

# **Sector Report**

## **Renewable Heat**

### **Background**

Renewable heat makes a considerable contribution to the European energy market, although the growth was less significant than in the electricity sector during the last decade. This sector will play a very important role in the medium and long term and will have a crucial effect on whether the EU fulfils its primary energy targets. It contributes to a great extent to decreasing import dependency and diversifying sources of production, and working towards achieving a sustainable development in Europe. The European Community has been proactive in seizing opportunities to develop new renewable energy markets and technologies for heat generation and in building-up leading industries. Moreover, renewables have provided an important impulse to realising social objectives such as increased employment opportunities and supporting social cohesion in Europe.

Heat produced by renewable energy sources (RES-heat) in 2001 amounted to about 49 Mtoe or roughly 12 % of the gross heat consumption in the EU-25 countries. Both in the EU-15 as well as in the new Member States, biomass is by far the most dominant source of RES-Heat and contributes about 97 % of total RES-Heat consumption in the EU-27. Geothermal energy makes the second largest contribution with roughly twice the heat output of solar thermal collectors in the EU-25. From 1990 until 2001, the biomass heat output increased by 20 %, solar thermal heat by 200 % and geothermal heat by almost 150 %.

The future potential of RES-heat in the EU-15 realisable until 2020 amounts to about 150 Mtoe, which corresponds to roughly 30 % of the projected heat consumption. The corresponding figure for the new Member States is 35 Mtoe for the mid-term potential (more than 50 % of the projected heat consumption). The largest additional potential in the EU-15 is found in the biomass sector (40 % of the total potential), whereas geothermal heat and solar thermal collectors have a similar potential of about 30 % each. In the new Member States, biomass heat (65 %) shows the dominant future potential followed by geothermal energy and solar thermal heat (about 17 % each).

### **Objectives of the ALTENER Programme**

ALTENER is the Community's programme for the promotion of renewable energies. The main aim of ALTENER is to implement and complement Community measures designed to develop the renewable energy resource potential. More

specifically, the ALTENER programme focuses on the harmonisation of equipment and products, the development of the RES infrastructure in order to increase investor confidence, and the improvement of information dissemination and training as well as the increase of the operational capacity of renewable energy sources.

ALTENER complements a number of EU policy measures on renewable energy sources, which have made considerable progress over the last decade. The existing Community legislation aimed at stimulating the development of renewables in the European energy market with relevance for the heat sector is comprised of:

- The White Paper “Energy for the future” (COM(1997)599), which set a target of doubling the share of renewable energy from 6 % in 1997 to 12 % in 2010.
- The Green Paper on the security of energy supply in Europe (COM(2002)321).
- The Directive on the energy performance of buildings (COM(2001)226) supporting, among others, the application of renewable heating applications.
- The Common framework on the taxation of energy products and electricity, specifying minimum tax rates and permitting tax exemptions for energy products and electricity from renewable sources (Environment Daily, March 21, 2003).

Other important measures for the promotion of RES-heat include the Campaign for Take-Off as well as research and development (R&D) funding under the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Framework Programmes. Between 1998 and 2002, the period of the 5<sup>th</sup> Framework Programme, the European Union spent more than 400 million € on R&D for renewable energies. The R&D programme aims at fostering outstanding scientific and technological developments. ALTENER complements technological innovation very well by focusing on the improved market diffusion of renewable energy technologies on the European energy markets. The projects summarised in the sector “Renewable Heat” are forerunners of this development.

### **Important Project Results and Contents**

More than half the projects in the sector “Renewable Heat”, which were all funded under the ALTENER programme, deal with the promotion of defined RES technologies such as solar thermal energy, biomass, biogas, and geothermal energy. Some projects are explicitly directed towards integrating different renewable energy sources within certain buildings or sectors. The other projects take a general view on renewable energies focusing on specific measures to overcome existing barriers to increased use. According to their respective main emphases, the projects in the renewable heat sector can be subdivided into three main clusters with several sub-clusters:

1. Projects aiming at the promotion of certain technologies:
  - solar thermal energy
  - biomass and biogas
  - geothermal energy
2. Integrated RES concepts
3. General RES projects with emphasis on specific actions
  - policy-oriented actions
  - market transformation activities
  - awareness-raising, and
  - assessments and studies.

