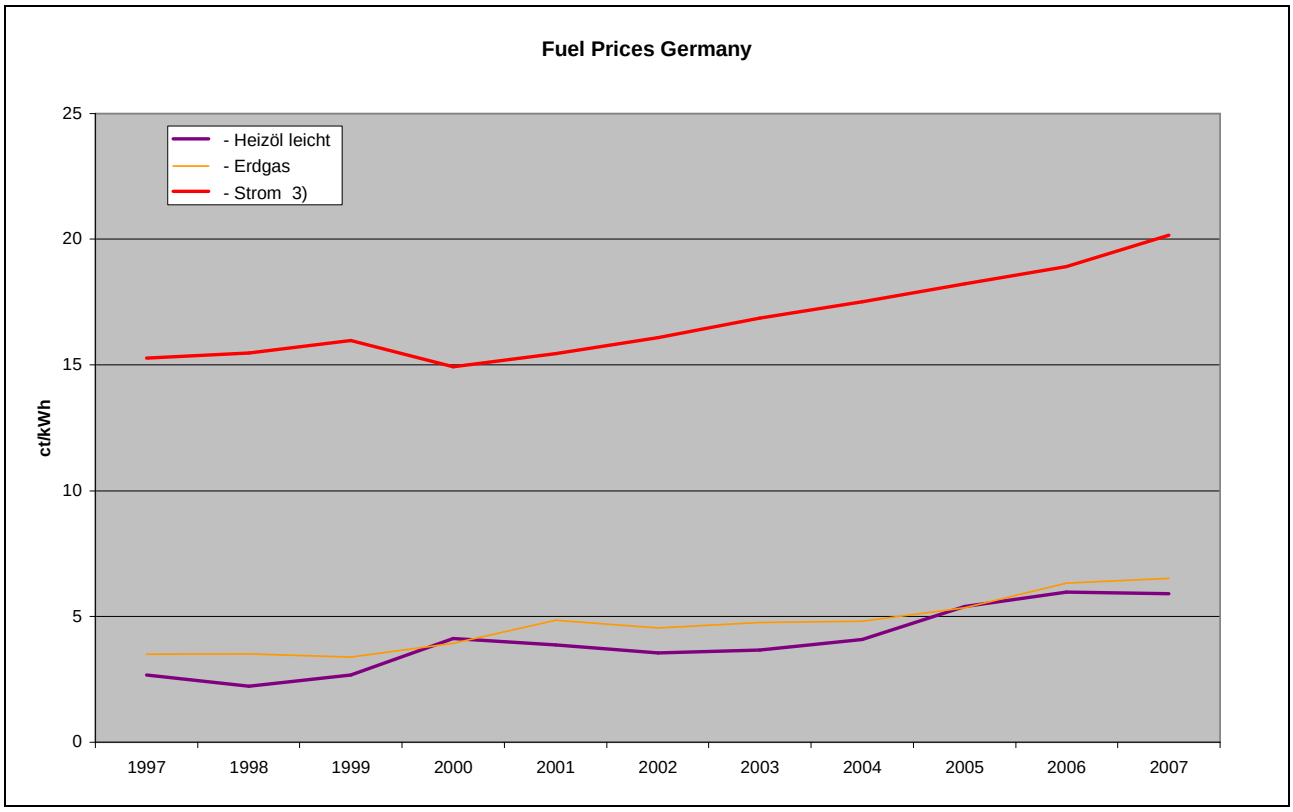


Chart 2.1: Fuel prices in Germany, 1997 – 2007

In Germany the heating costs could decrease by 50% if an efficient heat pump is in use compared to natural gas systems referring to heating an adequate residential building.

2.2 Market analysis

The number of installed heat pumps has been increasing rapidly in the recent past. Due to rising prices of oil people think about alternatives and the German heat pump market has been growing in 2007 by an average rate of approximately 20%.

2.2.1 Availability of data

The during the kick-off meeting compiled table has been used as a base to collect information for the market analysis. Some changes were recently made because the before defined data has not been available.

The requested data are distinguishable in three category groups:

- non-residential sector of buildings
- residential sector of buildings
- installed heat pumps in the target areas

Data referring commercial buildings could not be delivered by the administration of the district.

The total number of dwellings in the district is known. The quantity of dwellings built since 1990 has been calculated by the national shared Data referring residential buildings in the target area are not available so national because this information is not available on a regional level. It is assumed that the distribution of buildings in Germany and in the target area regarding time of construction and insulation is similar.

Data referring installed heat pumps in residential buildings in the target area has been delivered by the energy supplier. In case of being supplied by electricity with a special rate the energy supplier was able to specify the number of installed heat pumps. It is not possible to distinguish the installed units by their heat source so the national shares have been use to calculate the numbers.

2.2.2 Non-residential sector

The level of information regarding installed heat pumps in the non-residential sector is very poor in the target area. There have not been any promotion programmes to use heat pump technology for heating business buildings. Due to that and the high penetration of the gas grid heat pumps are not common in the non-residential sector. The high investment is also hindering the use of heat pumps because the payback is evaluated as too long.

2.2.2.1 Installed units

The number of installed units in this sector could not been determined yet. It is not available by energy suppliers or administrative departments.
It is not common to use a heat pump for in administration or factory buildings. On the one hand the capital investment is much higher and natural gas and district heat are available. On the other hand consumers with a high demand of energy receive cheaper rates than private citizens by the energy supplier so the cost saving of a commercial application would decrease.

2.2.2.2 Market development

Even a rough estimation would not be meaningful to measure the recent market development because the number of heat pumps for heating is considered very few.

2.2.2.3 Market potential

There is a market potential concerning heat pumps in non-residential applications if they are used in combination with heat recovery. If there are air conditioning systems in use in commercial buildings a heat pump could transfer waste heat into the fresh air to save energy and decrease costs. There are different sources of waste heat for example the outlet air of an air conditioning system in administration buildings or the waste heat of an industrial process.

2.2.3 Residential sector

Regarding the domestic buildings in the target area the share of heat pumps is quite low. There are 47.525 dwellings overall in the district. Compared to the number of heat pumps there is a huge potential not developed. Especially the owners of adequate buildings by their insulation standard which are at least those were built since 1990 should think about using an efficient heat pump for heating. The share of

buildings built since 1990 in Germany is about 11% so there are 5227 adequate dwellings. The supplier ewe has started to promote heat pumps in two other districts besides so these promotion activities could be extended to the target area as well.

2.2.3.1 Installed units

Due to natural gas is available everywhere and heat pumps have not been promoted in the area there are just 175 installed units by the end of 2007. The installed units can not be distinguished by their heat source. The national allocation could be used for an estimation.

- ground source 45%
- air 34%
- water 7%

2.2.3.2 Market development

There has been a steady increment over the last years which is averaged 20% (see line “increment LK“). The absolute number however is with 175 (see line “total HP LK”) units still low. As the table shows the development of different areas of the three energy suppliers in the district is very different.

Year	2002	2003	2004	2005	2006	2007
total HP LK	122	135	143	151	160	176
Increment LK	-	17%	13%	14%	19%	34%
total HP RiLi	7	9	11	14	18	22
Increment RiLi	-	29%	22%	27%	29%	22%
total HP eweGeb	107	117	122	126	128	129
Increment eweGeb	-	9%	4%	3%	2%	1%
total HP Osterholz	8	9	10	11	14	25
Increment Osterholz	-	13%	11%	10%	27%	79%

Chart 2.2: market development in the target area, 2002 – 2007

The prospective market development could be expected with an increment of at least 20%. With the specific intervention by ProHeatPump the increment should be upgraded to 30% or more in the target area. Following the development in the past and looking into future there would be 438 heat pumps installed. The “best-case scenario” indicates a number of 650 installed units could be reached in 2012 if there are successful interventions.

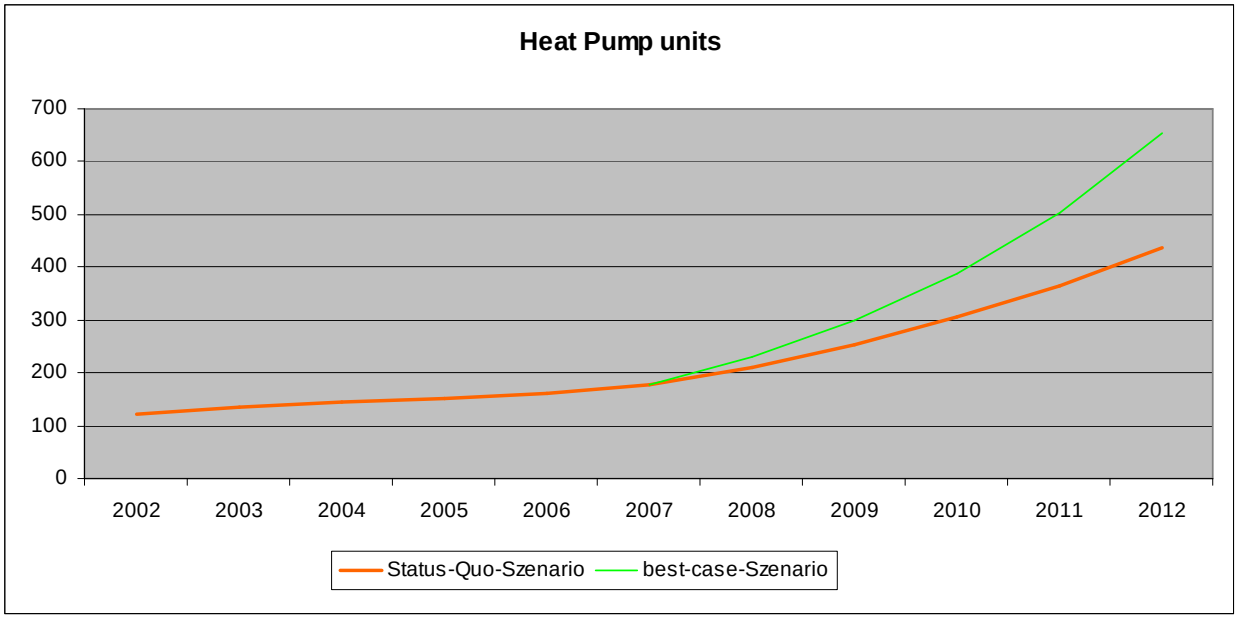


Chart 2.3: Market development in Germany, 2002 – 2012

2.2.3.3 Market potential

Concerning new buildings a realistic short term market potential could be to use a heat pump in every third new one and two family house to reach the same share as natural gas and oil.

In addition those buildings which were retrofitted recently should be investigated if they are appropriate to a heat pump. Due to rising energy prices there is an increasing potential of using heat pumps in retrofitted old buildings.

2.3 Conclusion

Although the heat pump market is not well developed yet in district “Osterholz-Scharmbeck” the increment of installed units has been steady. ProHeatPump should achieve an improved cooperation of the most important market players in the region to assure the best consulting if a customer is interested in using a heat pump system to reach a satisfying result.

These market players are:

- The energy consultant
- The installer
- The energy supplier

3 Market analysis Germany (rwe)

The district „Rhein-Erft-Kreis“ is located in the west of Germany in the province of North Rhine-Westphalia between the Cities Cologne, Düsseldorf and Aachen. Its total size is 704,7 km² and comprises approximately 464.209 inhabitants. The population density of the district is normal with 659 inhabitants per sq. km regarding German conditions.

In the graph below is shown the location of the Rhein-erft-Kreis in Germany and North Rhine-Westphalia.

3.1.1 Current energy supply

The target area Rhein-Erft-Kreis is well developed concerning energy supply. The whole area is covered by a electricity supply grid. All residential buildings have access to the grid. For heating supply natural gas, supplied by a gas grid has been very common. Due to the vicinity to the power station some official buildings like city halls, public swimming bath and kindergarten are connected to district heat. Another common heating system is electric storage, due to the fact that many people living in that area working in the near by power plants receiving granted electricity. Also heat pumps have been popular in the late 70´s and early 80´s, by the people working in the power plants. Today heat pumps are very popular in this region again, because of the regional history of heat pumps and the heavily raising energy prices. Today not only people working in the power plants using heat pumps, also a wider range of

people considering heats pumps as a economical and ecological heating source. Other heating sources like biomass, coal or liquefied gas play a minor role.

3.1.2 Energy prices

The table below shows the present energy prices in this target area.

