Potential of Solar Thermal in Europe

Executive Summary

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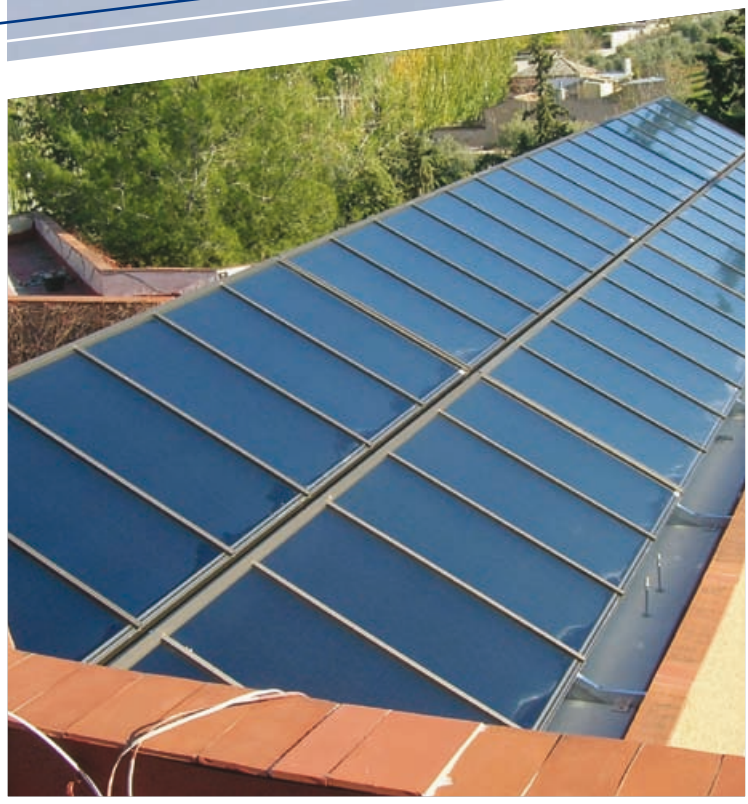

CREATING MARKETS FOR RES

SIXTH FRAMEWORK PROGRAMME

Executive Summary

The European Union and its Member States have committed themselves to achieving a 20% share of renewable energy in Europe's final energy consumption by 2020.

To reach this target, the renewable heating sector will have to make a significant contribution since the demand for heating and cooling represents 49% of the total energy demand in Europe.

As only three renewable sources (biomass, geothermal and solar) generate heat, it is crucial to clarify how these different sectors can contribute to the renewable energy target. Obviously, solar thermal systems will be needed to provide a substantial share of the low temperature heat: deep geothermal sources are limited to a few locations in Europe and shallow geothermal is considered as energy efficiency technology within this study; biomass will be used for transport fuels, electricity generation and medium to high temperature applications as well.

In order to provide the European Union and its Member States with substantiated information on the solar thermal contribution to the 20% renewable energy target and its long-term potential, detailed surveys were conducted using a representative sample of five European countries - Austria, Denmark, Germany, Poland and Spain. The information gathered was then extrapolated to the 27 EU countries. Both the technical and economic potential of solar thermal technologies were examined for different applications.

To determine the potential contribution solar thermal would make to the overall heat demand in the selected reference countries, a model was developed for the future demand - taking into account also energy efficiency measures. Based on this model, the future heating and cooling demand was calculated for the years 2020, 2030 and 2050.

The model includes three scenarios and focuses on the following segments:

- space heating of residential buildings
- hot water preparation in the residential sector
- space heating in the service sector
- industrial low temperature heat (up to 250°C)
- air conditioning and cooling in the residential and service sectors

The three scenarios are a "**Business As Usual scenario**" (BAU), an "**Advanced Market Deployment scenario**" (AMD), including financial and political support mechanisms such as subsidies and obligations, moderate energy efficiency measures and improved research activities, and a "**Full R&D and Policy scenario**" (RDP), which includes substantial financial and political support mechanisms, energy efficiency measures and research activities.