### *Projects aiming at the promotion of specific technologies*

Some of the projects in the sub-cluster **solar thermal energy** also include photovoltaics (for details, see Sector Report “Renewable Electricity”), e. g. a national campaign for the general public in Italy and a regional one in Germany, a CD-ROM with PV and solar thermal installations for the housing and the public sector, or a regional market database.

A number of projects concentrate on training measures, e. g. courses and materials for planners and architects offered by several German organisations, training on solar systems in agro-touristic areas in Italy and France, or seminars in schools and public lessons in Spain and Portugal. Some larger projects address installers as a very important target group for promoting solar thermal technology, because they act as planners, installers and advisers for their clients at the same time. One of these projects developed courses in six European countries and tested them in pilot cases<sup>1</sup>; another defined general standards for a high-quality seminar for installers and developed and tested accreditation procedures for courses which fulfil these requirements<sup>2</sup>; a similar project is still ongoing in different countries, combined with public awareness activities<sup>3</sup>.

Some projects compiled a bundle of dissemination measures and most of them were applied in various countries. These are usually a combination of brochures, web-sites, campaigns, seminars and events etc.. Some activities target particular types of buildings, e. g. hotels or sport facilities. Almost all the other projects concentrate on household installations. Only one project found promising potentials for flat collectors in industrial processes.<sup>4</sup> Some project teams developed handbooks, e. g. on the active and passive technologies available for solar cooling, on design guidelines<sup>5</sup>, or on solar thermal promotion strategies<sup>6</sup>. Promotional activities were also incorporated into regional action plans on solar thermal installations in projects whose results again emphasised the relevance of co-operation between different market players and decision-makers. Another priority of studies was (or still is) on

network building, e. g. on a local level<sup>7</sup>, and exchanging experiences between experts and other stakeholders through a web-site<sup>8</sup> or in workshops.

Two large projects, in particular, are directed at **passive solar use**. The first groups different work packages, one of which was a competition for architects at three locations in different EU countries, combined with the use of an assessment tool to evaluate the solar quality of a construction plan.<sup>9</sup> Due to co-operation with investors, the chances that the winners will be able to implement their designs are regarded as high. Another work package was the development of a pilot project in the social housing sector in Ireland; its realisation depends on the local authority. The second project found a high potential for passive solar energy use, but also a lack of awareness and information among designers and developers; to counter this, a web-site was created which has received frequent visitors and design software was produced.<sup>10</sup>

Roughly the same number of projects as those on solar thermal use are found in the field of **biomass and biogas**. Most concentrate on small units rather than large-scale applications. Some of the projects include combined heat and power production and are therefore also included in the Sector “Renewable Electricity”.

Several projects deal with network building in the form of international co-operation between countries with varying degrees of penetration of the biomass technologies and the exchange of experiences and expertise. An EU-wide “virtual biogas centre of excellence” is under construction involving organisations and institutions which can contribute to dissemination activities.<sup>11</sup> Another team developed training books and a CD-ROM on solid biofuels combined with a promotion campaign and the establishment of a “virtual biomass network”<sup>12</sup>. It discovered that qualified energy consultants play an important role in encouraging potential investors. Exchanging know-how was a central element of an “Olive Oil Network” about the best practices of biomass use in the olive oil industry<sup>13</sup> and of a feasibility study including financial models with private participation<sup>14</sup>. A number of projects deal with the processes along the supply and distribution chain. These included a study on the European biomass market place<sup>15</sup> and a project which aims at network building and elaborates a toolbox to establish such networks in order to develop commercial structures and mechanisms for wood heating with combined heat and power production.