Partner		rwe
target area		Rhein-Erft
		€/kWh
heating oil		0,09
natural gas		0,09
electricity		0,21
electricity heat pump		0,15
heatig heat pump (COP 4)		0,04
district heating		0,09
pellets		0,04
electric storage heating		0,12

Chart 3.1: development of energy prices in Germany

3.2 Market analysis

The German heat pump market has had a steadily growing development since the beginning of the early 90s. Since 2000 the growing of the market has increased even more rapidly with its peak in 2006 a growth of 147% up to 44.000 sold units per year. Also in 2007 the market grow by 1% (45.000 sold units). In Germany are 300.000 hp units in operation at the end of year 2007. In 2008 it seems the market will reach the number of 50.000 sold units. In market development is shown in the following graph. Brine-water heat pumps are still the most popular heat pumps, but air-water heat pumps are growing fast. Air –water heat pumps are a cheaper investment compared to brine-water machines and especially in the renovating sector of heating systems, they become more popular.

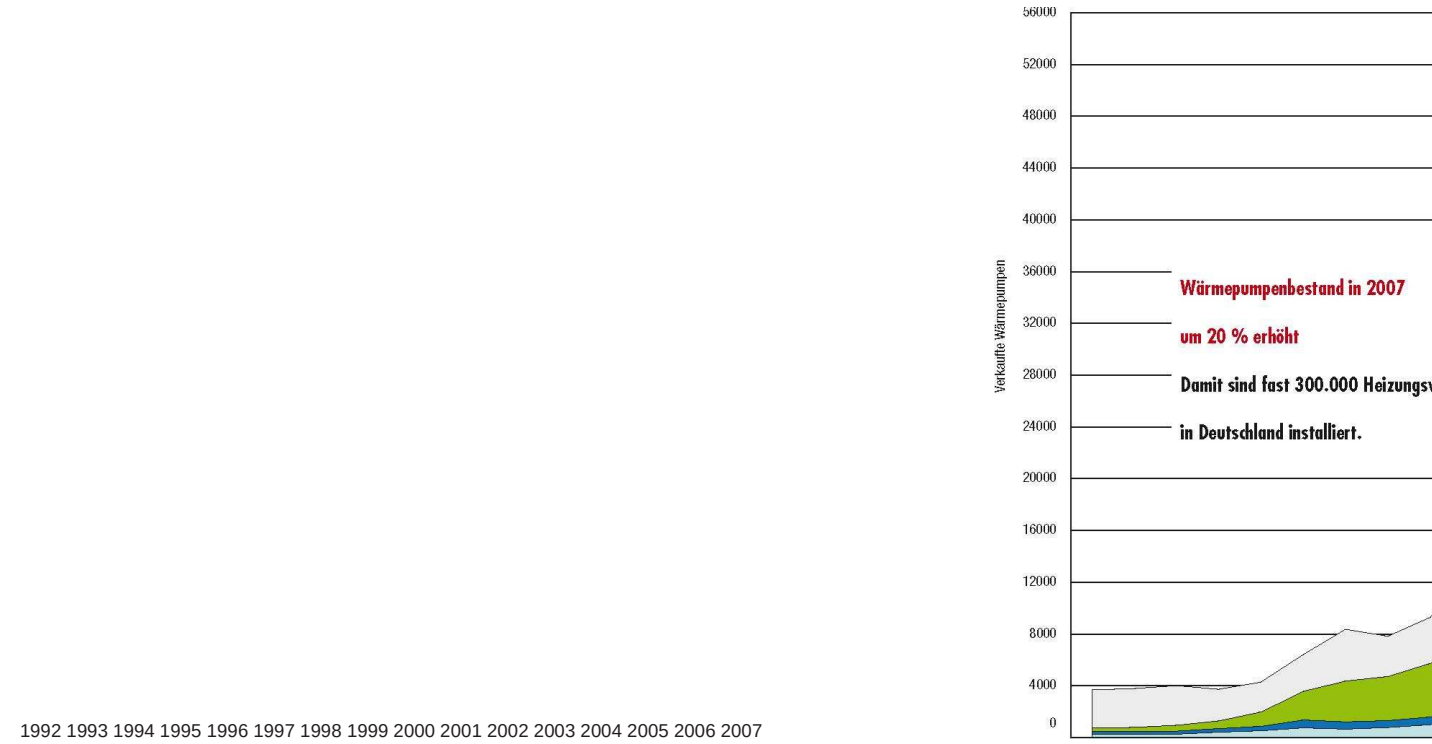


Chart 3.2: market development in Germany, 1992 – 2007

3.2.1 Market segments

In the Rhein-Erft-Kreis the potential users of heat pumps has been estimated and compared to the installed units today. The potential for heat pumps in the segment of renovation are oil heated houses and houses using other energy sources such as liquefied gas or coal. In the segment new buildings all houses belong to the potential

users of heat pumps. Especially areas in which natural gas are not foreseen. But also in those areas heat pumps gained serious market shares.

	Total	Natural Gas	Electric Storage Heating	Oil	Heat Pump	Others
Total	109087	55692	19267	25568	3597	4963
%		51%	18%	23%	3%	5%
(Semi-) Detached Houses	96123	49367	16762	21730	3578	4686
%	88%	51%	17%	23%	4%	5%
Multi Family Houses	12964	6325	2505	3838	19	277
%	12%	49%	19%	30%	0,1%	2%

Chart 3.3: Overview of the heating structure of the district of Rhein-Erft-Kreis

Gas, oil and electric storage heating are the dominating heating technologies. Heat pumps have a minor share, even they grow rapidly in the last years. Other heating sources are liquefied gas, district heating, coal and lignite as well as pellets. Also solar thermal technologies gains market shares. This technology is used to support heating drinking water and in some cases also to support heating.

3.2.2 Non-residential sector

Data for the market segment SME is currently not available. Concerning heat pumps SME had played no role in the past. This have changed in the last couple of years. New SME buildings such as smaller office buildings and factory halls have considered to heat and cool the building with a heat pump (passive and active cooling). The chance to cool a building with a heat pump much more cost effective than with an air condition system is quite attractive for investors, especially with a view of the further development of energy prices. But the high investment costs are an obstacle.

Often is the investor and the user of a building not the same company. The investor tries to invest not to much money in a building, especially in the heating system, so he can offer the building for a attractive lease. The operating costs of a building have to be paid by the leaser. Since energy prices have risen so dramatically, leaser pay more attention to the operating costs of a building. Therefore heat pumps with the ability to cool passive and active will become a greater market share in new constructions. In the renovating sector of SME heat pumps will play no mayor role. The investment costs are normally to high and the technique of the building is not compatible with a heat pump.

3.2.3 Residential sector

In the residential sector about 3% of the houses are heated by heat pumps in the region. This is slightly higher than the German average which is about 1-2%. The reason is the close relationship of the people working in and for the power plants and the utility company in the region. The people working for the electricity company have a long tradition heating with electricity (electric storage heating) and also the company marketing heat pumps very strong. Both together leads to a stronger penetration of heat pumps in the Rhein-Erft-Kreis.

But the market share in the existing house is still quite small. In the last 20 years the major energy source for heating in Germany has been natural gas. Also in this by lignite dominated area. Normally each new build house has been more or less automatically connected to the gas grid. Natural gas had a very good reputation. But since the prises have risen so hard and the feeling that the supply is not sure for longer, investors think about alternatives. The great dependency of Germanys gas supply of Russia make the people unsure for the future, which is the right energy source.

Table 4 shows the development of the share of the different heating energy resources for new buildings in Germany since 1990. Gas have had a share of more than 70% over many years in the past, but has gone back in 2006 significantly under 70% to nowadays to an 18 years all time low of less than 60%. Heat pumps are with 17% the most common heating alternative in the meantime. Also district heat becomes more popular due to the support schemes of the national government. Other sources are pellets and biomass, as well as solar thermal.

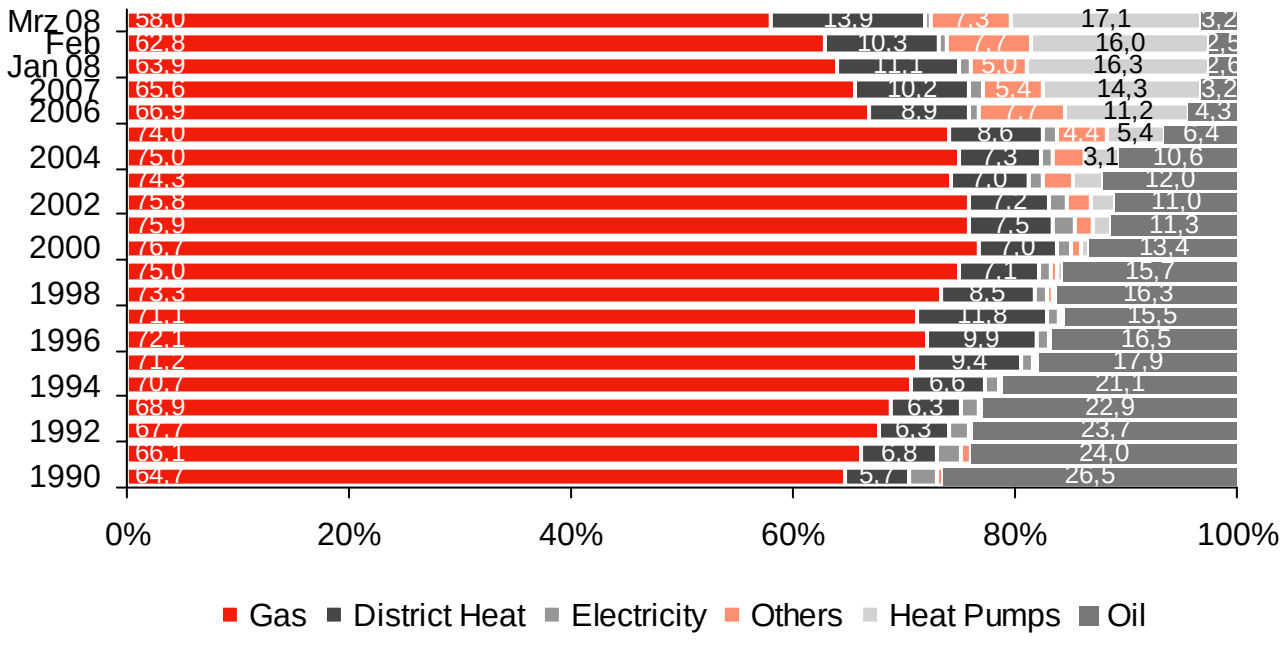


Chart 3.4: development of energy sources used for heating in new buildings

Below chart 3.5 shows the development of sold heating units since 1979. After a steady growing up to a peak in 1994 of more than 650.000 units. This 1995 the market have decreased rapidly down to 200.000 units per years. The share of gas in 2030 is estimated of 50%, which seems to be optimistic, if taken into consideration that gas has already fallen down to 58% in early 2008.

Coming up a new energy building standard (EnEV 2009) and a new law (EEWärmeG), forcing the use of renewable energies for heating, the over all consumption of new buildings will drop to 1000 – 1500 m³ gas/a and unit. Additionally the numbers of new houses will decrease further, due to an over aging population.

In new settlements gas suppliers will calculate, if a new gas grid is feasible. If 50% and more of the new houses will switch to an other energy source and the energy consumption of the houses are so low, the pay off time for a gas grid will take to long.

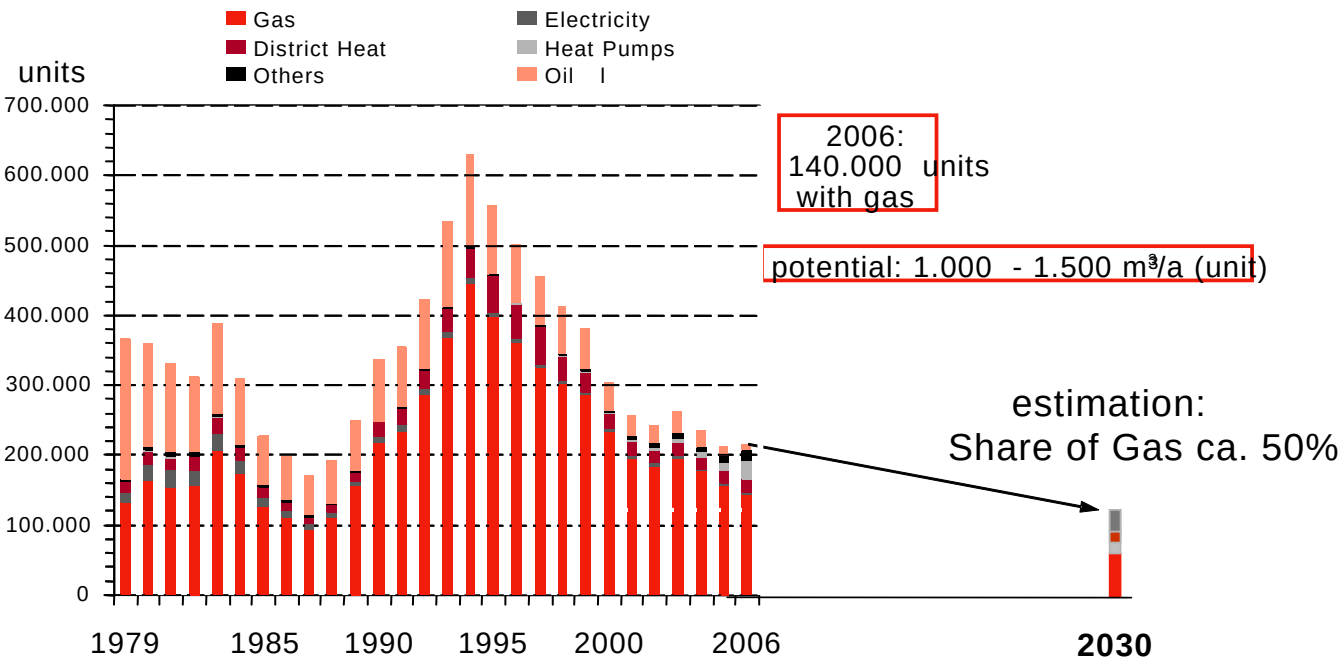


Chart 3.5: development and estimation of energy sources used for heating in new buildings

3.2.3.1 Installed units

In chart 3.5 are shown the number of installed units per year and heat source. Ground source heat pumps play still a mayor role. Air to water heat pumps grow faster in the last years and water to water heat pumps play in this region a minor role.

