EREC

European Renewable Energy Council

RENEWABLE HEATING

ACTION PLAN FOR EUROPE

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Introduction

Until recently, Renewable Heating and Cooling (RES-H) received little political attention. At EU level and in most Member States, most of the discussion about the promotion of Renewable Energies was focused on Renewable Electricity (RES-E). Support policies for RES-H tend to be weak and fragmented. In most EU Member States, there is not yet a comprehensive approach to support RES-H.

Europe can no longer afford to neglect the huge potential of renewables in the heating and cooling sector, and the European Union's institutions have started to take a closer look at RES-H as a key element for improving our security of energy supply and mitigating climate change.

In December 2005, in its Biomass Action Plan, the European Commission announced that it would work towards a Directive to promote Renewable Heating and Cooling. On 14 February 2006, the European Parliament approved by an overwhelming majority a Report with recommendations to the Commission on heating and cooling from Renewable Sources of Energy (2005/2122(INI)) by rapporteur Mechtild Rothe.

On 10 January 2007 the European Commission published its energy / climate package. The package, and within it legislation on Renewable Heating and Cooling was long-awaited by the industry and stakeholders alike, especially because the Parliament had requested such a Directive and the Commission had announced it. But the Commission only proposed a binding target for the EU to achieve a 20% share of Renewable Energy by 2020 instead, plus a 10% target for biofuels. Unfortunately it did not contain any new draft legislation on boosting Heating and Cooling from Renewable Energy Sources.

This Action Plan for Renewable Heat in Europe draws the conclusions of dozens of case studies on specific policy support schemes and of the sector-specific Action Plans for Solar Thermal, for Bioheat and for Geothermal in Europe, produced by the relative European industry and trade associations, ESTIF, European Solar Thermal Industry Federation, AEBIOM, European Biomass Association and EGEC, European Geothermal Energy Council. Based on this broad experience, some guidelines for best practice policies and some suggestions on avoidable mistakes are proposed.

Structure of the Renewable Heating Action Plan for Europe

The Action Plan for Renewable Heat in Europe will present integrated guidelines for each of the **5 key issues** of the Key Issues for Renewable Heat in Europe project (K4RES-H):

1. Verifiable targets for RES-H: Market monitoring, statistics and methods for target setting
2. Quantifying the energy delivery of individual RES-H installations: Methods for measurement and calculation
3. Regulations: Best practice to promote RES-H, identification of regulations hampering RES-H usage
4. Financial incentives: Best practice to promote RES-H
5. Innovative RES-H Applications: Issues specific to upcoming RES-H applications, like Renewable Cooling

In addition it will serve as a blueprint for strong and coherent RES-H policies. It aims at providing stakeholders and policy makers with detailed information and clear guidelines based on the existing experience with policies to promote RES-H. This analysis of best practice policies should contribute to designing new support schemes able to drive the EU beyond a doubling of the current Renewable share of its Heating and Cooling supply.

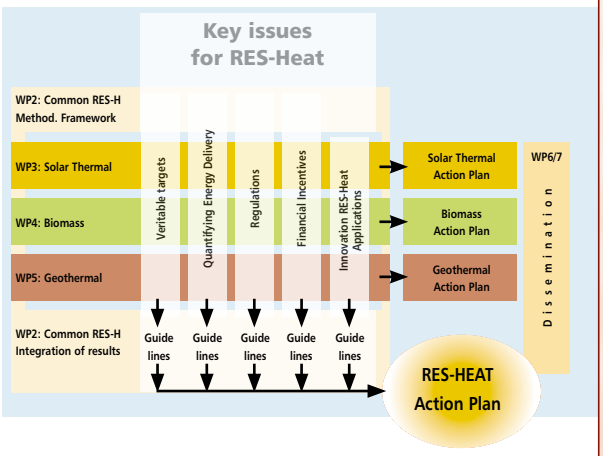
Within this Action Plan, a chapter on financial incentives identifies financial incentive schemes (FIS) for Renewable Heating and Cooling – provided they are managed well - as one decisive instrument to promote the use of RES-H. Principles of best practice for FIS for RES-H are discussed.

A chapter on regulations addresses the question on how regulation schemes should be designed in order to best promote the uptake of RES-H. It concludes that regulations for RES-H are best designed and administered at national level; best practice case studies for several Member States were prepared for all three technologies in order to provide assistance for the design of positive regulations.

A separate chapter is concerned with innovative applications, such as RES-H for industrial processes. Innovative applications are not yet widely available. The chapter lists the specific barriers to growth and consequently the best strategies to help overcome these barriers.
Special attention is also paid to so-called flanking measures, which are important too for the development of RES-H technologies. One example is the dissemination of information in order to increase public knowledge and to raise understanding of Renewable Energies and their benefits for private consumers as well as for the industry.

Targets are a very important element in policy making for Renewable Energies. The setting of verifiable, absolute targets for RES heating and cooling implies the solution of some statistical and methodological issues. A chapter on verifiable targets tries to identify these issues and recommendations for a methodology to set RES-H targets can be found here.

Energy delivery is discussed in the final chapter. The project developed guidelines for a widely agreed methodology to measure or calculate the energy delivery of individual RES-H installations. Such a methodology will enable policy makers to design policies to promote RES-H based on the desired result in terms of sustainable energy delivered.



Structure of the K4RES-H project

The K4RES-H project aims to support the discussion on RES-H policies with this comprehensive Action Plan for RES-H in Europe.

K4RES-H deals with the five Key Issues setting verifiable targets for RES-H; quantifying energy delivery of individual systems; regulations; financial incentives; policies for innovative applications.
For each of the three main RES-H technologies, these issues were analysed separately under the leadership of the relative European trade associations, ESTIF, AEBIOM and EGEC, based on a common methodology.

These associations have summed up the results of their sectors' analysis into three independent publications:

- Action plan for solar thermal in Europe (ESTIF)
- Action plan for bioheat in Europe (AEBIOM)
- Action plan for geothermal heat in Europe (EGEC)

A comprehensive website provides more information on each key issue, and on the project and its deliverables [1].

In addition to EREC and the associations mentioned above, the K4RES-H project was realised with the active collaboration of the following organisations:

EC-JRC, European Commission Joint Research Centre, and WIP-Renewable Energies contributed to the methodological work and the integration of the Key Issues 1 and 2.
The Barcelona Energy Agency, IDEA, Instituto para la Diversificacion y Ahorro de la Energia, and Energie 2000, Energieagentur im Landkreis Kassel, contributed specific case studies on solar binding regulations in the relative regions and countries.

[1] www.erec.org/projects/proj_K4_RES-H_homepage.htm

The benefits of Renewable Heating and Cooling

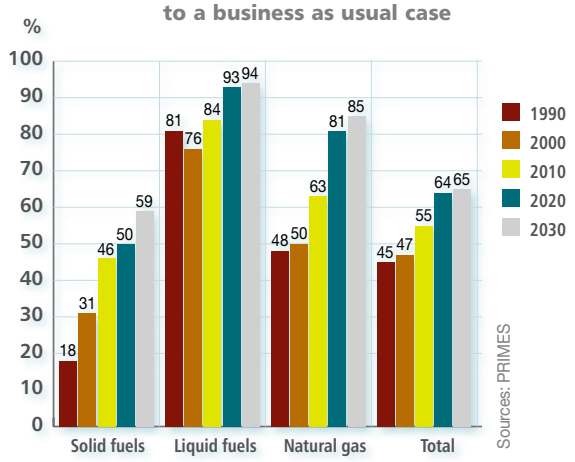
In the long term, Renewable Energies will inevitably dominate the world's energy supply. The reason is at the same time very simple and imperative: there is no alternative. Mankind cannot indefinitely continue to base its life on the consumption of finite energy resources.
Today, the world's energy supply is largely based on fossil fuels. These sources of energy will not last forever, are to a large extent imported from politically unstable countries and have proven to be one of the main causes of our environmental problems. Renewable Energies are in line with an overall strategy of sustainable development.