Two projects are concerned with organic residues from agriculture and the agro-industry. One developed a regional action plan together with a municipality<sup>16</sup>, the other investigated barriers, studied potentials and market conditions, and identified promoters and dissemination measures in rural areas<sup>17</sup>. Two biomass projects developed planning tools. A study on small-scale wood-fired district heating networks, which included technological analyses, market conditions and the impacts of biomass use, resulted in a handbook for the planning process.<sup>18</sup> This

handbook emphasised the influence of non-technical factors on the realisation of projects and identified the lack of knowledge on the part of decision-makers as a major obstacle. A computer-based model for decision-makers<sup>19</sup> went in the same direction and was validated in pilot tests. An ongoing large project in several EU Member States, including accession countries, is developing a market- and practice-related tool alongside many other measures to promote bioenergy, which is regarded as a key instrument for achieving the aims of the EU White Paper.<sup>20</sup> Another project has just started to gather data from existing biomass plants for a benchmarking process and to identify best practice cases for dissemination purposes.<sup>21</sup> Finally, some feasibility studies focus on the technical and market potentials for biofuel micro turbines<sup>22</sup>, high-temperature combustion of biomass<sup>23</sup> and biomass use in district heating schemes.<sup>24</sup>

A smaller share of the biomass projects in the sector “Renewable Heat” deal with heat production without CHP. They are relatively heterogeneous with respect to their subject matter. In 1998/99, some early projects developed handbooks, e. g. on biomass heating for greenhouses, on processing feasibility studies, or on co-operation models for SMEs in the heat service sector with common marketing and franchising strategies.<sup>25</sup> In another project, a similar operational model is being tested in case studies.<sup>26</sup> A multi-national market study on wood pellet supply revealed that market barriers can best be overcome by country-specific measures, but that there is the need for common quality standards of the materials.<sup>27</sup> A few projects focus on training either for installers, or for planners. A large ongoing study concentrates on biomass heating systems in large buildings – the feasibility and profitability of which had been shown in a former study<sup>28</sup> – and is developing promotion measures, including an Internet platform for exchanging information.<sup>29</sup> A similar, very large project aims at establishing a “European Pellet Centre” as a platform for all the players concerned.<sup>30</sup>

Only a few, relatively small projects in the sector “Renewable Heat” deal with the promotion of **geothermal energy**. Two of them are feasibility studies, one emphasising the development of a methodology as an aid to decision-making.<sup>31</sup> The diffusion of absorber technologies for the use of ground, wall, or piles heat offers new business and employment opportunities.<sup>32</sup>

### *RES Integration Concepts*

A number of projects deal with the promotion of RES integration. They include RES electricity as well as heat production. Some of the projects share a similar approach: they concentrate on a special site or type of building as case studies in different countries, carry out feasibility analyses, initialise and support the implementation and finally develop additional dissemination measures and materials. Examples of the cases involved include a restructured old building site, newly built settlements<sup>33</sup>, mountain communities, mountain huts, urban and sport

facilities<sup>34</sup>, information centres on Greek and Spanish islands, rural areas characterised by agriculture and tourism<sup>35</sup>, schools<sup>36</sup>, and hotels<sup>37</sup>. Common to most of these projects is that they used the results obtained for guidelines, handbooks and seminars for planners, decision-makers and users of buildings. Other projects taking a more general approach are still ongoing. One is developing a regional planning tool taking the local infrastructure and other specific conditions into account<sup>38</sup>, another is trying to set up Regional Advice Units to bring together and train local players. Finally, one project is undertaking a benchmarking process of the role of building regulations in different countries in order to develop a European model building code for RES integration into residential new buildings and retrofit concepts.<sup>39</sup>

### ***General RES Projects with Emphasis on Specific Actions***

Most of the projects in this cluster fall under types of awareness-raising activities, followed by assessments and studies. Only few address market transformation activities. Finally, some projects were found on policy-oriented actions.

One of the projects in the sub-cluster “**policy-oriented actions**” deals with the legal and administrative framework for RES.<sup>40</sup> Besides other work packages, it will provide an Internet-based tool with legislative information relevant for RES investors. Another team found out that increasing attention is being paid to tradable green certificates.<sup>41</sup> It studied different existing certificate systems and drew conclusions for their appropriate design and accompanying incentives. One large project is analysing RES policies in EU countries in order to suggest future initiatives and especially to transfer experiences to accession countries in the form of a conference and workshops with decision-makers and other experts.<sup>42</sup> In a smaller project, a national action plan was developed concentrating on the tourist industry, especially in Southern European countries.<sup>43</sup>