In analogy to the German development of the market of heat pumps the regional market in Rhein-Erft-Kreis had developed. Two developments should be outlined. In the past ground source heat pumps had have the majority. Air to water and water to water heat pumps had have an minor proportion. Nowadays air to water heat pumps become more and more popular. Two reasons could be seen for that. First the investment costs for air to water heat pumps are slightly lower than for brine water heat pumps. The installation is easier compared to the drilling. And secondly air to water heat pumps are the first choice in most of the renovating cases, also due to the easier installation.

Compared to other countries like Sweden or France air to air heat pumps play no rule in Germany. In Germany a hydraulic heating system is still state of the art.

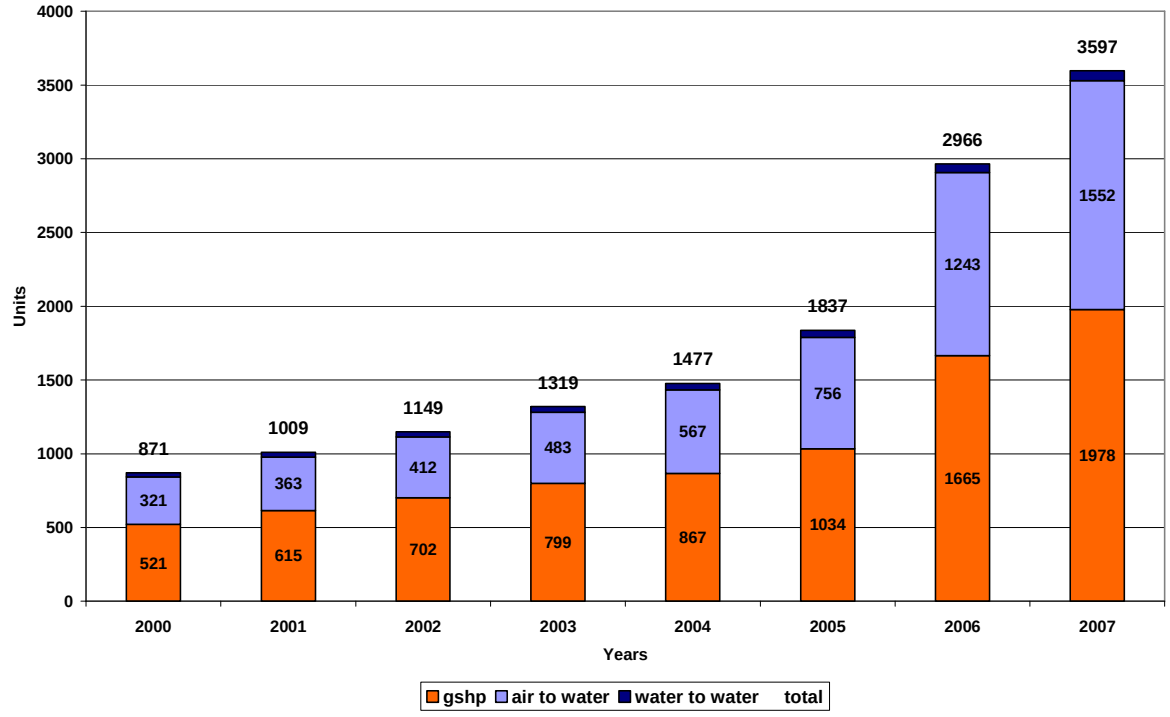


Chart 3.6: market development of heat pumps in Rhein-Erft-Kreis since 2000

3.2.3.2 Market development in the region

Since 2000 the region recognises a significant growth of heat pumps. In 2006 the region had a growth rate of 61% compared to Germany with 147%. This is significantly smaller than the German growth rate. The region had already been well developed concerning heat pumps. The penetration of heat pumps has been quite high. A growth rate of more than 100% is not feasible in that region. The very high growth rate in 2006 in Germany had to major reasons. Firstly the new value added tax, which had risen from 16% to 19% from 2006 to 2007.Many investments have been done in 2006 to avoid the higher VAT. Secondly the rising gas price. Regions where almost no heat pumps had been installed in the past suddenly investors chose heat pumps. Those developments led in many regions to the big growth rate in 2006. In Germany heat pumps still have a very little share of about 1-2% in heating. From this little share a growth rate above 100% is feasible. But if the share is already higher in a specific region like the Rhein-Erft-Kreis it is not feasible that a similar growth rate will be reached.

But in 2007 when in Germany the market had grown only by 1% the growth rate in the Rhein-Erft-Kreis had been again higher than the German rate. 21% has been the growth rate 2007 in the region. The steadily marketing and information of the electricity company in connection with the installers and manufactures lead to this development. The electricity company promote heat pumps on there website, in regional newspapers, info evening for investors and with different support schemes.

One of the mayor obstacles for an investor had been to find the different installers for the heat pump, the drilling, the electric installation and the building. The electricity company put those installers together, helping an investor to find the right handcrafts. This in connection with an attractive support schemes lead to a very successful development.

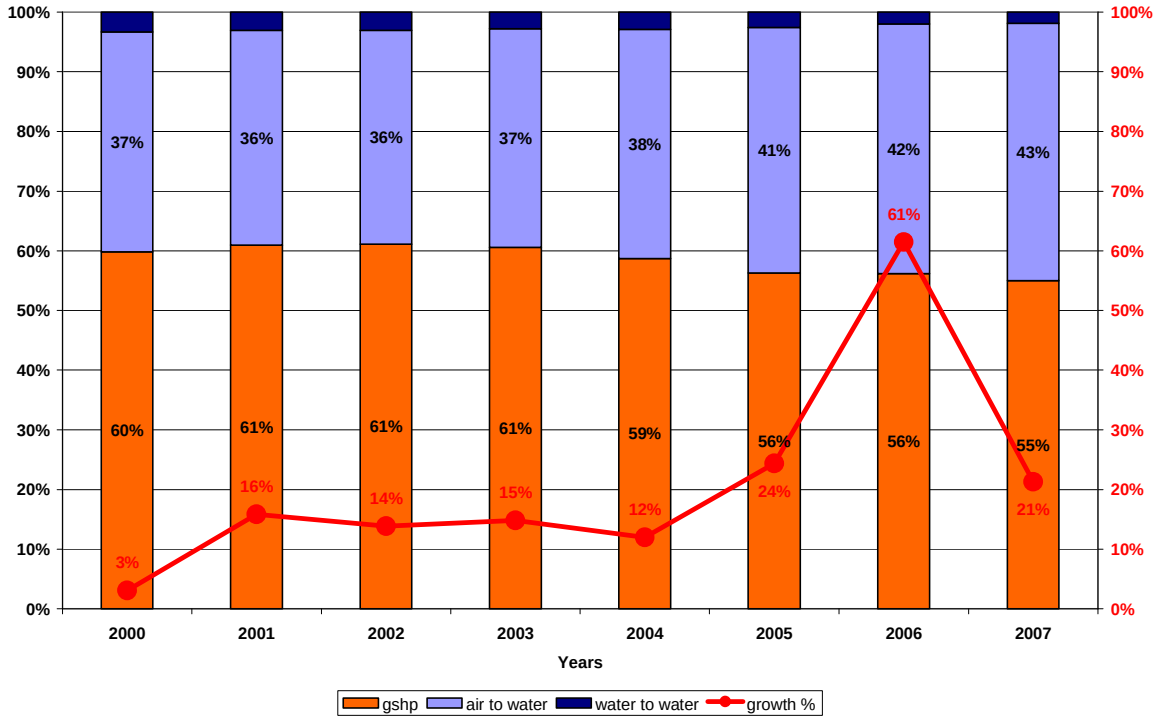


Chart 3.7: market shares of heat pumps and groth rate in Rhein-Erft-Kreis

In chart 3.7 is also shown that the market share of air to water heat pumps is steadily growing.

3.2.3.3 Market potential

The market potential of the region is mainly characterised by new buildings and by the houses using today oil and other energy sources for heating. The electricity company offered a support scheme which focus especially on the exchange of old oil boilers to new heat pumps. This programme is very successful. In the first six months 2008 already 41 heat pumps have been installed - 38 replaced oil boilers.

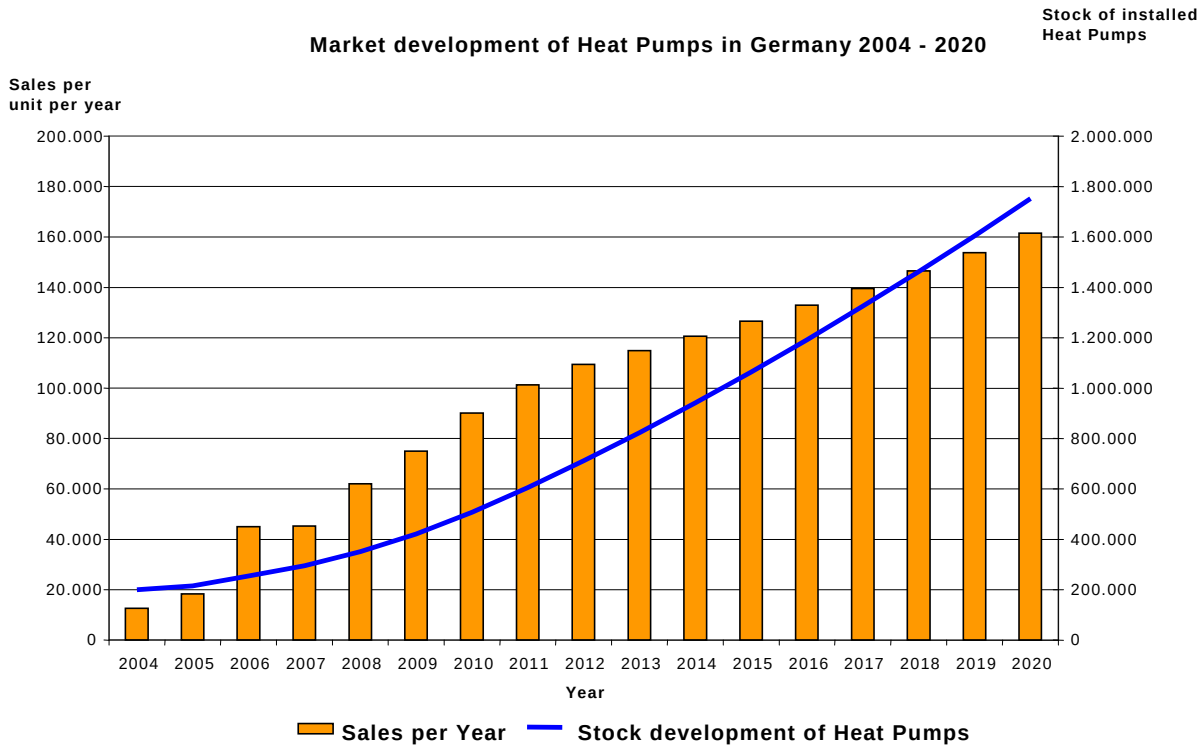


Chart 3.8: market development of heat pumps in Germany, 2004 - 2020

In the region of Rhein-Erft-Kreis a comparable development is foreseen as in Germany. The marketing and promotion of heat pumps in the region will gain new investors for heat pumps. An important argument is the lower price for heating. This argument will lead to discussions in the neighbourhood and among families and friends. This is an important way to convince people which had never heard about a heat pump. The reliability of friends is much more worth than the statements of companies. But to reach this goal it is very important that heat pumps fit to the house and that the installation has been done proper.

With today's energy prices a heat pump has a pay back period of 7 to 10 years, depending which kind of heat source is chosen. Ground source heat pumps are more expensive than air to water heat pumps.