Renewable Heating and Cooling in particular has several benefits for society

Security of energy supply

Heating is a primary human need, currently covered in the EU mainly by gas, oil and electricity, most of which is produced with finite and imported resources such as fossil fuels and uranium.
At the end of 2005, an economic-political conflict among two external countries made millions of EU citizens aware that the security of heating supply depends on a handful of external countries and pipelines, that can be easily victim to terrorist attacks or other conflicts.
At the same time, it becomes more and more absurd to burn precious and scarce oil, that cannot be substituted in sectors like air transport or chemistry, while Renewable Heating sources can easily provide the same energy. The same is valid for electricity. Electricity production today is too costly, and the waste of electricity in large amounts when reconverted to heat has to be avoided.
By decreasing the dependency on imported and scarce energy sources, every RES-H system reduces the need to take public measures such as strategic energy reserves, investment on infrastructure for transport of energy sources, diplomatic and military costs. By increasing the indigenous energy supply, RES-H will become cheaper than conventional measures in the long term.
Decentralised and diversified systems for energy generation are also less vulnerable to accidents and reduce transport needs.

Import dependency in EU-25 according to a business as usual case



Replacing imported fuels with local jobs

The largest part of the RES-H devices installed in Europe is produced within the EU. The technological leadership of the European RES-H industry is a fact today.
Wherever the hardware will be produced in the future, a substantial part of the turnover is inherently local or regional: design, installation, training, marketing and distribution, all benefit local employment. And there is a huge potential for converting the EU agricultural and forestry sectors to support a massive growth in the use of biomass for heat.
Therefore, RES-H creates benefits for the regional and the European economy while reducing the need for imports of fossil fuels and uranium.

Employment

	2020 jobs Fte*
Wind	318.000
Photovoltaic	254.000
Biomass	528.000
Biofuels	614.000
Small Hydro	28.000
Geothermal	70.000
Solar Thermal	660.000
TOTAL RES	**2.472.000**

*Full time employment Source: EREC

The table shows the expected employment (Full Time Equivalent) in the year 2020 in the RES industry and includes both direct and indirect employment. The job losses in the conventional energy sector have already been subtracted.

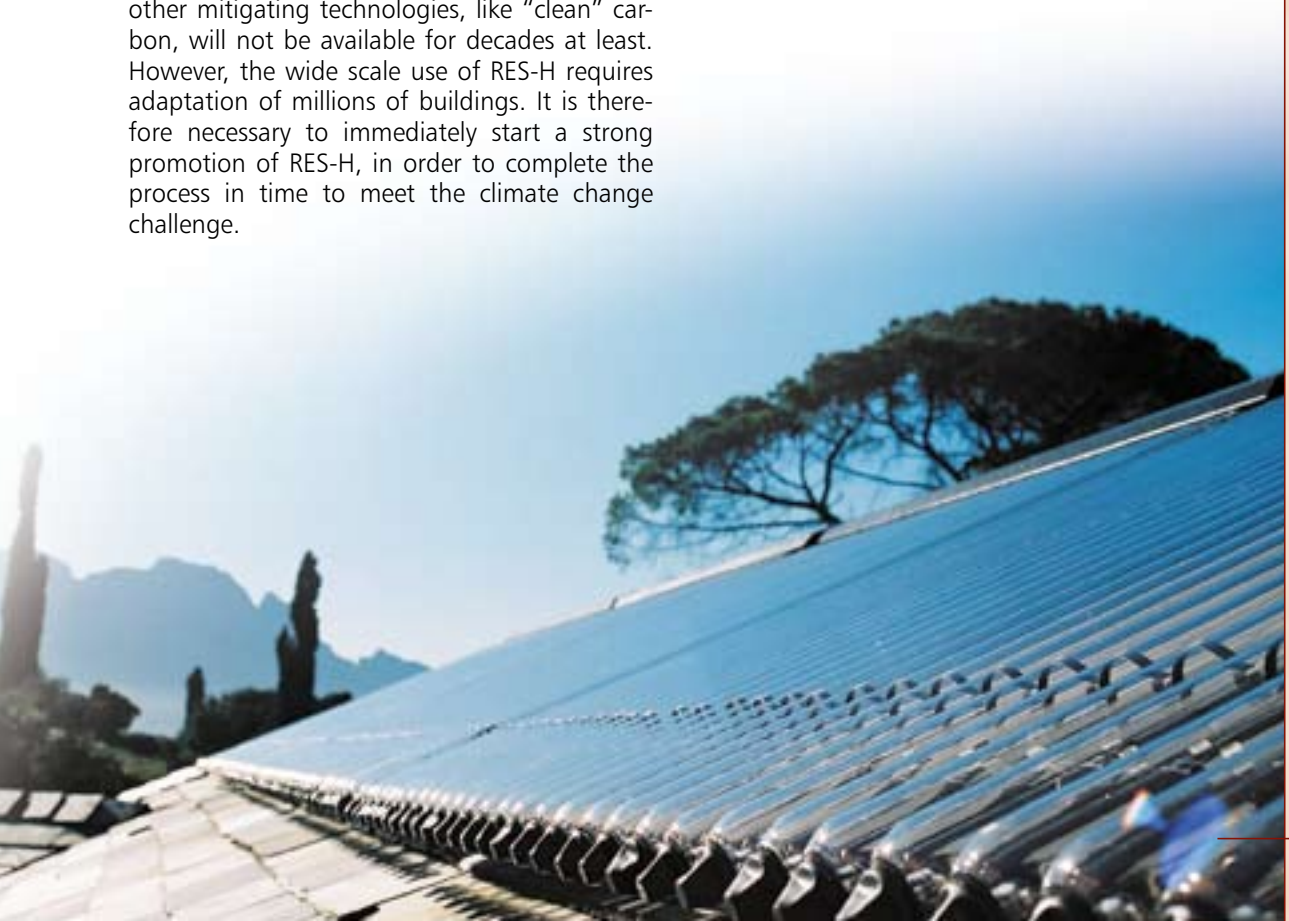
Developing the Renewable Energy sector is a key element of industrial policy for the 21st century. The countries and regions that gain a competitive edge in these sectors today, will be the winners in the world markets of tomorrow.

Climate protection

The "Stern Review Report on the Economics of Climate Change" shows that the costs of inaction or delayed action by far outweigh the costs of action to mitigate climate change.
The cost of business as usual could reach 20% of the global GDP by mid century, with conservative estimates suggesting at least 5%, resulting in the worst economic depression in modern history. The cost of action to reduce greenhouse gas emissions and to stabilise atmospheric greenhouse gas concentrations at levels that would prevent catastrophic climate change is likely to be in the order of 1%.

There is no doubt that the energy sector is decisive for climate change mitigation. Within the energy sector, RES-H represents one of the cheapest and most obvious options, particularly when renewables substitute heating based on oil or on electricity.

Furthermore, a number of RES-H options are already fully available and affordable, while other mitigating technologies, like "clean" carbon, will not be available for decades at least. However, the wide scale use of RES-H requires adaptation of millions of buildings. It is therefore necessary to immediately start a strong promotion of RES-H, in order to complete the process in time to meet the climate change challenge.