The large majority of the projects in the sub-cluster address **local policy** in communities or on islands aiming at 100 % RES and respective action plans (see also Sector Report “Sustainable Energy Communities”). Some of the earlier projects concentrated on regions in Spain. The largest project in the sub-cluster analysed four municipalities in different countries with respect to the barriers and potentials for local partnerships with authorities, large and small companies, utilities and community organisations, and carried out feasibility studies for 100 % RES.<sup>44</sup> It included awareness measures, feasibility studies, demonstration examples and dissemination, and was carried out with many local partners participating in the team. The topic of another project was to learn from the monitoring of six “inspirational” communities which had exemplary activities and successful schemes<sup>45</sup>; experiences have been transferred to other interested communities. In the course of other projects, local or regional action plans were developed, e. g for the Universal Forum 2004 near Barcelona<sup>46</sup> or in rural areas like the Dyfi Eco

Valley in the UK<sup>47</sup>, and for islands, e. g. implementing RES and energy efficiency strategies in the republic of Cyprus as a transferable example for a typical island situation<sup>48</sup>. A multimedia approach was developed in another project to be applied by local authorities in order to raise public awareness for RES<sup>49</sup>. In one of these projects focusing on municipal decision-makers in different countries,<sup>50</sup> the Climate Alliance – also participating in the project – compiled an electronic information system with indicators for policies, monitoring of achievements and a best practice database.

Projects on market transformation activities are rare in the Renewable Heat Sector. RES-related industrial development in remote European areas is at the centre of a very large ongoing project.<sup>51</sup> This develops regional business development action plans and a replicable methodology on how to overcome socio-economic barriers to RES utilisation.

About half of the projects in the sub-cluster **awareness-raising activities** concern **training** measures in a broad sense; others carried out campaigns and the remainder focus on the development and dissemination of tools and materials. The training projects address specific target groups, e. g. architects, engineers, installers or decision-makers. As well as smaller projects with single activities such as a conference or some workshops, mainly information materials have been developed, e. g. a CD ROM for training engineers based on awareness levels and educational needs<sup>52</sup>; a distance learning package on wind, solar power and biomass for engineers and technicians<sup>53</sup>, or a training programme for the agricultural sector. In a large project, a “virtual campus” for renewable energies was established as a platform for exchanging experience and information sharing, and two solar courses (PV and thermal) are offered electronically<sup>54</sup>.

Different types of **campaigns** have been carried out or are planned in several projects. Usually different aspects are covered by the countries involved, e. g. a TV campaign on biomass in the Czech Republic<sup>55</sup>, or a solar awareness campaign in Spain with a measured significant increase of solar thermal use<sup>56</sup>. Another activity mainly addressed at Eastern Europe is an RES campaign on PV, solar thermal energy and biomass including the dissemination of best practice examples from accession countries and the creation of a virtual market place for industry, financing institutes and potential investors in new RES project ideas.<sup>57</sup> Campaigns were also organised within the projects described above in the cluster referring to particular technologies.

Finally, some **tools, materials and media** on RES applications are being developed and distributed to various target groups, e. g. software for feasibility studies, a simulation model for the EU RES electricity market for potential investors<sup>58</sup>, and the application and further dissemination of an already existing method for municipalities concerning the development towards a 100 % RES community<sup>59</sup>. A