3.3 Conclusion

The heat pump market in Germany is still quite small. A sale of 50.000 heat pumps per year from all heat pump producers together is the average production and sale

of gas and oil boilers of one of the big heating system producer such as Vailiant, Viessmann and Buderus. The heat pump producer have enlarge their production capacities in the last two years to keep up with the market growth.

Heat pumps will play an important role in the future in the German heating market. But the market strength of the gas companies should be not underestimated. A marketing campaign for gas condensing boiler and gas heat pumps could change the market development again. The market development is not stable yet. Therefore a market share of more than 5% of installed heat pumps is necessary.

Another interesting market segment is coming up with SME. As describe above the factor financial affordable cooling become more and more important to office and production sites. In this segment an additional growth is feasible.

4 Market analysis France (GREThh)

Report from GREThh is missing.

Target area :

- Region Rhone-Alpes
- Population : 5.81 Million (9.73% of France)
- Surface : 43700 km² (8.06% of France)
- Density : 134 inh/km²
- Number of town over 100 000 : 7 (Annecy, Annemasse, Chambéry, Grenoble, Lyon, Valence and Saint-Etienne)

Location of Rhone-Alpes target area in France

Energy data

General energy data (source Ademe)

- CO2 emission for electricity (heating) : 180 g / kW h
- CO2 emission for natural gas : 0.273 g /kW h
- CO2 emission for domestic fuel : 0.450 g / kW h
- CO2 emission for coal : 0.588 g/ kW h

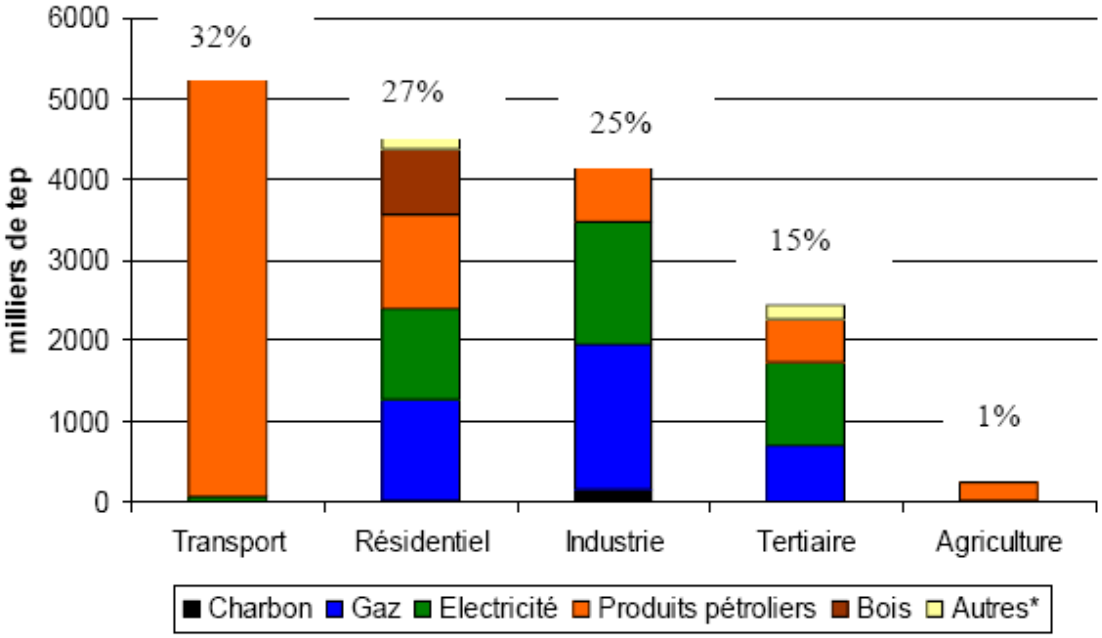
Energy prices for France (source DGEMP) in € for 100 kWh PCI

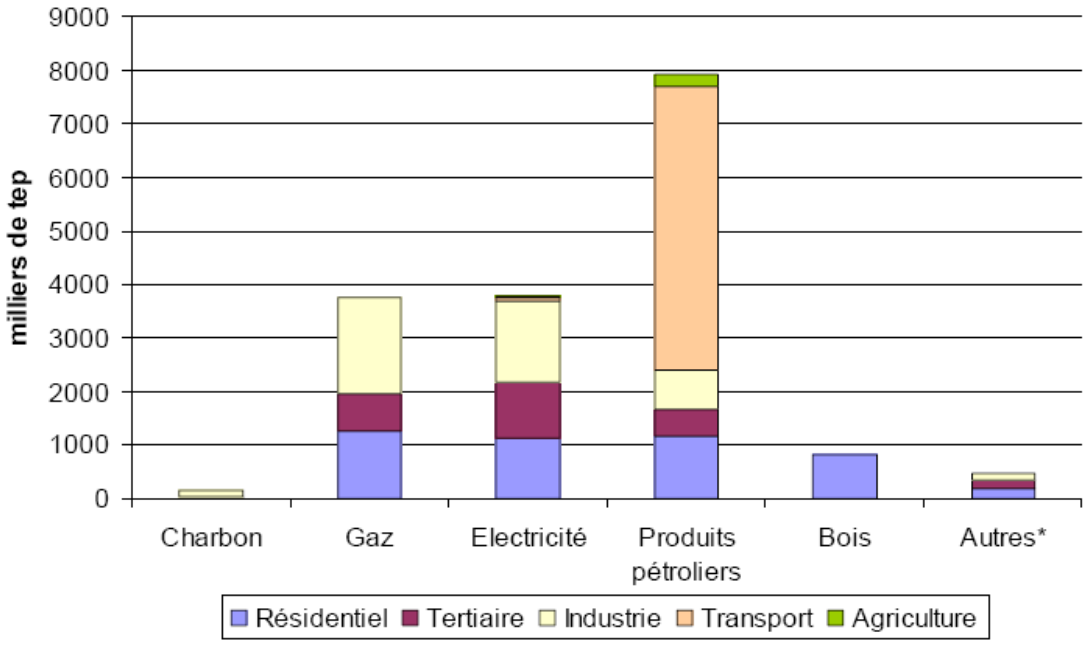
	January 2007	January 2008	Variation
Domestic fuel	5.6 €	7.64 €	+ 36%
Propane	10.61 €	11.72 €	+ 10 %
Coal	6.52-6.97 €	6.51-6.96 €	0%
Electricity	10.74 (single rate) – 6.54 (double rate)	10.85 (single rate) – 6.61 (double-rate)	+ 1%
Natural gas	5.2 to 5.39 €	5.41 to 5.61 €	+ 4%

Energy consumption in the target region

Energy consumption for residential (R) and tertiary (T) buildings in 2002:

- Coal : 81.5 GW.h
- Fuel and propane : 22.9 TW.h (73.3% R / 26.7% T)
- Natural gas : 19.8 TW.h (66.6% R / 33.4% T)
- Electricity : 21.4 TW.h (59.5% R / 40.5% T)
- Wood : 5.8 TW.h (100 % R / 0% T)
- District heating 2.55 TW.h (62.4% R / 36.6% T)
- **Total 75.1 TW.h**





Energy consumption by type and sector in toe (ton oil equivalent: 1 million toe = 11.63 TWh)

Target 1: buildings

- Non-residential building (office, commercial, industrial, health, social, hospital, schools and hotels)
- Size below 2000 m²
- Technology : reversible geothermal heat pumps (heating and cooling)
- Total built area : 84 million m²
- Built area 1980-1997 : 30.8 million m²
- Built area 1998-2005 : 16 million m²

Building typology for the period from 1980 to 2005(source MTETM-SITADEL)

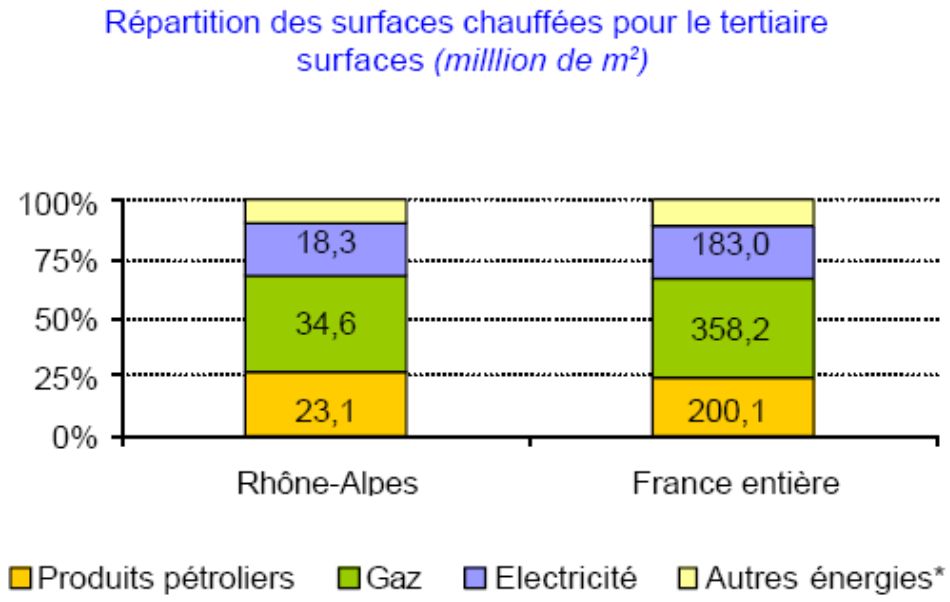
Building type	Surface (millions m²)	Number	Average surface (m²)
Public	13.1	20154	651
Commercial	8.3	14070	593
Hotel	1.2	1010	1145
Industrial+office	23.5	32368	727
Total	46.1	67602	683

95% of the buildings are less than 2000 m² (representing 60% of the surface).
73% of the buildings are less than 500 m² (representing 23% of the surface).

Energy usage in non-residential buildings in area

- Fuel and propane : 23.1 millions m² (28%)
- Natural gas : 34.6 millions m² (41%)
- Electricity : 18.3 millions m² (22%)
- Other (coal and RES) : 8 millions m² (9%)

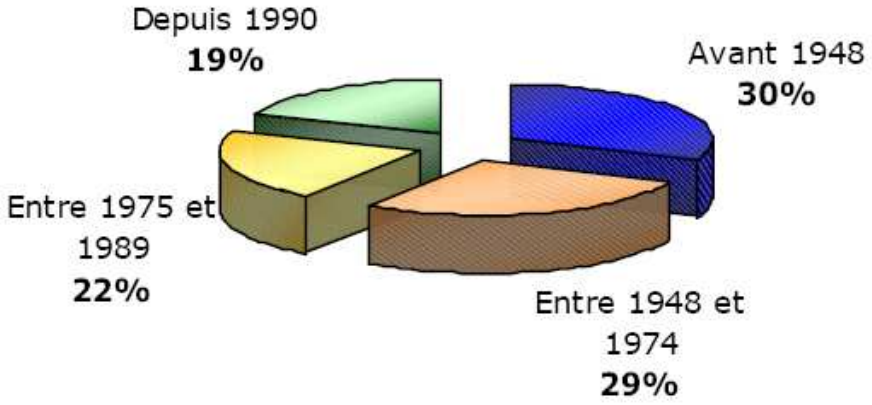
Total 84 millions m²



Target 2: Residential buildings

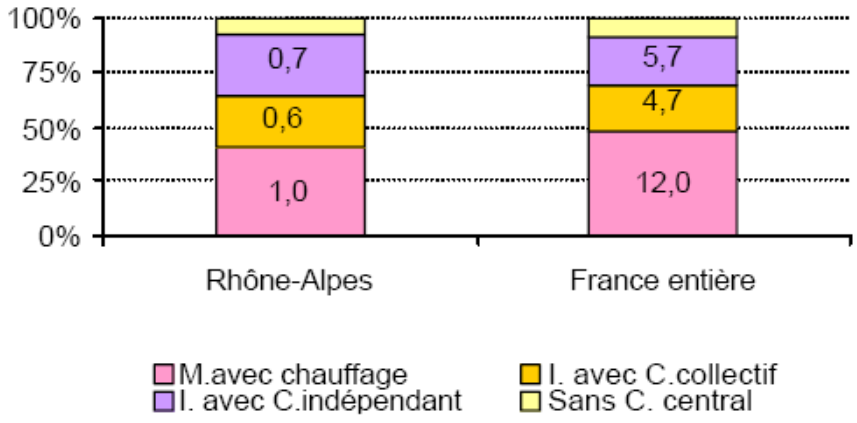
In Rhone-Alpes region there are 3 025 000 residential buildings (10% of the French stock), with more that 80% of principal housing. 41% are owners of their house/apartment. 46% are individual house. The average age of the buildings is 47 years with approximately 30 000 new buildings per year.