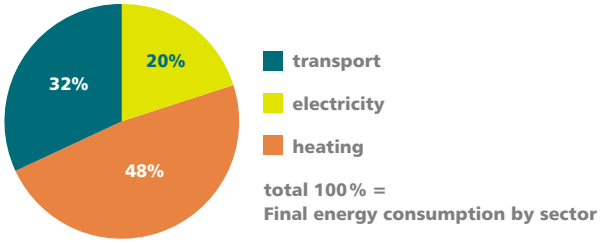


RES-H creates benefits for the regional and the European economy while reducing the need for imports of fossil fuels and uranium

Policy measures related to Renewable Heat

Renewable Heating – a neglected giant

Over the last decade, energy policy focused very much on the liberalisation of the electricity markets. Citizens and the media often portray energy and electricity as one and the same thing. Most people, including some decision makers, underestimate the share of energy used for heating purposes. In fact, the EU's final energy demand for heating is higher than for electricity or for transport.



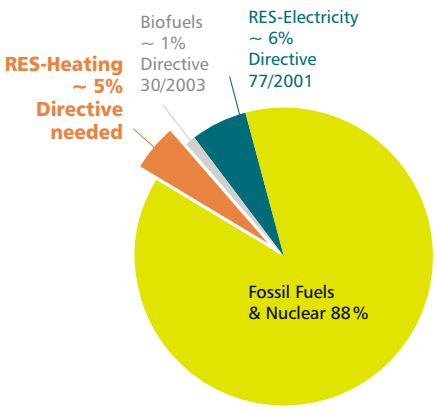
Source: Eurostat, elaborated by EREC

The heating sector is a neglected giant, and RES-H so far has received too little political attention from both EU level and Member State level. Another reason may be that RES-H products are substantially sold by small and medium sized enterprises (SMEs), which do not yet have a strong impact on EU energy markets.

Setting Renewable Heating and Cooling on the European agenda

In the White Paper of 1997 on Renewable Energies, the EU laid down clear objectives for Renewable Energy by 2010: a share of 12% of renewables in gross inland energy consumption. By 2003, two EU Directives had been adopted to promote renewables in the electricity (RES-E) and transport sectors (biofuels), with a significant positive impact on national policies and market growth.
The two existing Directives include specific national and EU targets in terms of renewables' share in the electricity and transport fuel sectors. Looking in terms of the EU's gross energy consumption, these targets sum up to roughly 6% (RES-E) and 1% (biofuels). The remaining

Allocation of the 12% RES target to different sectors (by 2010)



Source: EREC

5% can only come from the heating sector.
However, the heating and cooling sector is missing in the policy framework. Specific sectoral targets were included in the White Paper, but they were never translated into European legislation.

In May 2004, the European Commission recognised that the unsatisfactory growth of the RES-H sector is jeopardising the chances of the EU to reach its overall target for Renewable Energies ("The share of Renewable Energy in the EU", COM/2004/0366 final). However, the Commission refrained from proposing specific measures for this sector.

Towards an EU Directive to promote RES-H

The political discussion at European level gained ground with the Resolution adopted by the European Parliament on 14 February 2006 on Renewable Heating and Cooling, based on an initiative report by MEP Mechtild Rothe. The resolution was supported by an overwhelming majority, composed of a cross-party and cross-country coalition of Parliamentarians.
The Parliament clearly recognised the huge potential of relatively cost effective renewables in the heating and cooling sector, and that Europe urgently needs to take action to increase their usage. The Parliament clearly asked the Commission to table a Directive proposal, including:

- Ambitious and effective targets for RES-H at national and EU level
- Clear monitoring procedures based on improved statistical data
- Reduction of administrative barriers
- Guidelines for best practice instruments able to promote RES-H effectively

EREC, European Renewable Energy Council, warmly welcomed the Resolution of the Parliament. A public consultation was launched and concluded by the European Commission.

A call for action to the Member States

In the coming months and years it will be the task of the Member States to implement strong and concrete measures in their own countries, in order to help the RES-H sector towards reaching its full potential.

In the last few years, the EU Directive for RES-E led to an improvement in national policies in many EU Member States. The political support for renewables in the heating and cooling sector (RES-H), however, remained fragmented and discontinuous.
Hardly any country or region ever developed a comprehensive plan to promote Renewable Heating and Cooling. Individual instruments – like a financial incentive or a promotional campaign – were often implemented for a limited amount of time, without a comprehensive plan for market development. In many cases, financial incentives were short term oriented or had to be interrupted due to lack of funds.
The result in many countries is a stop-and-go market development, which discourages private actors from long term investments. In some countries, Renewable Heating and Cooling is simply neglected, with many applications and technologies receiving no political support to face uneven competition with the traditional heating systems.

A higher degree of market penetration is, however, necessary in order to achieve economic feasibility through mass production and marketing. There is a substantial potential for economies of scales, that can be only achieved if the market reaches a critical mass. It must be stressed that this must happen both at local/regional level and EU-wide.
The local economies of scale are linked to the presence of widespread distribution and marketing structures, well-trained installers and engineers, and to awareness of the potential users. These factors combined can make the difference between stagnation and a self-sustained growth, that can become independent from public support after a while, as shown by several case studies presented within the K4RES-H project.
At EU level, there are large unexploited economies of scale in the manufacturing processes and in the R&D sector. As long as only very few Member States represent a considerable market for RES-H components, the overall volume of sales is too small to support a widespread introduction of automated production processes. In that sense, it can be argued that the lack of market growth in some countries is also preventing the more advanced markets from reaping the fruits of mass production in the RES-H sector.

Solar Heating and Cooling for a broad range of applications

Is it not absurd to consume precious electricity, oil or gas to reach low temperatures, which can be easily supplied from the sun?
Highly reliable and cost effective solar thermal technologies are used today for a wide range of applications like domestic hot water and space heating in residential and commercial buildings, support to district heating, solar assisted cooling, industrial process heat, desalination, swimming pools and others.

Domestic hot water and space heating

Source: Solarpraxis [2]

Even the simplest solar thermal system can provide a large part of the domestic hot water needs. With some more initial investment, 100% of the hot water demand and a substantial share of the space heating needs can be covered with solar

Large residential and tertiary systems

Until now, the bulk of the solar thermal market has been in detached houses. However, large residential and tertiary buildings often have ideal conditions for the use of solar thermal energy, and these market segments are now growing substantially. Solar thermal is particularly useful wherever there is a significant and regular demand for heat, for instance in hotels, sport centres, residences for elderly, student houses, large private residential blocks etc.

Solar cooling

A growing number of demonstration projects show the huge potential for solar assisted cooling. Thermally-driven chillers use solar energy to produce cold and/or dehumidification. When backed up by biomass boilers, 100% Renewable Cooling Systems are possible. Solar cooling is on the edge of wide market introduction and substantial cost reductions can be expected in the next few years.

[2] www.solarpraxis.com

Process heat and other applications

Solar thermal can also provide the heat needed in many industrial processes, like food production and drying, desalination of drinking water, industrial laundries etc. While ordinary solar collectors typically provide temperatures of 60-100°C, concentrating collectors can reach temperatures of 300°C and beyond. In the lower temperature range unglazed solar collectors are an effective way to reduce energy demand for swimming pool heating.

