



## Renewable Heating and Cooling

### The problem

- In Europe, about 50% of energy is consumed for heating and cooling in buildings, more than for electricity (20%) and transport (31%). Today renewable energy sources (solar, geothermal energy with heat pumps, biomass, etc.) could already provide almost all the energy needed for heating and cooling in new efficient buildings and more than 50% in old renovated buildings.

### Policy Relevance

- There are two pillars of European legislation in favor of renewable sources for heating and cooling: the Directive on the "Energy Performance of Buildings" (EPBD), which came into force in 2003, and the Directive "20-20-20", which came into force in 2009.

### Best Practices

- City of Barcelona pioneer for solar legislation

### Links and References



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### *Solar Thermal*

In Europe, the majority of new solar thermal installations are installed in the residential areas for heating domestic hot water. The share of demand covered by solar thermal is typically in the range of 40-80%. By 2050, solar thermal could cover at least 50% of total heat demand if energy consumption is reduced thanks to energy-saving measures. In Europe, solar domestic hot water is already cost-competitive with fossil-fuel technologies, if considered within the lifetime of the solar system. Applications for space heating in multi-family houses, as well as solar-assisted district heating are also close to competitiveness. Solar thermal is a very mature technology in the residential area, but it would need improvement in two areas thanks to scientific research: the first is to develop compact long-term efficient heat storage, that could render possible the storage of heat from the summer for use in winter in a cost-effective manner, and the second is the improvement of solar cooling. The table below shows a range of prices for heat generated by a solar thermal system, compared to the current price of gas and electricity for the end user, and the price projected for 2030. Inflation is not taken into account.

### Cost in €-cent per kWh

	Today		2030	
	Central Europe	Southern Europe	Central Europe	Southern Europe
<b>Solar thermal</b>	7 - 16	5 - 12	3 - 6	2 - 4
<b>Natural gas</b>	8,5 - 29		17 - 58	
<b>Electricity</b>	7 - 33		14 - 66	

By 2030, it is assumed that economies of scale and technical improvements could lead to about a 60% reduction in costs. Over the last decade, investment cost reductions of around 20% have been observed for each 50% increase in the total installed capacity of solar water heaters. The European sector today provides almost 40,000 full-time jobs and this figure is expected to rise to 220,000 by 2020. The market size in Europe (around 2 GW<sub>th</sub> new installed capacity per year) is small compared to China: 12.6 GW<sub>th</sub> per year. The expected future global ST market could reach 100-200 GW<sub>th</sub> within a decade. The total annual turnover of the European solar thermal industry has exceeded 3 billion Euro. The solar thermal market in the EU and Switzerland grew by 60% in 2008 to 3,3 GW<sub>th</sub> of new capacity, equivalent to 4.75 million m<sup>2</sup> of collector area. The biggest contribution came from Germany. In Spain, France and Italy, solar thermal density per inhabitant remains below the European average, which at the end of 2008 was 38 KW<sub>th</sub> /1,000 inhabitants.

### *Heat pumps*

Heat pumps absorb heat from the air, ground or water to heating or cooling a building. In Northern Europe they are mainly employed for heating and hot water production, while their main application in Southern Europe is cooling (here hot water is mainly produced by solar thermal technology). Because of the initial investment, higher than for other technologies, the market is less developed compared to solar thermal, but the potential in the EU is huge: more than 70 million heat pumps could be installed by 2020 and they could reduce final energy consumption by 902 TWh. Cost comparisons over the long run show an advantage for heat pumps after 10 to 12 years. The European market has been characterized by double-digit growth since 2004, but unfortunately precise figures are difficult to find as heat pumps are not part of official statistics. The most important markets are Sweden (95% of market share in the new single/double family houses), Switzerland (87%), Austria (36%), Finland (35%), Germany (25%) and France (15%). About 20 years ago there were more than 100 small and locally situated manufacturers. Today manufacturers consist of a few companies with industrial-size production (in Scandinavia, France, Germany, Switzerland) and several smaller ones.



### **Biomass**

In Europe, 66% of the biomass is used to produce heat, 31% for electricity and cogeneration and 3% for liquid fuels. Small-scale heating systems for households typically use firewood or pellets; medium-scale systems burn wood chips in grate boilers; large-scale systems are able to burn a greater variety of fuels such as wood waste. Heat can also be produced on a medium or large-scale through cogeneration that provides heat for industrial processes in the form of steam and can supply district heat.

### **Policy relevance**

The *EPBD Directive* required Member States to set minimum energy performance requirements for buildings, taking also into account the positive contribution of renewable energies. ([link a EPBD della scheda "Green Home"](#))

Thanks to *Directive 20-20-20*, for the first time, heating and cooling is directly covered by a European Directive. On February 14<sup>th</sup> 2006, the EU Parliament adopted a report by Mrs. Rothe (MEP) with recommendations for the Commission to work on heating and cooling from renewable energies.

### **Best practices**

*The City of Barcelona* has been the pioneer for solar legislation. The first "Solar Ordinance" came into force in the year 2000: it required that a certain share of domestic hot water be supplied by solar thermal in new buildings and renovated buildings. The regulation received widespread public support and many other cities, all over the Continent, have introduced the same legislation in recent years. Moreover, many countries have included energy requirements into their building codes. At a European level, the Solar Keymark is the first and most important international quality certificate for solar thermal products. It is based on three issues: initial type-testing to EN 12975 or 12976 standards; an implemented manufacturing "Quality Management System (QMS)"; annual review of QMS and bi-annual product inspection.

### **Links and References**

EREC-European Renewable Energies Council, 2008, "Renewable energies technology roadmap: 20% by 2020" ([http://www.erec.org/fileadmin/erec\\_docs/Documents/Publications/Renewable\\_Energy\\_Technology\\_Roadmap.pdf](http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf))

Esttp-European Solar Thermal Technology Platform, 2008, "Solar Heating and Cooling for a Sustainable Energy Future in Europe" ([http://www.estif.org/fileadmin/estif/content/esttp/downloads/SRA/ESTTP\\_SRA.pdf](http://www.estif.org/fileadmin/estif/content/esttp/downloads/SRA/ESTTP_SRA.pdf))

Estif-European Solar Thermal Industry Federation, 2009, "European Solar Thermal market in 2008" ([http://www.estif.org/fileadmin/estif/content/market\\_data/downloads/2008%20Solar\\_Thermal\\_Markets\\_in\\_Europe\\_2008.pdf](http://www.estif.org/fileadmin/estif/content/market_data/downloads/2008%20Solar_Thermal_Markets_in_Europe_2008.pdf))

Ehpa-European Heat Pump Association, 2008, "European Heat Pump Action Plan" (<http://www.ehpa.org/script/tool/forg/doc415/20080306%20action%20plan.pdf>)