Ancienneté des résidences principales en Rhône-Alpes



For the heating mode, half of the collective buildings are connected to centralised system (district heating or collective boiler). Only a minor part of the building stock does not have a centralised heating system.

Répartition des modes de chauffage dans le résidentiel
(million de logements)



I : immeuble M : maison individuelle C : chauffage

* Charbon (essentiellement), énergies renouvelables thermiques, vapeur

Weather data

City	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg
Lyon	2.6	4.5	7.2	10.3	14.3	17.9	20.8	20	17.1	12.5	6.7	3.2	11.4
Grenoble	1.8	3.6	5.9	8.8	13.2	16.6	19.5	18.9	15.8	11.6	5.9	2.7	10.4

Average monthly temperature in ℃

Market data

For France, the heat pump market data is collected by the AFPAC (French Heat Pump Association), there is no regional market data. Over the 69600 heat pumps installed in 2007 (18600 ground source and 51000 air-source), 80% of the ground source heat pumps are installed in new buildings and only 37% for air-source heat pumps.

It can be assumed that more than 10% of the installed heat pumps are in the Rhone-Alpes region, due to the fact that leading manufacturers are installed in the region (CIAT, Avenir-Energie, France-Geothermie, Sofath…).

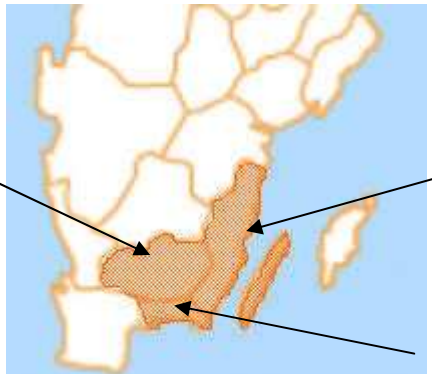
Conclusion

Rhone-Alpes region is particularly interesting for heat pump installation for residential and tertiary applications. For residential applications, the proximity of the major French heat pump manufacturers is supporting the market. For tertiary buildings the climate conditions are favourable to the installation of reversible heat pumping system.

5 Market analysis Sweden

5.1 Introduction

The districts Kalmar, Kronoberg and Blekinge are situated in the southeastern part of Sweden and has a population of 564 000 inhabitants. The largest cities are Kalmar, Växjö and Karlskrona. The region has a lot of forest and the share of bioenergy in the energy system is relatively high.



	Total size	Inhabitants	Pop. density	Structure
Kalmar	11 170 km^2	234 000	21 inh./km^2	12 communities
Kronoberg	8 460 km^2	179 000	21 inh./km^2	8 communities
Blekinge	2 940 km^2	151 000	51 inh./km^2	5 communities
Total	**22570 km^2**	**564 000**	**25 inh./km^2**	**25 communities**

5.1.1 Current energy supply

Electricity is available everywhere in the target area, in urban areas district heating normally also is very common, but mainly for larger buildings. For small houses district heating is more unusual, about 10 % of small houses are heated with district heating and 76 % of multifamily houses. Otherwise electricity is a very common heat source in Sweden (33 % of small houses) due to clean electricity based on hydro and nuclear power and also historical low electricity prices. Higher and higher electricity prises has however created a market for heat pumps. Today about 10 % of all small houses and multi family houses in Sweden are heated with ground source heat pumps. Other common heat sources for small houses are biomass (33 %) and oil (4 %).

5.1.2 Energy prices

The table below show development of fuel prices in Sweden from 1997 till 2006

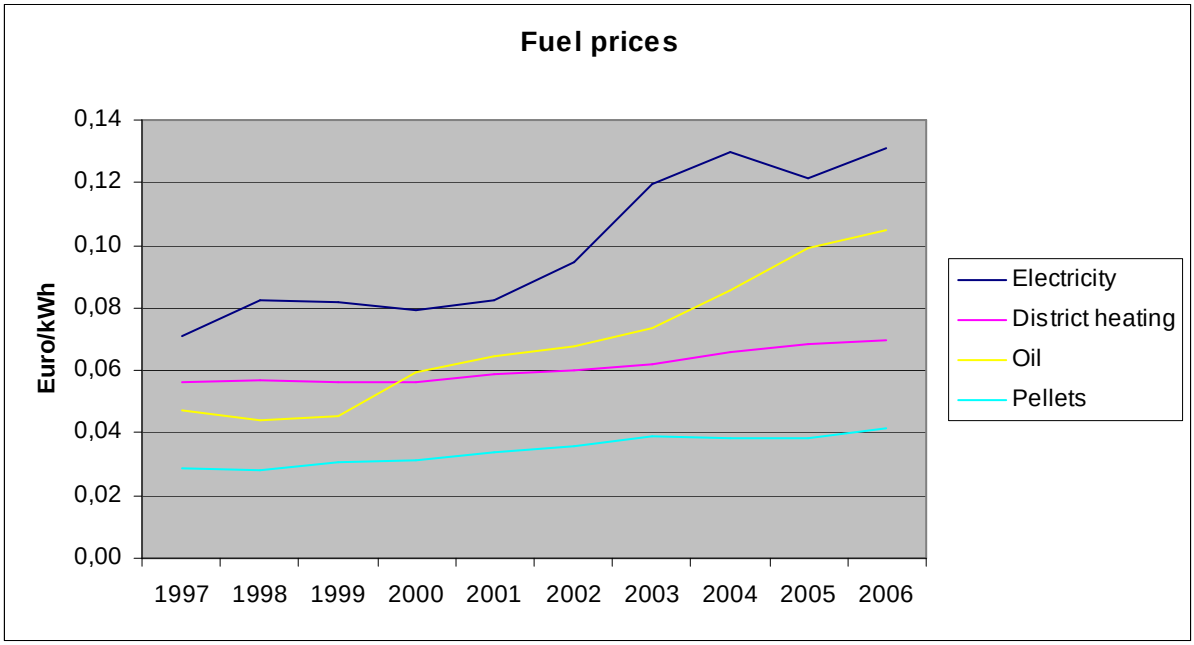


Table 5.1: Average fuel prices in Sweden, 1997 – 2006

5.2 Market analysis

The number of installed heat pumps has increased rapidly since beginning of 1990, which is a consequence of rising energy prices on electricity and oil. Table 2 shows the market development in Sweden for water/brine heat pumps and air/exhaust air heat pumps.

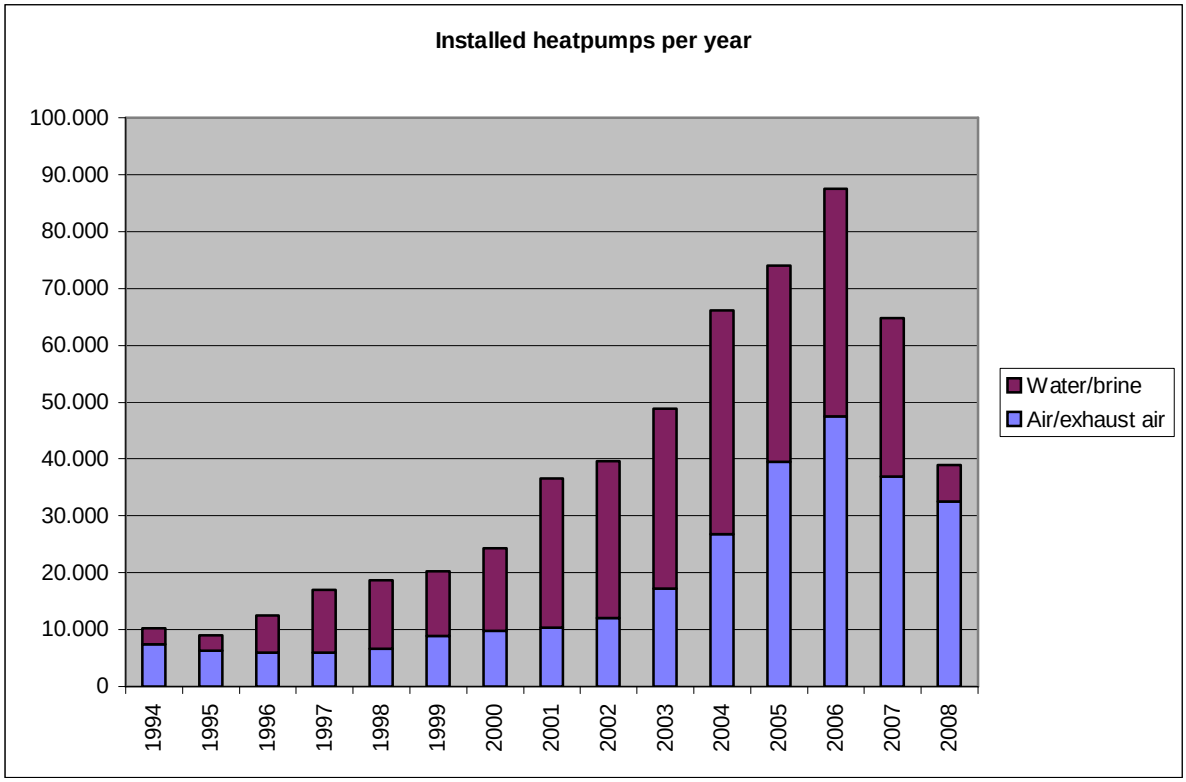


Table 5.2: Market development in Sweden, 1994 – 2007 and jan-apr for 2008

5.2.1 Market segments

To get an overview of the market in the region Kalmar, Kronoberg and Blekinge, data regarding number of potential customers and present number of installed heat pumps has been studied.

	Public	S.markets	Hotels	SME	Small Houses	Gshp
Kalmar	630	84	82	556	70 914	*5 602*
Kronoberg	434	57	44	542	54 079	*4 759*
Blekinge	317	37	41	302	43 903	*3 820*
Total	**1 381**	**178**	**167**	**1 400**	**168 896**	**14 181**

Table 5.3: Number of public buildings, supermarkets, hotels, SME companies, small houses and total number of installed ground source heat pumps in the region

The number of ground source heat pumps in the region is the total number for all segments. Municipalities that give permissions for gshp installations normally don't have the installations sorted by type of user.

The largest market for gshp has however so far been single-family residential buildings, but the market for this segment seems to decrease at the moment.
There is an increased interest in large heat pumps (50-100 kW heating capacity) for multi-family buildings. In this segment however, the sales statistics are quite scarce.

5.2.2 Non-residential sector

There is clear information regarding installed heat pumps in the non-residential sector, mainly because the manufacturers are not always the same as in the small capacity (1-20 kW) segment. There has been a promotional programme for public buildings, not specific for heat pumps but for energy efficiency measures (including heat pumps). Within this program, 42 heat pumps has been installed since 1 January 2005 in the county of Kalmar.

There could be a market potential concerning heat pumps in non-residential applications if they are used in combination with heat recovery. If there are air conditioning systems in use in commercial buildings a heat pump could transfer waste heat into the fresh air to save energy and decrease costs. There are different sources of waste heat for example the outlet air of an air conditioning system in administration buildings or the waste heat of an industrial process.

Heat pumps also can be an alternative for SME companies outside district heating areas. A lot of SME companies still use oil as heating source since they so far has been relieved from high energy taxes. But oil prices are going up and also industries are now looking for other heating alternatives. Market potential is very difficult to estimate.

5.2.3 Residential sector

For small houses about 8-10 % of the buildings are heated with ground source heat pumps in the region, which is about the average for Sweden. This means that over 14 000 of almost 170 000 small houses in the region are heated with ground source heat pumps. There is also a high number air and exhaust air heat pumps, but there are no statistic for this on regional level.

The market for gshp in small houses is presently decreasing, reasons for this is that many house owners already has changed heating from oil and electricity to other alternatives and also that air to water heat pumps has gained market shares due to technology development and lower installation costs.

There are also about 116 000 dwellings in multifamily houses in the region, but most of these are heated with district heating (70-80 %). Heat pumps are also used, approximately 8-10 % based on values on national level.

5.2.3.1 Installed units

Number of installations per year on a national level can be seen in table 3. For estimation the national values could be used also for the region.