The solar thermal industry

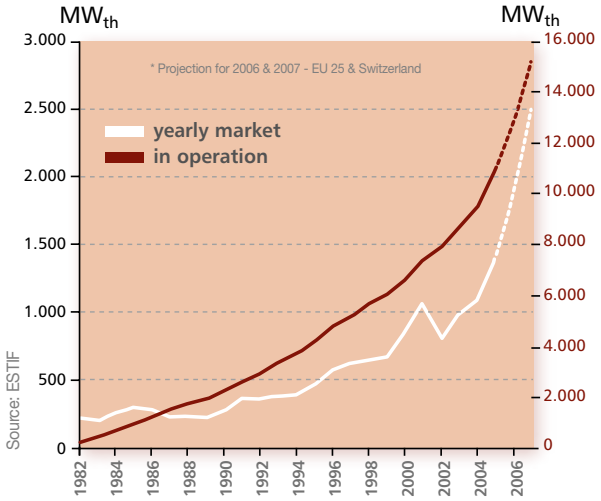
Solar thermal replaces imported energy sources with domestic jobs. The sun does not send any bill and does not affect foreign policy.
With a turnover of over 2 billion €, the sector employs more than 25.000 people in Europe.
From the industrial point of view, solar thermal technology is based on very simple principles, but the trend towards high-efficiency systems, and the automation of the production processes leads to more and more sophisticated products and high-tech processes.
Over half of the turnover is related to marketing, distribution, design and installation of the systems. Correspondingly, solar thermal is a job machine for local and national development, as most of these jobs are inherently local.

European companies have a technological lead in the whole value chain. Substantial development of the domestic market volume and further R&D activities are necessary to maintain this lead, notably compared to Chinese competitors which benefit from a domestic market more than five times larger than the whole EU market.

Strong growth…

Solar thermal in Europe is growing at an impressive pace: 2006 is the third year in a row with more than 25% market growth.
The capacity in operation was 5 GW_{th} in 1997, 10 GW_{th} in 2004 and will reach 15 GW_{th} in 2007.

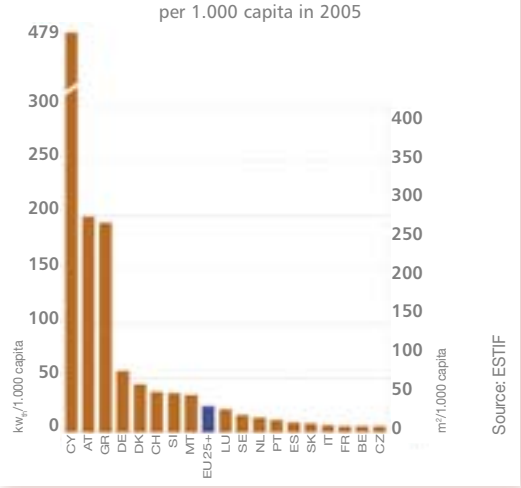
Growth of solar thermal in Europe



…but only in a few countries!

However, this development is driven by only few countries. In 2005, the EU reached an average capacity in operation of 24 kW_{th}/1.000 capita, but the national values range from 479 in Cyprus and 199 in Austria, to less than 10 in most EU countries, including high-potentials like Italy, France and Spain. If the whole EU had the same level per capita as Austria in 2005, the annual market would be over 13 millions m^2 and a capacity in operation of 91 GW_{th}.

Solar thermal capacity in operation
per 1.000 capita in 2005



Huge potential, ambitious targets!

In 2005, Europe produced solar thermal energy equivalent to the content of 34.000 lorries, each of them carrying 20.000 litres of heating oil to the final customers. If lined up in a row on a highway, these lorries would cover the distance from Lisbon to Madrid.

Minimal 2020 Target: By 2020, the minimal target should be that the whole EU reaches Austria's level of 2005, achieving a capacity in operation of 91 GW_{th}, and providing 5,6 Mtoe of solar thermal energy. In this case, the same lorries on the highway would then reach from Lisbon to Moscow.

Ambitious Target: By 2020, the ambitious target should be that the whole EU reaches a level of 1 m^2/per capita. The lorries on a highway in this scenario would then cover the distance from Lisbon to Sydney.

Long term Target: The long term target of solar thermal should be to realize the full technical potential in the whole EU, which is approximately 100 times higher than in 2005. Here, the lorries would stretch 1,5 times around the globe.

	GW_{th} capacity	Tonnes of oil equivalent (toe)	Number of heating oil lorries	Distance of lorries on highway (km)
1990	2,2	137.897	7.000	125
2005	11,2	686.493	34.000	600
2020 Minimal Target (Austria)	91	5.600.000	278.000	5.000
2020 Ambitious Target (1 m^2 per capita)	320	19.650.000	982.000	17.500
Long term Technical Target	1.200	73.100.000	3.655.000	65.500

Source: ESTIF

Reaching the critical mass for economies of scale

Today, solar thermal is one of the most cost-effective sources of Renewable Energy. People in the leading solar thermal countries benefit from higher solar value for money because reaching a critical mass of the market allows for high quality at better prices.
The potential for further economies of scale is substantial. At local and national level in the areas of marketing, distribution, design and installation of the systems. At European and global level in the production of hardware, where automation for large volumes is still in its beginnings.

Reference: Please refer to: www.estif.org/STAP for further information

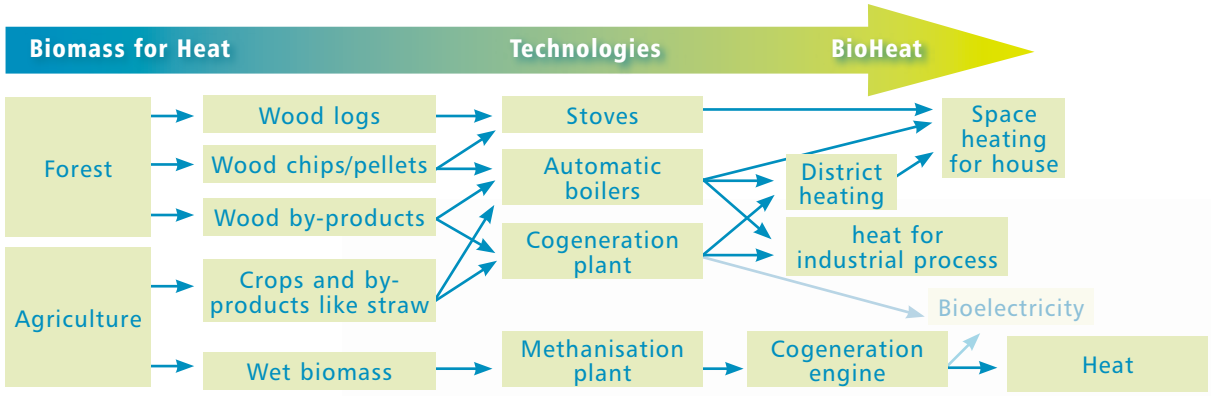
Biomass for Heat

Biomass originates from forest, agriculture, their related industries and waste streams. It represents two thirds of the Renewable Energy Sources in Europe. Biomass for heat accounts for 96% of the Renewable heat.

Combustion of wood for heat production is the main bioenergy route in the world, with a constant drive for improved efficiency, reaching more than 90% for automatic systems, and reduced pollutant emissions. Several systems can be considered, depending on the size. Small-scale heating systems for households typically use wood logs or pellets. Medium-scale users typically burn wood chips in grate boilers while large-scale boilers are able to burn a larger variety of fuels, including wood waste and refuse-derived fuel.
Heat can also be produced on a medium or large-scale through cogeneration which provides heat for industrial processes in the form of vapour and can supply district heat networks.