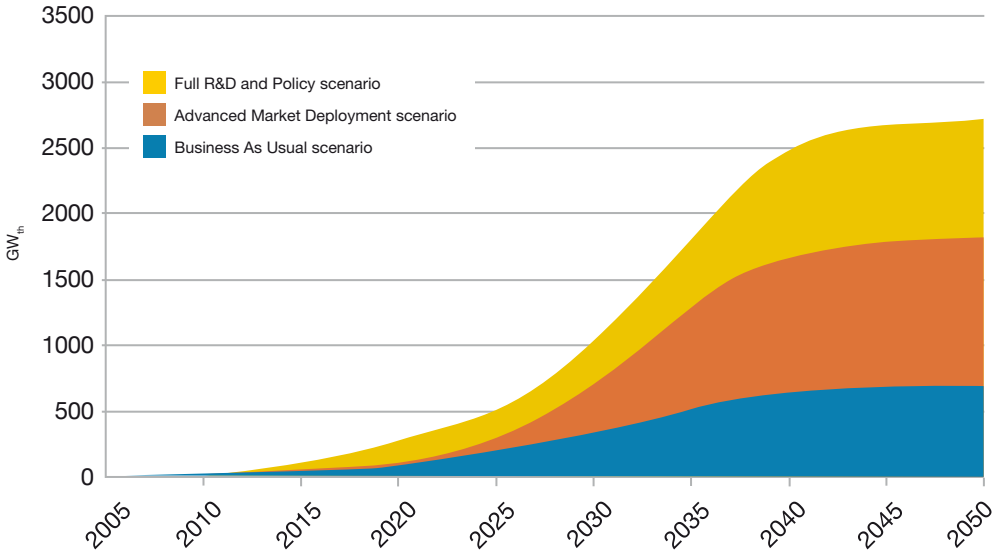

Figure 1: Development of EU-27 solar thermal capacity according to 3 scenarios (2005-2050)

Contribution of Solar Thermal to the EU 20% Renewable Energy Target

Assuming there is a 9% reduction of the overall final energy demand due to energy efficiency measures by 2020 (compared with the year 2006), the contribution of solar thermal to the EU 20% Renewable Energy target would be 6.3% in the RDP scenario and 2.4% in the less ambitious AMD scenario.

Related to the required 11.5 percentage points increase in renewable energies (the share of renewables in 2005 was 8.5%) in the EU-27 countries by 2020, **the contribution of solar thermal would be 12%** according to the RDP scenario, 4.5% according to the AMD scenario and 2.9% in the BAU scenario.

To reach the goals of the RDP scenario, a 26% average annual growth rate of the European solar thermal market is needed up to 2020[1].

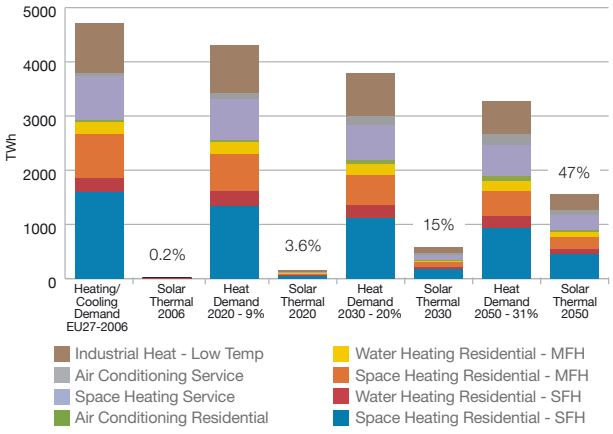

Figure 2: Total heating and cooling demand of EU-27 and contribution of solar thermal by sector according to the Full R&D and Policy Scenario (RDP)

A 15% average annual growth rate is required to reach the goals of the AMD scenario and a 7% growth rate for the BAU scenario. The resulting total collector area by 2020 would be between 97 million m^2 (BAU) and 388 million square meters (RDP). These collector areas correspond to total installed capacities of 67.9 GW_{th} and 271.6 GW_{th}.