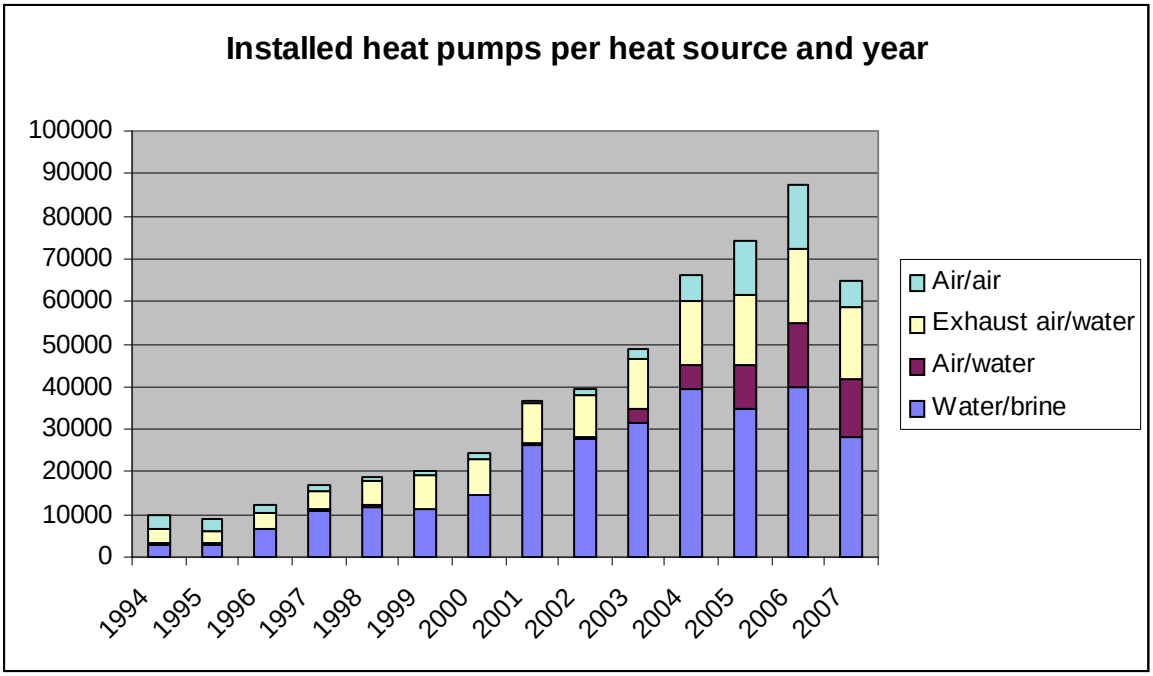


Table 5.4: Installed heat pumps per heat source and year in Sweden, 1994-2007

5.2.3.2 Market development in the region

There has been a steady increment over the last years in the region. The annual increment is estimated from some of the municipalities in the region.

Year	2002	2003	2004	2005	2006	2007
total HP	3421	5930	8518	10421	12683	13204
Increment	-	73%	44%	22%	22%	-

5.2.3.3 Market potential

Concerning new buildings almost all new small houses have a heat pump. The normal installation is an exhaust air heat pump or a gshp, but due to new building regulations that has come it will probably be difficult to fulfil the regulations with an exhaust air heat pump, it will be necessary to install a gshp instead, even with better building envelopes..

A large “heating system change” has taken place in Sweden in the beginning of the 21st century. A lot of oil and electricity boilers have been replaced and many of these have been changed to a heat pump. There is however still old boilers left, but the exchange will most likely be slower the next coming years.

It is very difficult to predict a future market development since the increment has slowed down the last years and the trend also for 2008 is decreasing. The peak has probably been reached. It could however be relevant to assume an annual increment of about 5-10 % since it still are oil boilers left. The number of installed units could then in best case reach 22 500 in 2012.

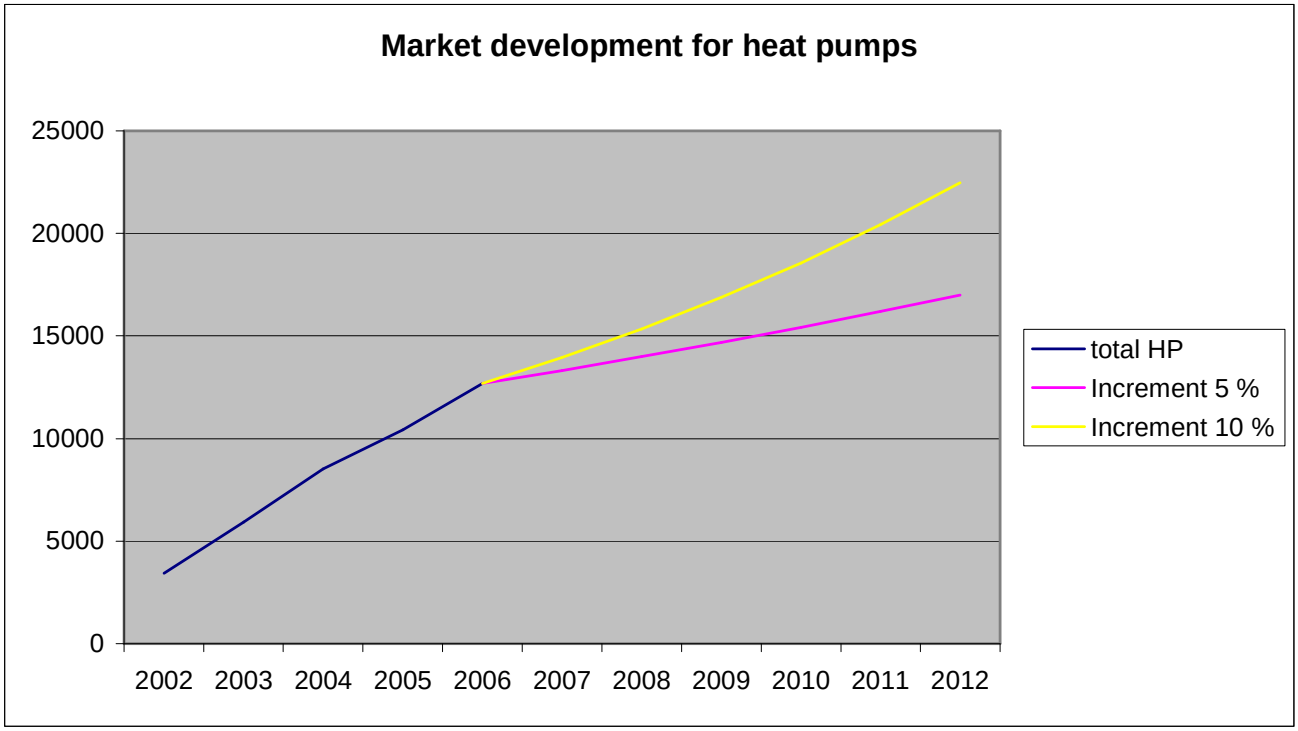


Table 5.5: Installed heat pumps per heat source and year in Sweden, 1994-2007

Expanding market for heat pumps are for example multifamily houses if they are used in combination with heat recovery. Also SME companies are more and more interested in changing heat source. Many SME’s have oil boilers today and are looking at alternatives. The number of heat pumps used in SME companies has not been possible to find and an estimation for the future is difficult to make.

A lot of houses in Sweden are also heated with direct electricity. Today electricity prices still are too low to motivate a conversion of the heating system to a hydronic system, which itself is an installation cost of about 8-10 000€. But with increasing electricity prices this will be more interesting and should not be underestimated as a future market potential. Today this market has been penetrated by cheap, reversible

split air/air units. They have with current electricity prices a straight payback period of 2.5-3 years.

5.3 Conclusion

The heat pump market is very well developed in Sweden. The market for heat pumps has grown very fast for the small house segment. Last years the market has decreased, which is natural since the number of boilers to be converted from oil or electricity is decreasing all the time. The oil and electricity boiler exchange will continue, but not as fast as the last years. The heat pump market can probably still grow with about 5 to 10 % per year.

Other growing segments are public and private buildings and SME's.

Another important factor for the heat pump market is to increase the quality of installations, to optimise operation of the heat pumps and also to inform house owners about possibilities to improve their heat pump system with for example combinations of renewable energy sources. This must be done to get more satisfied customers and to further decrease CO2 emissions.

6 Market analysis Bulgaria

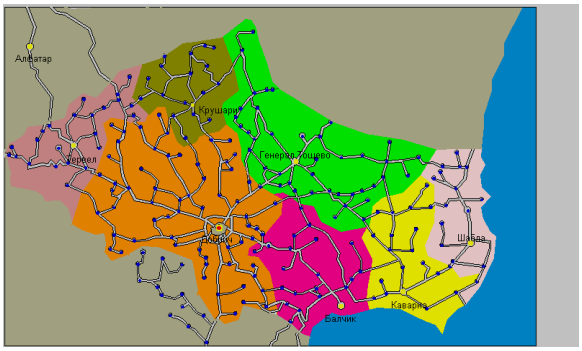
6.1 Introduction Bulgarian target area

The energy supply in the Dobrich Municipality and Varna Municipality is assured by these companies:

- EON
- BST Company
- Toplivo
- others

The energy consumption in Dobrich Municipality is:

Electricity: 888 TJ (terajoule) Electricity + Heat: 1498 TJ(terajoule)



6.1.1 Current energy supply

There is electricity available everywhere in the target area and also the gas grid is well developed. In Varna district heating is also available.

6.1.2 Energy prices

Energy prices (February, 1st 2008)	
Heating oil	0,05 €/kWh
Natural gas	0,04 €/kWh
Electricity	0,07 €/kWh
Electricity for heat pumps	
Heating heat pump (COP 4)	0,02 €/kWh (1 kWh electricity => 4 kWh heat)

In Bulgaria the heating costs could decrease by 50% if an efficient heat pump is in use compared to natural gas systems.

6.2 Market analysis

The heat pump market in Bulgaria is not developed yet. The number of installed heat pumps in the region is 6.

6.2.1 Availability of data

The requested data are distinguishable in three category groups:

- non-residential sector of buildings
- residential sector of buildings
- installed heat pumps in the target areas

The total number of dwellings in the district is known for Dobrich by end of 2006 and for Varna by end of 2003. Adequate dwellings are massive residential buildings, SME's, public buildings.

Data referring installed heat pumps in the target area has been delivered by the installers.

6.2.2 Non-residential sector

There are 4852 public buildings in Varna and 109 municipality buildings in Dobrich. There are gas supply networks and this sector uses primarily natural gas heating and electricity.

6.2.2.1 Installed units

The number of installed units in this sector is 2 heat pumps (water – water)

6.2.2.2 Market development

Information is not found

6.2.2.3 Market potential

There is potential for public buildings with geothermal water in Varna.

6.2.3 Residential sector

There are 36369 massive buildings overall in the region. There are 378 res. buildings built 2001-2003 in Varna and 100 res. buildings built 2001-2006 in Dobrich.

New residential buildings constructed in 2006 :

- 97 in Dobrich district
- 458 in Varna district

There is a huge potential not developed.

The level of knowledge of HPs is low**.**

6.2.3.1 Installed units

There are 4 installed units brine – water heat pumps by the end of 2007.

6.2.3.2 Market development

Information is not found

6.2.3.3 Market potential

The kind of the prevalent number of residential buildings in the big cities, the way of building-up of the cities and the condition of the buildings make the use of the abovementioned heat pumps rather difficult. There are no yards for the apartment buildings.

There have been increasing preferences to buy or build a house near big cities instead of apartments within the cities. The ownership of suburban houses is no longer the priority of a restricted number of especially rich citizens. The number of the projects for closed-type villa settlements is increasing and the interest towards them is increasing as well because of the additional services and the infrastructure constructed nearby. For such settlements, heat pumps are especially feasible.

6.3 Conclusion

The heat pump market is not well developed yet in Varna Municipality and Dobrich Municipality and the installations which will be created under this project should be taken as a pilot case or demonstration model.

The most promising market for HPs is new family houses, new buildings, existing renovating and insolating buildings, new SMEs.

There is an importance of a national lobby organization in our country that is concerned with the promotion of HPs

7 Market analysis UK

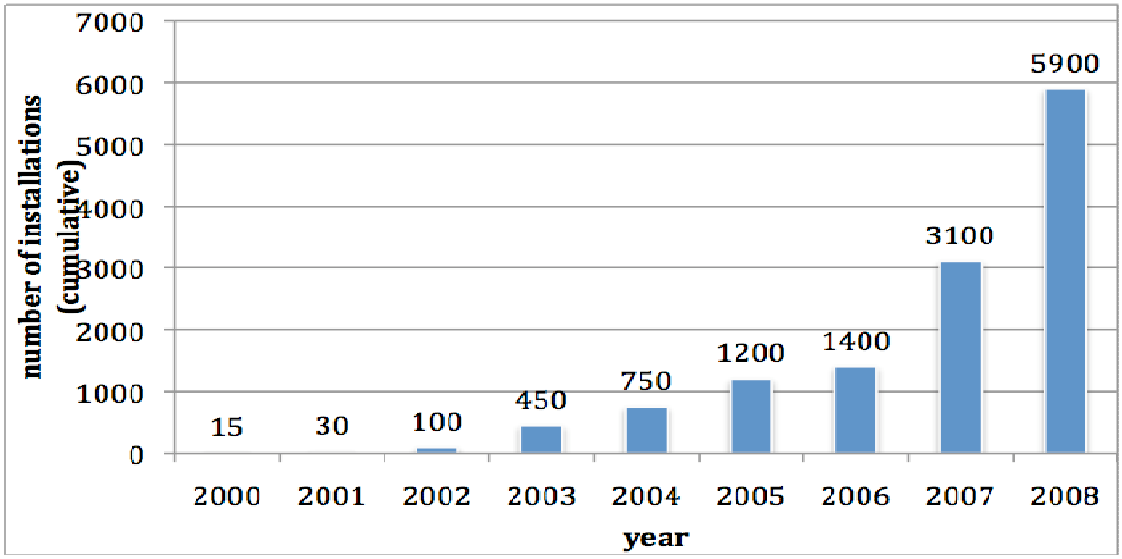
1 Current installations

1.1 The GSHP market is not yet well developed in the UK, but the number of installations is growing rapidly, particularly for large commercial buildings or complexes. There are no precise figures for the number of GSHP installations in the UK, and the few agencies that have attempted the exercise have produced markedly differing and imprecise estimates. The table below represents a blending of estimates from a number of sources, principally a market analysis by BSRIA in 2007, and a market survey undertaken by the National Energy Foundation in 2004/05.[i] At the end of 2007, we estimate that just over 4000 units were in place, with a total capacity of about 4MW$_{th}$.