Wood pellets are offering bright opportunities for convenient automatic heating systems for family houses

Biomass for heat can be converted into bioheat through several chains (simplified diagram)

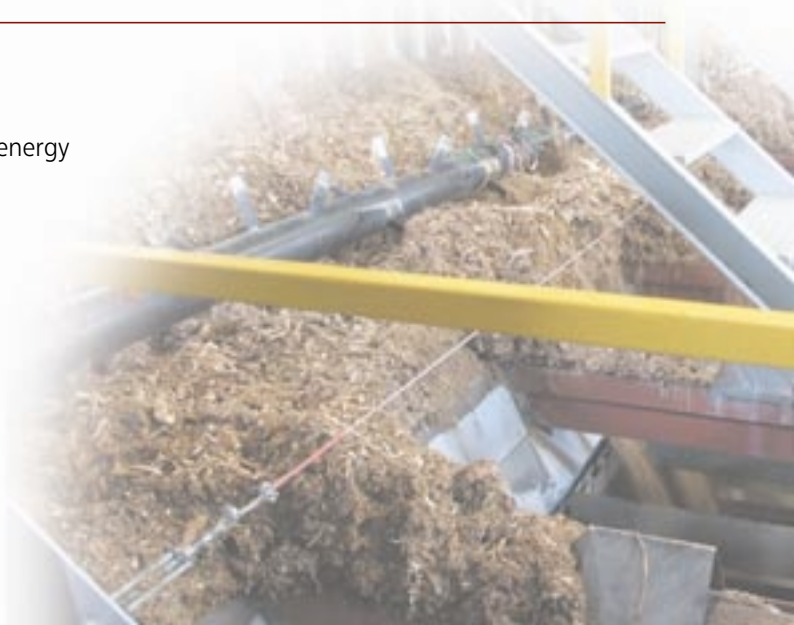


Source: AEBIOM

Specific advantages of biomass for heat

Security of energy supply

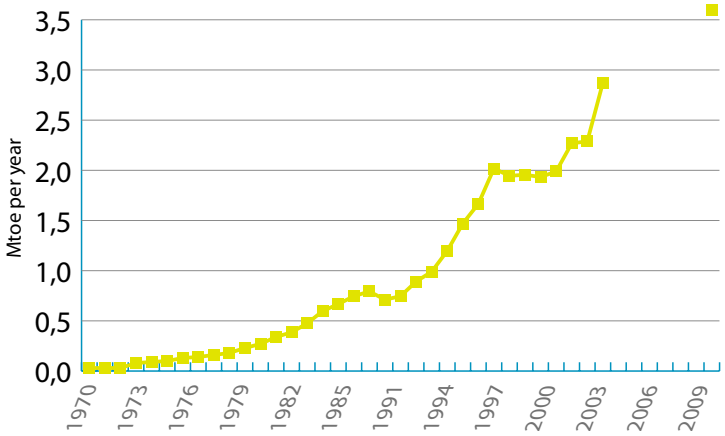
- Technologies available and reliable
- In general very high conversion efficiency into final energy
- Convenient possibilities for private households
- As biomass can be stored, bioheat can be produced on demand
- Possibility for cogeneration
- Biofuels cheaper than fossil fuels
- Many business opportunities, especially for SMEs
- Abundant job creation



Due to the higher oil prices these last two years bioheat has boomed in many European countries. All bioheat chains have progressed significantly, backed up with an industrial development related to the biomass preparation and distribution, technology manufacturing, and various kinds of energy services.

Medium size boilers can be used to heat schools, hospitals, public buildings, groups of apartments, small district heating networks, etc.

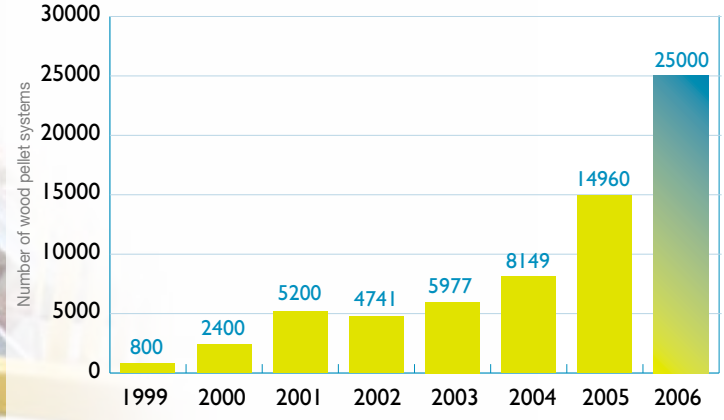
The supply of biofuels for heat in district heating in Sweden is increasing steadily



Source: SVEBIO and Swedish National Energy Agency

Various studies have shown the significant impact of bioenergy on local communities and employments. One million toe of biomass heating systems generates 70.000 jobs for one year for the installation (7.000 MW) and 4.500 jobs per year for the operations and maintenance.

Annual increase of wood pellet systems in Germany



In a few years the market development of wood pellet systems in Europe is impressive as shown in the graph with the annual wood pellet system sales in Germany

Source: German Energy Pellet Association

A big potential for geothermal energy: heating and cooling

Geothermal Energy is a Renewable Energy resource that delivers heat and power 24 hours a day throughout the year. It is nearly infinite and available all over the world to satisfy heating and coolings needs.

Per definition, geothermal energy is the energy stored in form of heat below the earth's surface.

It has been used since antique times for heating, and for more than 100 years also for electricity generation.

Source: EGEC

The geothermal potential is inexhaustible in human terms, like that of the sun. Beside electric power generation, geothermal energy today is used for district heating, as well as for heating and cooling of individual buildings, including offices, shops, small residential houses, etc.

Traditional heating applications

Deep geothermal energy

Deep geothermal energy can be used mainly in geological basins (France, Germany, Italy, Hungary, Poland, etc.), for district heating, for agricultural uses like greenhouses, for aquaculture, and also for power. The preferred method is the use of thermal water through well doublets, but recently also deep borehole heat exchangers have been demonstrated.

Shallow geothermal energy

With ground source heat pumps, geothermal applications can be present virtually everywhere.
In several countries (Sweden, Switzerland, Germany, Austria) a market-driven economy exists already. This is further boosted by the current oil price development.

Innovative applications

Desalination applications

One in three people in the world currently suffer from water shortage. Geothermal energy could be one of the technologies which will reduce this problem by desalinating seawater.

Absorption cooling

Geothermal energy has been used for cooling for a long time in the form of reversible geothermal heat pumps or through direct cooling in shallow geothermal applications. A very good potential for larger systems (large individual buildings, district cooling) can be seen in geothermal absorption cooling.

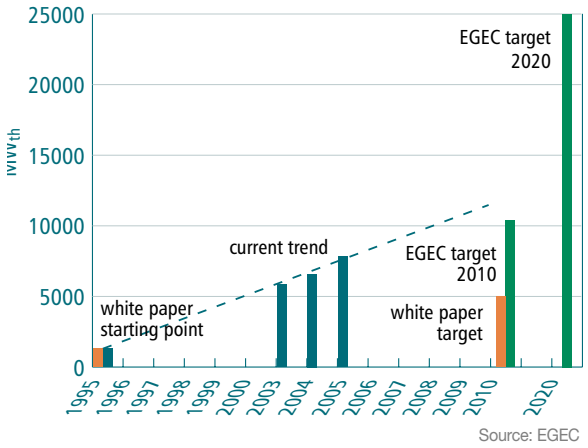
Combined Heat and Power

Combined Heat and Power (CHP) plants are not a new use of energy, whether it be from conventional fossil fuels or geothermal. However, what has been happening recently in the geothermal arena is the use of low-temperature resources (down to 98 °C) in combination with binary power units.