Economic Effects

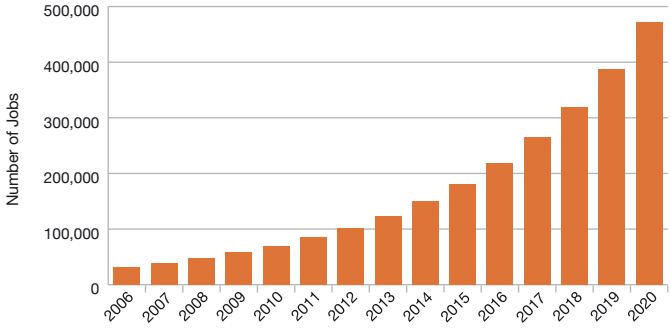

Figure 3: Jobs in the solar thermal sector based on the Full R&D and Policy Scenario (Calculations assume an average increase of productivity of 4% per annum)

According to the RDP scenario the impact on employment would be considerable. In total, the solar thermal sector would encompass 470.000 full-time jobs in 2020, in the European Union domestic market alone.

An investment of the order of EUR 214 billion would be required in the solar thermal sector to reach the 2020 goals of the RDP scenario. This includes production, engineering, trade and installation of solar thermal systems from 2006 to 2020.

Solar Thermal contribution to the Energy Supply and CO_2 Reduction

The solar yield in the RDP scenario is 155 TWh in 2020. This corresponds to an oil equivalent of 22 billion metric tons. Taking this oil equivalent into account the annual contribution to the CO_2 reduction by solar thermal systems is 69 million metric tons.

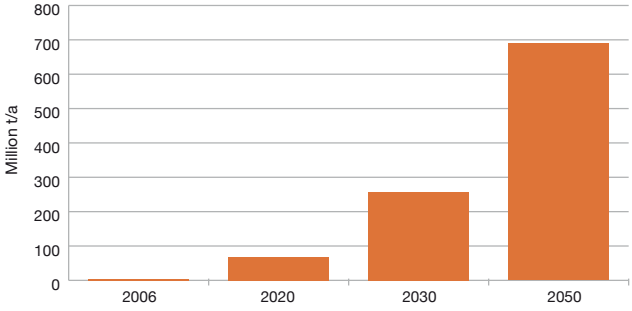

Figure 4: Annual contribution to the CO2 reduction by solar thermal systems in the respective year - according to the Full R&D and Policy Scenario (RDP)

[1] By comparison: The average annual market growth in Europe between 2000 and 2007 was 12,4%

Long-Term Potential

In 2050, the solar thermal contribution to the European Union's (EU-27) low temperature heat demand ranges from 47% in the RDP scenario to 8% in the BAU scenario. The corresponding annual solar yields are 1552 TWh (RDP) and 391 TWh (BAU).

The collector area needed to reach these goals is between 2 m^2 (BAU) and 8 m^2 (RDP) per inhabitant in the EU-27. The resulting total collector area is between 970 million m^2 (BAU) and 3.88 billion m^2 (RDP).

If solar thermal is to contribute significantly to the long-term heating and cooling demand in the EU-27 countries then the primary focus in central and northern Europe must be on systems for space heating (solar combisystems) and in the Mediterranean area on systems providing space heating, hot water and air conditioning (solar combi+ systems).

If the focus remains solely on solar thermal systems for domestic hot water preparation then the solar thermal contribution to the long-term final energy demand will be limited. By 2030 the full potential for these applications will have been reached and the market would be reduced mainly to the replacement of old systems.

Another important segment with considerable potential is low temperature process heat for industry.

The full study of the Solar Thermal Potential in Europe is available at **www.estif.org**

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