Table 7.3: Estimated and forecast GSHP installations in the UK (totals). F = forecast

(Mid-)Year	2001	2002	2003	2004	2005	2006	2007	2008
Number of GSHP installations	30	100	450	750	1200	1400	3150	5900 (F)

Chart 7.2: Estimated and forecast GSHP installations in the UK (total)



1.2 According to the BSRIA report, about 80% of the UK market in 2006 was residential (GSHPs <20kW$_{th}$), but the fraction of installations in commercial and public buildings is growing since UK policy came in place that aims to increase the use of renewable sources in buildings. According to the same report, in 2006 about 85% of all installed heat pumps were GSHPs.

1.3 Judging from the disparities between estimates and the fluctuations in the growth rate, the margin of error on the figures for 2007 is around 20%.

The GSHPA is currently working with the Heating and Hot Water Industry Council (HHIC) to produce more reliable figures for GSHP installations in the UK.

2 Projections

2.1 The BSRIA report estimates that the growth rate in number of installations per year will decline from about 100% pa in 2006 to about 40% in 2010, basing its projections on the expectations of the main manufacturers. It forecasts 7400 installations per year by 2010, with a total by then of about 22000 HPs installed.

2.2 In 2005 the EST projected GSHP take-up: 2009: 2250; 2015: 101,000; 2020: 538,000; 2040: 1m. These forecasts were subsequently seen as low because they assumed no government intervention to support the technology, nor took into account government publicity efforts on climate change and suppliers' marketing efforts. [ii]

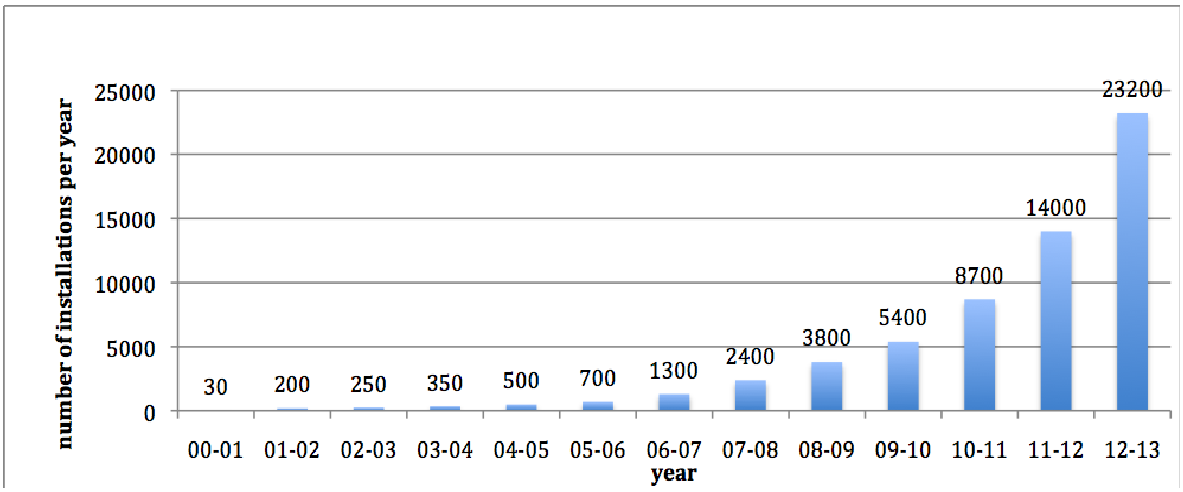
2.3 Among other projections, the defra CERT Illustrative Mix assumes 28000 HPs could be installed between 2008 and 2011.

The table and chart below present our best estimate of the number of installations per year up to 07-08, with a forecast up to 2011-12. It is based on a blend of figures from different sources. Taking the average growth rate 2000-2007, and assuming existing conditions continue, it is expected that the average growth rate in number of installations per year from 2007-2010 will be around 60%.

Year	2000 -1	2001 -2	2002 -3	2003 -4	2004 -5	2005 -6	2006 -7	2007 -8	2008 -9	2009 -10	2010 -11	2011 -12	2012 -13
Number of GSHP installations per year	30	200	250	350	500	700	1300	2400	3800 (F)	5400 (F)	8700 (F)	1400 0 (F)	2320 0 (F)

Table 7.3: Estimated and forecast number of installations per year. (F)=forecast

Chart 7.4: Estimated and forecast number of installations per year



3 Market potential

3.1 As an Energy Solutions report notes for Eire, there are no estimates of the total resource – that is, the total amount of heat that theoretically could sustainably be extracted – and this is not the important constraint for the UK except perhaps in the very long term. Local limitations on the energy that can be extracted for specific installations, however – the space for horizontal collectors, suitable sites for boreholes, or crowding of boreholes around multiple installations – might become a problem.

3.2 A variety of methods have been used to estimate the potential market for GSHPs in the UK, but there is no agreed basis for such an estimate. Given the current low level of installation, there seems little practical purpose in anything but the very long term in attempting the exercise.

3.3 A DCLG report indicated a potential for 17 million units, on the basis that there are this many houses with gardens.[iii]

3.4 A defra report estimating potential carbon savings from energy efficiency and microgeneration appliances takes a figure of 140000 heat pumps in the period 2011-2020.[iv]

3.5 In its market analysis for Eire, which similarly has few GSHP installations at present, Energy Solutions assumed that new build would represent 1% of the total space heating demand in hotels, health, defence, education and other public sectors, and because of other incentives, 5% in the commercial office sector.[v]

3.6 Two distinctions figure prominently in estimates of the future market: between properties on and off the gas grid, and between new build and retrofitting. In both cases detailed arguments have been rehearsed about the relative merits in both economic and carbon terms. There are however also summary claims or assumptions about the importance of these divides: in the extreme, to the effect that GSHPs are not worth considering on the gas

grid or for retrofitting to properties. These statements have gained currency despite sound arguments to the contrary.

4 Heating system mix and current and future competition

4.1 Space heating and water heating in the UK are dominated by wet systems based on gas boilers. There is an extensive gas network reaching all but remote rural areas in the country, and almost all dwellings with access to the gas grid are connected routinely. There is extensive competition keeping down the capital costs of installation and the cost of gas. Oil, electric (direct radiant or storage), wood/peat/coal/'smokeless' solid fuel, and bottle gas heating serve small markets, though it is not clear the extent to which electric radiant heating is used to supplement other heating.

Table 7.5: UK heating mix

Gas central heating	84.2%
Oil central heating	7.0%
Electric Storage	5.5%
Gas non-central heating	1.3%
Electric non-central heating	1.1%
Solid central heating	0.72%
Solid non-central heating	0.14%

source: defra, *Energy, Cost and Carbon Saving Calculations for the Draft EEC 2008-11 Illustrative Mix: Energy Efficiency Commitment 2008-11*, Jan 2007

4.2 Approximate current prices for energy forms delivered to domestic consumers are shown in Table 7..

Table 7.6: Approximate prices for delivered domestic energy forms, 2008

	p/kWh
gas	3
electricity	10
heating oil	3.8
wood chips	1
wood pellets	3-4
coal	2-4
LPG and propane	4.5-8

We are not aware of any special electricity tariffs offered for HPs.

4.3 In the UK overall, over 90% of the population has mains gas supply, though in Scotland some 26% of homes do not. The percentages of homes off the gas grid in the three target areas are shown in Table 7.. Table 7. shows the proportion of dwellings in the target areas with central heating.

Table 7.7: Target areas: percentage of dwellings with central heating

	CH	partial CH	none
Edinburgh	82	8	10
East Lothian	91	5	3
Perth & Kinross	83	11	6

We do not yet have information on the heating mix for the target areas beyond these basic categories.

4.4 It has been mandatory to install gas boilers with A or B efficiency ratings since 2005 (efficiency > 86%), pushing installers towards condensing boilers and allowing non-condensing boilers only in exceptional circumstances. Sales of condensing boilers increased from 9% in 2001 to around 85% in 2006 and 95% by 2007. By 2006, about 18% of domestic boilers were condensing, but another 27% of existing boilers were over 15 years old and could be expected to be replaced soon. Current mean efficiency is estimated as low as 70%.

4.5 Residential energy use depends crucially on the energy performance of houses, which varies greatly. Estimates vary, but the mean is thought to be around 12000kWh/y for space heating and 4500kWh/y for hot water. The space heating average is expected to decrease substantially as the performance of new build dwellings improves and as more houses are fitted with insulation. Average cooling load across the housing stock, and cooling load for houses with air conditioning, are not yet known.

4.6 Other current technologies may be combined with GSHPs – in particular solar thermal collectors. The wider use of existing technologies such as

community CHP/DH or biomass boilers may provide competition, or in the former case opportunities for integration. Future technologies may compete with GSHPs: in particular, a challenge may come from micro-CHP at the individual household level,[vi] and from air source heat pumps, the efficiencies of which are expected to become comparable to those of GSHPs within a short time, and which have lower capital costs. One estimate is that there will be 30,000 ASHPs in the UK by 2011, twice the likely number of GSHPs.

5 Target areas: current installations

5.1 There are also no precise figures for the number of GSHP installations in Scotland, let alone the target areas. We have therefore attempted to estimate the current number of installations in the three target areas through calculations on different assumptions using the following information:

- estimates of total UK installations;
- numbers of households and population;
- numbers of installations subsidised by the national and regional grant schemes.

5.2 The estimated total number of installations in the UK at the end of 2006 is about 4500 units. The Energy Savings Trust estimates the number of installed units in Scotland at about 250 at the end of the same year. This would mean that around 6% of all the GSHP units in the UK are installed in Scotland by the end of 2006.

5.3 If we use percentages of households and population to estimate the total number of installed units (both around 8.5% of UK total), around 380 units would have been in place by the end of 2006.

5.4 The most reliable basis for an estimate of the current market in the target areas is the figures for grants awarded under the two main government grant schemes in Scotland: SCHRIA and LCBP. Under SCHRI, 761 installations for communities and households were awarded a grant by mid 2007. By mid 2007, around one third of the units that had been awarded a grant had actually been installed; the others were under construction or in the planning phase. We estimate therefore that in May 2008 around 50% of the units that have been awarded a grant are actually installed. By March 2008 only three installations in Scotland had been given a grant under the LCBP programme and the effect of this addition is therefore negligible for this approximation. (For comparison, by May 2008 the LCBP stage 1 scheme had paid out 283 grants for completed GSHP installations from 444 active grants, from a total of 603 grants offered – 47% of the grants offered and 64% of active grants.[vii])

5.5 Our first approximation of the number of installed residential units in the target areas at mid 2007 is therefore:

- Edinburgh: 2 units;
- East Lothian: 2 units;
- Perth and Kinross: 33 units.

5.6 We expect that most installed units, given the relatively high price of GSHP installations, are subsidised by one of the two government schemes (about 90%[viii]). This means that the above figures roughly correspond to the total installed units in the areas. We have no figures yet for the number of units that may have been installed for or by utilities under the EEC/CERT initiative.

5.7 On the basis of population, we assume that commercial and public building installations (estimated to account for 15% of GSHPs installed in the UK) would bring these totals to:

- Edinburgh: 6 units;
- East Lothian: 3 units;
- Perth and Kinross: 38 units.

We suspect this underestimates the number of commercial and public installations – particularly in Edinburgh with its concentration of public and commercial buildings. The numbers of public buildings in the three target areas are shown in Table 7..

Table 7.8: Target areas: public buildings (2007)

Edinburgh	430
East Lothian	140
Perth & Kinross	170

We are therefore attempting to improve the estimate of current (and hence projected) installations by other means, particularly by collating information on individual schemes.