Industrial applications

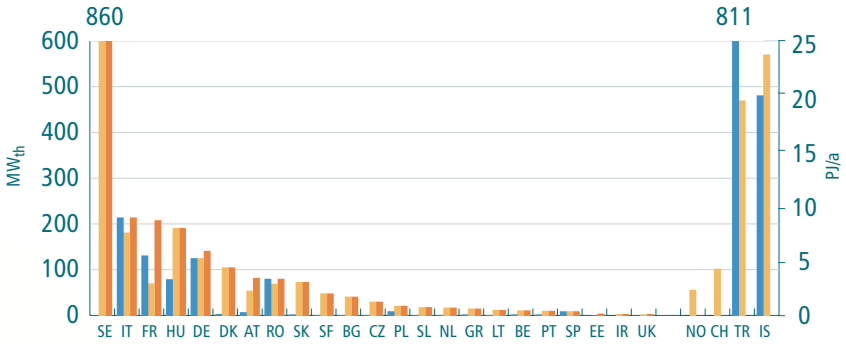
Geothermal energy may be used in a number of ways in the industrial field: drying, process heating, evaporation, distillation, washing, chemical extraction for food processing, supermarkets, wastewater treatment, chemical recovery.

According to World Geothermal Congress (WGC) 2005 data, in 2004 a total of approximately 2 Mtoe has been supplied by geothermal heating alone within EU 25, and more than 1 Mtoe in other European countries. Leading countries are Italy, Sweden, Greece, France, Germany inside the EU, and Turkey and Iceland for the rest of Europe.
At the end of 2005, the installed thermal capacity (including heat pumps) amounted to almost 8.000 MW_{th}. Unlike other Renewable Energy sectors, the geothermal sector has already outgrown the EU White Paper objectives outlined for 2010 (which were less ambitious, and did not account for the great success of geothermal heat pumps, and of the geothermal potential in the new Member States).



Source: EGEC

Concerning geothermal power production, the installed electrical capacity in the European Union alone totalled about 800 MWe, in 2005, producing more than 5.500 GWh of electricity (with an excellent average load factor of 77 %!).



Source: EGEC

There is quite some variation between the different statistical sources, mainly due to diverging approaches towards geothermal heat pumps. Thus the main difference between Eurostat and the other sources is for countries with a high share of ground source heat pumps, e.g. Austria, Denmark, Finland, Germany, Sweden. For some other countries like Slovakia, Eurostat data are just missing.

Geothermal energy: A local answer, ecological and efficient, to reduce energy costs

A Renewable Energy:

- An energy resource nearly infinite, delivering heat and power 24 hours a day throughout the year, and available all over the world
- Friendly for the environment: large reduction in CO_2 emissions
- Very low visual impact, and most of the infrastructure can be hidden beneath the ground
- Heat-pump installations are unobtrusive and noise- and pollution-free on site

An energy economically sustainable:

- Reduction of energy invoice from 40 to 80%
- Not sensitive to conventional energy prices (or low sensitivity, in case of electrically driven heat pumps)

A safe and controlled technology:

- Not dependent upon climatic conditions
- Proven and reliable technically: drillings, heat pumps
- Excellent feedback from leading countries

An energy adaptable with high performance:

- An answer to different energy needs: heating, cooling, hot water
- Modulated according to size and nature of equipment, and in order to meet demands
- Adaptable to old and new buildings

Barriers to growth

Gaps among Member States show the growth potential

The development of RES-H markets in Europe is strikingly unbalanced. Very few countries have a very large share of the installed capacity at EU level, a fact that cannot be explained by the distribution of natural resources.
Why should Austria's solar thermal capacity per capita be 30 times larger than Italy's? Three countries together have a share of nearly 70% in geothermal heat pumps. The difference in RES-H development in the Member States is reflected in the different national policy frameworks, e.g. in Sweden the small-scale pellet heating system is already economical due to the taxation of fossil fuel, while in Austria significant investment subsidies (up to 35%) for modern wood-energy residential heating systems have been successfully introduced. Other Member States have been less supportive so far. If successful measures were adopted throughout the Union, RES-H would grow towards its full potential.

An impressive example for the uneven market development is the solar thermal capacity in operation per capita. The EU leading countries at the end of 2005 were Cyprus, Austria, Greece, and Germany with a respective capacity of circa 480, 200, 180, 60 kW_{th} per 1.000 inhabitants. However, the EU average is less than 30 kW_{th} and several high potential Member States like Italy and France are lower than 10. It is obvious that the growth potential is huge. If all countries would start serious market development like the frontrunners, we would see much more market development evenly spread.

Biomass heating has been most successful - both in district heating systems as well as in building-specific installations - in Nordic countries and in Austria and is now seeing very encouraging developments in countries such as France and Germany. Especially in most of the New Member States very large biomass potentials can be found.

Different public policies are one of the main causes of this unbalance. If efforts to promote Renewable Heating and Cooling are not significantly increased in all Member States, it is likely that the EU will:

- Miss its overall targets on renewables
- Continue to waste precious fossil sources and electricity that could be used for other purposes
- Miss an opportunity to create jobs and wealth at local level
- Miss the opportunity of achieving local and EU-wide economies of scale, leading to cost reductions for Renewable Heating and Cooling, in times of scarce oil, gas and electricity

A large part of the turnover related to Renewable Heating and Cooling systems is inherently local, as it comes in the area of design, installation and maintenance of the systems. In the case of biomass, regional forestry and agriculture often benefit. Therefore, a significant part of the added value remains in the regions where the RES-H market develops, whereas a large part of the added value related to fossil fuel consumption benefits economies outside the EU.

Barriers to growth

New policy initiatives in this field need to address the key barriers to growth, including

- High share of upfront investment costs: RES-H, especially solar thermal and geothermal, enjoy very low running costs (the energy source is free), but a higher share of investment costs than fossil or electrical heaters. This can be a key barrier, particularly for households
- Return on investment (RoI): for the sake of simplicity, many people tend to assume stable energy prices when calculating the RoI on heating devices that last 20 years or longer. However, there are good reasons to assume rising energy prices in the long term. This distorted perception is a barrier for RES-H
- Owner-tenant dilemma: in many buildings, both residential and tertiary, those who pay the bill are not the same as those who decide on investments for infrastructure
- "Chicken-and-egg" problem: low awareness causes low demand and vice-versa. Low demand from the consumers leads to a reluctance of installers, engineers or builders to enter RES-H business fields, which results in a limited offer on the market, which again causes high costs and low awareness
- Behaviour patterns: increased RES-H requires changed

investment behaviour of millions of energy consumers. For many, RES-H is still "exotic" and by default is not considered when an investment decision is being taken
- Lack of critical mass: in most EU countries, the small volume of sales makes marketing and distribution unnecessarily expensive. For the same reason, many market actors are SMEs and find rapid expansion difficult

A coherent and continuous policy framework is needed

No single instrument can cope with all barriers to growth.

Continuity is the most important single requirement for RES-H policies. This conclusion emerged from the extensive analysis of the sectoral studies and the numerous case studies produced within the K4RES-H project. To avoid stop-and-go, the political support must be continuous for several years.
To guarantee continuity, it is necessary to commit to ambitious and verifiable targets, that must be the guiding line for the specific measures to be taken. This study offers proposals on how to set such targets and monitor the development at national and EU level. Presently, statistics on the heating sector in general are weak. A speedy establishment of more detailed reliable and comparable statistics will allow to increase our knowledge of this market.
The key message resulting from the policy case studies produced within the K4RES-H project is that, in each EU country, there is a need for a comprehensive policy approach, based on clear and ambitious targets and on the coherent implementation of different instruments, reinforcing each other.

Coherent strategy to promote renewable heating

Source: Solarpraxis [3]

The main instruments to achieve sustainable growth of RES-H are:

- Financial incentives
- Regulations
- Awareness raising
- Training
- R&D
- Demonstration projects

Creating artificial barriers to trade within the Internal European Market must be carefully avoided. It is therefore essential that any national or regional instrument is strictly based on the existing European standards and certification procedures, when they are available like in the case of solar thermal. Where these are not available, and notably in the case of sustainability criteria for biomass, it is essential that such standards and certification procedures are set right away at EU level, in order to avoid lengthy harmonisation procedures, during which the EU market remains fragmented.