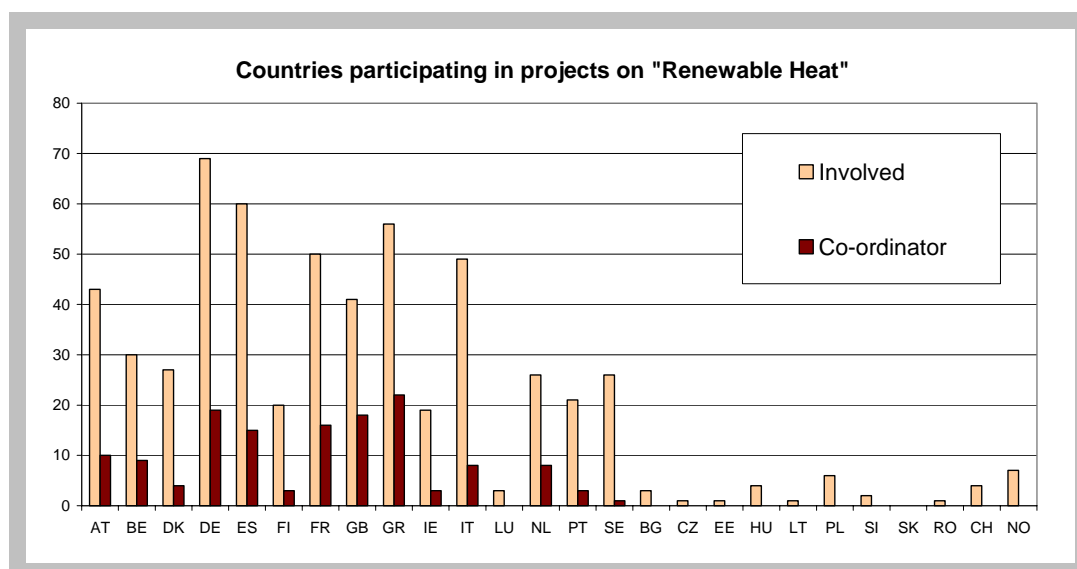
large project cluster contains an RES handbook for architects and a European “barometer” to measure RES progress in EU countries, the results of which are published together with exemplary RES projects in the “Renewable Energy Journal”.<sup>60</sup> Another large project elaborates planning guides for biomass, photovoltaics and solar thermal energy use in the main European languages.<sup>61</sup> In Germany, the PV and solar thermal guides have already gained recognition as standard works for planners and installers.

In the sub-cluster **assessments and studies**, the EC database AGORES was developed on RES projects funded by the Commission.<sup>62</sup> It is available on the EU web-site. Furthermore, statistical data on RES in the EU have been collected<sup>63</sup>, but only for the year 1998. An international benchmarking project on RES potentials and the attitudes of local governments towards them showed a change in perceived potentials over time<sup>64</sup>. 105 pilot RES installations and promotion activities were evaluated in a large study<sup>65</sup>; good practice examples are published on the web-site of the “Energie-Cités” association. Finally, a special field of application of RES is being analysed in a project on desalination systems which aims to produce a planning tool for decision-makers.<sup>66</sup>

### **Contractors and international co-operation**

Almost all the projects were or are being carried out by international teams. Between two and 20 partners participate in the projects. Recently, the number of partners and countries involved has increased strongly, resulting in much higher project costs: on average, projects prior to 2000 had three participants and nine after 2000. All European regions are represented. A large number of institutions come from Southern European countries. Besides German teams, Spanish, Greek, French and Italian ones are involved most frequently; most co-ordinators are from Greece. Accession countries are represented in only a few projects. In many projects there is more than one partner from one country. Taking into account the number of institutions involved per country, Germany has by far the largest number of participants, followed by Spain, Greece and Italy.

Co-operation between the different institutions and countries is predominantly characterised by an exchange of experience, an international comparison of conditions and potentials, or the application of a methodology or instrument in different contexts. In a few projects, completely different working steps are carried out in different countries.



## Summary

The dominant share of projects in the sector “Renewable Heat” concerns the promotion of specific technologies, primarily solar thermal energy use, biomass and biogas. Solar thermal projects mostly focus on training or on a bundle of awareness-raising measures, e. g. in case studies in various countries. A few projects refer to passive solar energy use and a considerable number of projects concentrate on the integration of solar energy in buildings or consider solar aspects in local planning processes. Obviously the hotel sector is one of the most important target groups for solar energy use, another one is the residential sector, whereas industrial applications are rare. In the case of biomass and biogas, activities aiming at network building play a significant role. Only a few projects deal with the promotion of geothermal energy.

The next largest share of projects in the sector concern the promotion of renewable energies in general. Policy-oriented actions are often directed towards local policy aiming at 100 % RES communities. Awareness-raising activities include mainly training programmes and publicity campaigns. A large number of tools, materials and media have been developed, which address the various target groups, principally planners and municipalities. Finally, in the sub-cluster of assessments and studies, among others, the frequently visited EC Internet database AGORES was developed by ALTENER projects.

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