6 Target areas: projected installations

6.1 We expect that about 50% of the installations so far awarded grants under the two government programmes are still under construction or in the planning phase but should be installed by the end of 2012. This would mean a significant increase in Scotland by that time to just over 770 installed (subsidised) units from these planned installations alone. For the target areas the figures for residential installations would be roughly:

- Edinburgh: 4;
- East Lothian: 4;
- Perth & Kinross: 66

6.2 This would represent a growth of about 100% over the years 2008-12, i.e. about 15% per year. Taking a growth rate in new installations as indicated in Table 2, we might expect a figure for total installed units in Scotland by 2012 of around 3400, and for the target areas:

- Edinburgh: 40
- East Lothian: 40
- Perth & Kinross: 520

However, it is not clear that such a rate of increase in Perth & Kinross can be sustained in the rural off gas grid market segment alone.

6.3 We expect the level of future installation to be crucially dependent on the continuation of the subsidy schemes and the conditions applying to them. Given the increased focus on commercial and public buildings in LCBP2, we might expect a proportionally greater number of such installations. However, the residential scheme under LCBP1 is likely to be discontinued when existing funds are exhausted.

7 Target areas: potential for residential installation

7.1 Our approach to estimating what we subsequently refer to as the 'potential' for residential installation of GSHPs is to make successive approximations – in most cases downwards on the basis of constraints on the suitability of properties and the likely penetration of GSHPs into particular market segments. The key bases on which we can attempt to adjust the estimates are:

- proportion of properties off the gas grid
- figures for new build
- proportion of detached properties
- figures for social housing
- heating mix – allowing for the penetration of GSHPs into market segments by current heating system and allowing for the age of the heating systems

7.2 The dominant market for GSHPs at present is new build housing off the gas grid. 89% of current GSHP adopters in the UK live in properties off the main gas grid.[ix] With 28660 (44%) houses not connected to the gas supply, Perth & Kinross provides the largest market segment of the three areas. On the basis of current off gas grid housing figures for the target areas, we can provide another estimate of the ceiling for residential GSHP installations, assuming retrofit was possible and appropriate in all cases.[x] The table below presents this potential for the target areas.

Table 7.9: Houses off gas grid in target areas

	Edinburgh	East Lothian	Perth & Kinross
Percentages of houses off the gas grid	15	21	44
Houses off the gas grid (2005)	34,100	8,800	28,700

7.3 The three councils have provided figures for additional houses expected to be built up to 2012. Table 7.4 presents the annual projected new build of houses off the gas grid from 2005 until the end of 2011. The figures are adjusted on the basis of the annual rate at which the gas network is expected

to expand; the number of new builds off the gas grid declines steadily in the three target areas.

Table 7.4: New build dwellings 2005-2012 by target area

Edinburgh	2005	2006	2007	2008	2009	2010	2011	2012
Annual (projected) new build	2380	1892	2623	2774	2415	1969	2175	1961
% off gas grid	15	14.7	14.5	14.2	13.9	13.7	13.5	13.3
Annual (projected) new build off gas grid	375	279	379	393	336	270	294	261
Perth &Kinross								
Annual (projected) new build	691	787	689	773	937	937	706	n/a
% off gas grid	44.0	41.9	40.0	38.1	36.3	34.6	33.0	
Annual (projected) new build off gas grid	304	330	275	295	340	325	233	
East Lothian								
Annual (projected) new build	768	524	602	1070	1112	854	849	695
% off gas grid	21.0	20.4	19.9	19.3	18.8	18.3	17.8	17.3
Annual (projected) new build off gas grid	161	107	120	207	209	156	151	120

7.4 Assuming that GSHPs are confined to new build, that a similar proportion of these houses is off the gas grid (see Table 7.), and that these have sufficient outside space for an installation,

7.5 Table 7.5 thus presents an estimate on this basis of the ceiling for dwellings that could be equipped with a GSHP by 2012.

Table 7.5: New build dwellings and total dwellings off gas grid by 2012

	Edinburgh	East Lothian	Perth & Kinross
Projected new house build (all types) (2006-12)	13800	5000	4800
Average new house build per year (1991-2007)	2020	440	710
Total number of detached properties (from total number of households) (2001)	23600	7800	20000
Number of properties built (2002-12)	22100	7500	6400
Number of detached properties built (2002-12)	2550	1530	2420
Total number of detached properties by 2012	25900	8300	22700

7.6 Increasingly tougher building energy standards should in principle make all new build houses suitable for GSHPs without further improvement of their insulation, but we note recent evidence that a substantial fraction of new builds do not even meet existing standards

7.7 The potential for domestic GSHP units in the future will be restricted by the space available for the ground loop, among other geographical and geological factors. There is no detailed information available on the proportion of suitable houses in the areas. However, data on the number of larger or detached houses in the areas are available. For the next approximation of the potential we assume that many of these houses provide suitable conditions for GSHPs. (Currently 90% of all installed units are in detached properties.) On the basis of the new build figures presented in

7.8 Table 7.5 and the percentage of detached properties, Table 7.6 presents the potential adjusted to take into account dwelling type.

Table 7.6: Numbers of detached houses by target area

	Edinburgh	East Lothian	Perth & Kinross
Number of new builds off gas grid (2006-12)	2080	1050	2120
Total number of dwellings off gas grid by 2012	36200	9600	30800

7.9 On the assumption that the proportion of detached properties off the gas grid is the same as on the grid, Table 7. adjusts the potential to take into account the type of property.

Table 7.13: Potential adjusted to take into account type of property

	Edinburgh	East Lothian	Perth & Kinross
Total number of detached properties by 2012	25900	8300	22700
Percentages of houses off gas grid	15	21	44
Detached houses off gas grid in 2012	3900	1700	10000

7.10 Rather than assume installation of GSHPs will be restricted to houses off the gas grid, we could take differential rates of penetration into different market segments according to heating systems in existing buildings or the heating systems that would otherwise be installed in new builds. That is, for new builds we could allow for some installation of GSHPs in areas served by the gas grid – on the assumption, for example, that some developers decide GSHPs are a better economic prospect if they have to pay for a connection from a new development to the nearest main, or that some owner-builders decide to install GSHPs for environmental reasons. Similarly for retrofits some gas boilers would be replaced by GSHPs; the rate of retrofitting should take into account the typical age of heating systems and acknowledge a cycle of replacement. The adjustment might also thus indicate a more realistic rate

of replacement of electric and oil heating systems in existing properties off the gas grid.

7.11 Defra provides in its Illustrative Mix estimates of the percentages of future heat pump installations (not just GSHPs) expected to be installed in homes with each heating type between 2008-11 in the UK. The percentages are shown in Table 7..

Table 7.14: defra Illustrative Mix: percentage of future HP units expected to be installed in houses by heating type, 2008-2011

gas CH	elec CH	oil CH	solid fuel CH	gas non-CH	elec non-CH	solid non-CH
10%	30%	10%	20%	0%	10%	10%

source: defra, *Draft Illustrative Mix of Measures for the Energy Efficiency Commitment 2008-11*, 26 Sep 2006

7.12 The full implications of this model can only be worked through when we ascertain the mix of existing heating systems in the target areas, but it does indicate we could expect a small proportion of GSHP installations to be undertaken in areas served by the gas grid: on the basis of the projected figures for GSHP installations in 2012 (6.2) perhaps 12 in the three target areas combined.

7.13 Social housing forms another distinct and promising market segment for GSHPs. Table 7. shows the extent of social housing in the target areas. Installation of GSHPs in social housing is subject to decisions by housing authorities or associations on behalf of multiple users, and other incentives may be operating besides those applying to owner-occupied or private rented dwellings.

Table 7.15: Social housing in the target areas, 2007

	Perth &Kinross	Edinburgh	East Lothian
Total number of households	58300	204700	38200
Rented from council	8800	22500	9200
Other social housing	2300	12300	1500
Total social rented	11100	34800	10700
% Rented from council	15	11	24
% Other social rented	4	6	4

7.14 We are unable to make an adjustment for social housing until we obtain estimates of GSHP installations in existing social housing relative to other forms of housing, and an idea of their rate of increase.

8 Realising the residential potential

8.1 Reaching the potential for residential installation as estimated in Table 7. would require the following average annual installation rates between 2007 and 2012:

- Edinburgh:

- East Lothian: 240
- Perth and Kinross: 1360

8.2 There are several constraints that make it highly unlikely that these levels of installation will be achieved. FETA (Federation of Environmental Trade Associations) expects the UK HP industry to expand rapidly and anticipates a 100% per year growth in domestic sales over the next few years. GSHP systems are however more complex than other HP systems and a major constraint for further market development is an insufficient number of qualified installers. The expectation is however that the number of qualified installers and installation capacity will rise steadily over the next few years – as a result of increased provision of training programmes, an increase in awareness among heating engineers and related companies, and policies supporting HPs. Further, until GSHPs are routinely considered by developers and architects for new builds or by heating engineers as a possible replacement for other heating systems in existing housing, and until the deterrent effect of the cost structure is overcome, take-up is likely to remain limited.

9 Non-domestic installations

9.1 We have not yet been able to obtain figures for installations in public and commercial buildings for the target areas. We have information on several installations and given that the number is small, we expect to be able to complete a list of current non-domestic installations. We shall again distinguish between future projects on and off the gas grid to obtain a first approximation of the potential.

9.2 Currently about 15% of installed GSHP units in the UK are in the non-domestic sector. The expectation is that increasingly tough regulation and an increase in incentives in these sectors – particularly in the form of subsidies from LCBP2 – will increase the share of non-domestic installations over the next few years. We might expect the share of non-domestic installations by 2012 to increase to about 20% of the total installed units.

10 Contribution of *ProHeatPump* activities

10.1 It is clear that the technical potential for GSHPs in the UK and in the target areas, even calculated with restrictive conditions, is many times greater than any reasonable projection of the likely number of installations in the next few years. That is, there will be no shortage of candidate new build and renovated dwellings for the foreseeable future. There seems little point then, in refining the estimates of potential further. Rather, it would seem sensible, as in sections 2 and 6, to estimate the likely level of installation on the assumption that current trends continue – which itself assumes that awareness of GSHPs, and conditions and incentives for them, continue to improve – and then to set a target for an additional contribution from the activities of the *ProHeatPump* project.

10.2 The basic problem with this objective, however, arises from the uncertainty in estimates of current installation and in projections, the variability of

conditions affecting the level of adoption, likely discontinuities in government policies and incentives for the technology, and fluctuations for other reasons. The effect of any contribution that could reasonably be attributed to project activities will be lost in the noise, and it will in any case be impossible to attribute any discernible increase credibly to these activities. It seems more sensible then to attempt to evaluate the effect of the activities by directly questioning those involved in new installations on the influence of any *ProHeatPump* activities they have encountered.

10.3 If we set regardless a 10% increase in the level of residential adoptions beyond what could be expected in a *status quo* scenario (6.2), then we would be expecting *ProHeatPump* activities to lead to extra installations up to 2012 so that the expected totals will be as follows:

- Edinburgh: 44
- East Lothian: 44
- Perth and Kinross: 570

Notes and references

i BSRIA, *World Renewables 2007: UK – Heat Pumps*, report 40264/5, Jul 2007; G Ellis, 'Ground Source Heat Pump Review and Market Preparation', presentation to the launch of the Ground Source Heat Pump Association, Milton Keynes, 20 Jun 2006. The BSRIA figures for installations are estimated from the sales of major suppliers of HP units.

ii Communities and Local Government, *Changes to Permitted Development Consultation Paper 1: Permitted Development Rights for Householder Microgeneration*, Apr 2007

iii Communities and Local Government, *Review of Sustainability of Existing Buildings: the Energy Efficiency of Dwellings – Initial Analysis*, Nov 2006.

iv Potential Carbon Savings from Energy Efficiency and Microgeneration Appliances Installed in the Domestic Sector over the Period 2011-2020, draft, undated.

v Energy Solutions, *Markets for Solar Thermal and Heat Pump Technologies in the Commercial, Industrial, Services and Public Sectors*, undated. Potential is expressed in GWh/y heat delivered, at an assumed 20% utilisation factor.

vi e.g. Ceres Power wall-mountable fuel cell CHP unit, backed by Centrica, one of the major utility groups. http://www.cerespower.com

vii Energy Saving Trust, personal communication, Jun 2008.

viii

ix R Roy, S Caird & J Abelman, *YIMBY Generation – Yes in My Back Yard! UK Householders Pioneering Microgeneration Heat*, Energy Saving Trust, London,

x The annual gas network expansion rate (2004-2006) for each area: Edinburgh +1.7%; East Lothian +2.8%; Perth and Kinross +4.9%. Source: BERR, Gas Consumption Data at Regional and Local Authority Level, 2008. http://www.berr.gov.uk/energy/statistics/regional/regional-local-gas/page36200.html