In the field of biomass, possible future competition for indigenous biomass resources among the Renewable Electricity, transport and heating sectors will need to be addressed by policy makers.

Wagner & Co, Cölbe [4]

Continuity is the most important single requirement on RES-H policies

[3] www.solarpraxis.com - [4] www.wagner-solar.com

Financial incentives

Higher upfront investment costs for RES-H installations compared to conventional heating systems are one of the main reasons for slow market development. Financial incentive schemes (FIS) such as direct grants, tax reductions, or low interest loans can be a decisive instrument in promoting the use of RES-H and exploit the huge untapped potential of renewables in the heating and cooling sectors.

The key lesson learned from the analysis within the project is that FIS can play an important role in promoting RES-H, if they are well designed, carefully managed and accompanied by appropriate flanking measures. If they are not, their positive effect is limited and can be even counter-productive in the medium and long term.

The key positive effects of well designed and managed financial incentive schemes are:

- Reduction of the upfront investment costs, or of the fuel costs in the case of biomass
- Psychological effect: signal of the public authority to the potential users

The development of RES-H markets faces specific challenges. In buildings, nearly 90% of the heat and almost 100% of cooling is produced on-site, the remainder being delivered through District Heating and Cooling networks, which however constitute an attractive market for RES-H.

On the demand side, policies to promote RES-H should therefore address millions of building owners and developers, construction companies, district heating operators, etc. And the financial incentives offered should be high enough to encourage these actors to invest private money.

On the supply side, the small volume of the market for RES-H equipment in most European countries means that manufacturers are still at an early stage in the development of economies of scale. A longer term financial incentive scheme creates trust in the growth of the market, thus encouraging investments in new production lines and the distribution chain.

Specific professional groups are crucial for the market development, as they often act as the gatekeeper between supply and demand: installers, heating engineers, and architects.
These groups are key influencers of the decisions of the potential users. At the same time they can have a stake in the supply side, as the added value of their services usually tends to increase if they offer Renewable Heating and Cooling. In a positive environment, they can contribute to the market penetration of RES-H. To do so, they need first to acquire skills and experience with RES-H systems. Without these skills, they may tend to discourage potential users, thus becoming a brake for market development.

Continuity is the decisive factor

Therefore, continuity in time is the single most important element of a well designed and managed FIS for RES-H. Several examples from different countries and RES-H technologies show that discontinuous financial incentives can actually hinder development of healthy market structures by creating a stop-&-go market dynamic.
Under such conditions, the supply side and the professional groups mentioned above are discouraged from investing. A short term FIS may boost demand for a while, but does not create healthy market structures. On the contrary, such a situation may lead to a proliferation of "gold-diggers", i.e. companies with a short term perspective that tend to install bad quality systems, leading to loss of reputation of the RES-H technologies.
The announcement of new or higher incentives in the future is even worse than a sudden reduction of the level of financial incentives. Again and again, such an announcement has led to consumers postponing their purchasing decision until sometime in the future.
Continuity creates confidence, which helps establish a healthy market for RES-H products.

Principles of best practice for financial incentives for RES-H

The K4RES-H project developed a series of recommendations based on the principles of continuity, coherence, clear targets, simplicity, open markets and incentive amounts. The main recommendations are summed up here:

- FIS should be established on a longer term basis: Providing funds for just a few months will not have a long-lasting effect on the market
- Avoid creating an incentive to postpone installation of RES-H systems: New or improved FIS, should not be announced before they become available
- Within a FIS conceived to last some years, adjustments of certain conditions should be possible to adapt the FIS to the market development. The adjustments should be discussed with market experts and be introduced, aiming at minimizing any negative impact on the market development
- The parameters concerning the eligibility of specific applications, technologies, the amounts offered and the categories that may apply for the incentive should be coherent and carefully tuned. The accompanying awareness raising and training measures should be targeted accordingly
- Any technical parameter linked to the eligibility for a FIS should be strictly oriented to European Standards and certification procedures, where applicable. Otherwise, a FIS can contribute to creating "isolated markets" at national or even regional level, thereby increasing the costs for the users
- Administrative procedures should be as simple as possible, both for the applicants and for the public administration
- The amount of the incentive should be related to the amounts of Renewable Energy delivered by the system. Requirements on measurement of Renewable Heating and Cooling should be related to their costs and benefits
- Innovative Renewable Heating applications, such as cooling or industrial process heat, should be awarded a specific discount, taking into account their future potential and additional benefits

Regulations

Building codes and planning laws can have significant impact on the uptake of Renewable Heating technologies – positively or negatively.

In Spain, many municipalities have adopted Solar Ordinances, similar to the one originally enacted in 1999 by the City of Barcelona. These regulations make solar thermal hot water systems a requirement in new buildings, and the effect on the uptake of solar thermal has been considerable. This paved the way for a solar obligation to be included in the new Spanish national building code, approved in 2006. The existence of a national solar obligation has encouraged many companies to invest more money into the development of the market in Spain.

By requiring new buildings to use – at least for a certain share of their heating and cooling demand – Renewable Energy Sources, these technologies quickly become mainstream products. Israel, which has had such an obligation since 1980 has shown that once the market has reached a critical mass, people voluntarily choose RES-H. Products and service are now offered everywhere – one does not have to find specialised shops, planners or installers – and mass production and marketing drives down costs. Public support for RES-H can therefore focus on emerging new applications, such as cooling for industrial process heat using Renewable Energy Sources.

In the UK, a growing number of local authorities have adopted a requirement, based on the national "Planning Guidance on Renewable Energy", on major new developments to cover a certain share of the energy demand by Renewable Energy. The London Borough of Merton was the first to adopt such a requirement, hence the name "Merton Rule". While not specific just to heating and cooling, this approach shows how governments can influence the uptake of renewables in buildings. And as the measure is not dependent on annual budget approvals, it tends to be more stable in time, thus greatly improving the investment climate for RES-H technology providers.

While the aforementioned regulations were enacted to stimulate the uptake of RES-H, other regulations sometimes create barriers to growth – often inadvertently. Most existing planning laws and building codes were developed without paying attention to the requirements of Renewable Heating and Cooling technologies. Serious problems with regulations for Renewable Energies can also develop when certain technologies are exclusively required, limiting the choice and the adaptation to a certain building, location and climate.

In particular for geothermal the issue of licensing procedure is of great importance. A major problem is that the relevant national legislation is spread throughout the mining, energy, environmental, water management and geological acts. If small geothermal systems are treated similarly to huge mining projects, small-scale applications will not enter into the market. For deep geothermal systems, fees and royalties can become a huge burden. They exist for example in France, Hungary (2 % of turnover), Poland, Romania (2 % of turnover), and Slovenia. There should not be any royalties on geothermal energy in these countries or anywhere else, and if there is a royalty, it should be as low as possible in order not to hamper this Renewable Energy Source from entering the market.

In general, simple and fair application and licensing procedures will help significantly in the development of RES-H.

Innovative applications

Renewable Heating and Cooling has a far bigger potential than those applications mostly used today. While the heating of the built environment (space heating, domestic hot water) will continue to be the most important market segment, other applications will grow to significant market shares.

One should mention a few examples, such as Renewable heat for industrial processes, for desalination and for cooling. Their success in the market will play a decisive role in transforming the heating/cooling market from one based on conventional – mainly fossil – fuels to a market based on clean and secure Renewable Energy Sources.
These applications are not yet widely available. It is therefore important to understand their specific barriers to growth and consequently the best strategies to help overcome these barriers.

ORC (Organic Ranking Cycle) installation in the geothermal CHP plant in Newstadt-Glewe, Germany

The current main barriers for these applications are common with most "early-stage technologies":

- High upfront investment costs
- Lack of awareness amongst decision makers
- Lack of trained professionals
- Lack of mature and possibly standardised products

In order to overcome these barriers, the following recommendations have been produced:

- Funding for demonstration projects and awareness raising
- Increased funding for R&D on these applications
- Training of professionals (planners, installers)
- Inclusion of these applications in RES-H targets as well as in policy measures, such as the implementation of the Energy Performance in Buildings Directive (2002/91/EC)

Cooling and air conditioning demand is growing at fast pace. While it is not immediately obvious, Renewable Heating can be used to drive cooling machines. Such thermally-driven cooling machines are either based on a sorption/desorption cycle or on the principle of desiccant and evaporative cooling (DEC). The technology has been used for decades, mainly in connection with industrial waste heat, which was used to drive the cooling machine. Ab- or ad-sorption chillers have traditionally come in rather large capacities – most often beyond 100kW cooling capacity. This made them unsuitable for use in smaller buildings, such as office or residential buildings. Smaller machines that can be used in these environments (10-20 kW) have emerged only recently. And even smaller machines (2-5 kW) are on the horizon.
One of the main benefits of thermally-driven cooling machines is their reduced electricity consumption for cooling purposes. By using Renewable heat, the whole process can furthermore be turned CO_2 neutral.
Thermally-driven cooling machines are a very good complement to heating systems:
Cooling demand – especially air-conditioning – is highest, when heating demand is low or zero. Thus any Renewable Heating system, which is unused or not fully used in summer, could drive a cooling machine. This increases full-load hours of the heating side of the system.

Flanking measures

Flanking measures such as public awareness raising and training of professionals are other key factors for the effectiveness of financial incentive schemes and regulations. This is so because best financial support schemes will not have a significant impact on the RES-H markets if the public is not aware of both, the financial incentives and the available RES-H options.

Awareness raising

Therefore, one particularly important flanking measure is the creation of public knowledge and understanding of Renewable Energy technologies and their benefits for private consumers. Those individuals that are taking decisions regarding the heating and cooling technology in private homes, office buildings or the industry, must be informed about the technology and how it can be applied in real lifetime situations, in order to replace conventional heating and cooling technologies. Well designed awareness raising campaigns should accompany other support measures – especially in less developed markets.

Leading by example, the public sector can set a precedent and give priorities to Renewable Heating and Cooling installations as part of the procurement policy, particularly when it comes to newly constructed buildings or buildings undergoing renovation. Demonstration projects in schools and other public buildings help to raise the visibility of Renewable Heating and Cooling technologies.

Training of professionals

Another very important measure is the education and training of relevant professionals: To date the lack of knowledge about RES-H technologies on the side of architects, planners and installers poses a serious burden for the broad market penetration of renewables in the heating and cooling markets. It has become evident that an installer who has installed conventional energy systems for many years is unlikely to offer or even recommend a suitable alternative based on Renewable Energy without the knowledge and awareness about the systems and the technical requirements. Where the standard training of professionals does not include RES-H yet, public bodies should support the establishment of specific training offers for architects, planners and installers. This would also ensure a high quality of the design and installation of the RES-H systems.

Setting targets and statistics

Targets represent an important step in policy making. The rapid market development and technological advancement of the Renewable Energy sector in recent years ensured progress on the White Paper targets in the area of electricity and biofuels, where Directives have set concrete targets. Analogous targets for the heating and cooling sector will guide national and local policy makers in their decisions and send important signals to investors and the public.

Nevertheless, as heating and especially Renewable Heating and Cooling has not been in the focus of energy statistics so far, setting verifiable absolute targets for RES Heating and Cooling implies the solution of some statistical and methodological issues.

The main challenge so far is the harmonisation of the statistical methodologies. As in most countries heating is decentralised and not grid connected, statistics cannot be derived from energy fed into the grid as in electricity. Statistical assumptions on the energy production must therefore be derived from the number and capacity of the installed RES-H systems. But despite common questionnaires of Eurostat and the International Energy Agency, the collection, aggregation and conversion of RES-H data varies greatly between countries. Therefore it is recommended to:

Improve the overall data quality by:

- Improving data collection
- Agreeing on a methodology to discount old RES-H systems, which can be assumed to have reached the end of their life-time

Improve the comparability of statistics by:

- Including all relevant RES-H system types in the statistics
- Harmonising the definitions of RES-H used
- Harmonising the conversion methodologies used in calculating the RES-H energy production.

These measures could significantly improve RES-H statistics in Europe. But even with the current state of statistics it is already possible to set and monitor verifiable targets.

The EU should set an overall RES-H target, which shall be broken down into national binding RES-H targets for each Member State. Member States should then define sub-targets for each separate RES-H technology taking into account their natural resources and the capacity already in operation. The clearer the target is formulated, the better it will serve as a guideline for policy makers who design and implement suitable support strategies and evaluate their success. Technology-specific targets set by each Member State will ensure that none of the technologies is easily forgotten.

According to Eurostat the share of Renewable Heating today is about 9% of total heat demand. This can easily be doubled by the year 2020 and with some ambition a share of 25% by 2020 is feasible.

Renewable Heat Projections

type of energy*	2003	2004	2005	2010	2020
biomass for heat	48,2			74,8	120
solar thermal	0,5	0,6	0,7	1,7	19,7
geothermal	0,56		2,1	4	8

Source: EREC

*in Mtoe

Quantifying energy delivery

In the heating sector, energy measurement is in general less common than in the electricity sector. In large Renewable Heating systems a direct measurement of the heat produced – and therefore of the conventional fuel saved – is a common feature. In small RES-H systems, this is typically not the case, as the costs of measurement would outweigh any benefit. Since policies to promote RES-H aim at increasing the production of Heating and Cooling from Renewable Energy many of them are linked to the measured or expected energy production of an individual RES-H installation. This link is sometimes very direct, e.g. when only the RES-H energy produced and measured is financially supported or more broadly, e.g. when a financial incentive is linked to the m^2 of solar thermal collector area of a certain system. Within the K4RES-H project, clear recommendations were developed on best-practice measurement of the Renewable Heat production for systems that are typically measured, as well as objective calculation methods to be used in cases where measurement is too expensive (typically this is the case with smaller systems). These practical recommendations can be used by policy makers, who want to implement financial incentives or regulations based on Renewable heat produced. As the detailed recommendations are rather technical, it is recommended to visit the K4RES-H website at http://www.erec.org/projects/proj_K4_RES-H_homepage.htm to receive the full set of information.

RENEWABLE HEATING ACTION PLAN FOR EUROPE

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WIP - Renewable Energies

Supported by

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The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

A comprehensive website provides more information on each key issue, and on the project and its deliverables: www.erec.org/projects/proj_K4_RES-H_homepage.htm

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Published in January 2007 - Design: ACG Brussels
Printed on ecologically friendly paper (chlorine-free paper)

Photo and graphical elements credits: ADEME, AEBIOM, AEE Intec, Austria Solar, Brian Jones, Bundesverband Solar industrie Bsi, EGEC, ESTIF, German Energy Pellet Association, Gtv, Lit-bioma, Neustadt-Glewe, Schott-Rohrglas, Solahart, SVEBIO Swedish National Energy Agency, TGA, Teufel Schwarz, Thermomax, ValBiom, Wagner & Co, Cölbe.