

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

<http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/ro-ckets>

Potential areas of industrial interest relevant for cross-cutting KETs in the Energy domain



This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

E.1.4: Solar thermal collector systems with improved efficiency and increased integrability

Scope:

To develop solar thermal collector systems for low temperature application whose efficiency is improved thanks to higher performing new surfaces, coatings and materials, and whose integrability is enhanced thanks to new design concepts, as well as solar thermal collector systems for medium and high temperature (100–400°C) application benefitting of high temperature-resistant materials.

Demand-side requirements (stemming from Societal Challenges) addressed:

- Contribute to achieving competitive, sustainable and secure energy
- Achieve levels of renewable energy consumption within the European Union of 20% by 2020 (as mandated by the Renewable Energy Directive (2009/28/EC))
- Achieve the largest proportion of renewables in the final energy consumption by 2050 as identified in the Energy Roadmap 2050
- Achieve net zero-energy buildings in the future, serving as driver to boost the market for novel renewable energy applications in the residential sector (according to the Energy Performance of Buildings Directive (2010/31/EU))

Demand-side requirements (stemming from market needs) addressed:

- Increase efficiency of energy generation systems and equipment in order to maximize yield
- Increase reliability of energy generation systems and equipment
- Reduce cost / payback of energy generation systems and equipment
- Reduce costs of installation as well as of operation and maintenance

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities):

- Development of higher performing new surfaces, coatings and materials for solar thermal collectors (e.g. transparent cover materials with anti-reflection coatings for high optical transmission; switchable coatings that reduce the stagnation temperatures; highly reflective, light materials for reflectors; new absorber materials with low-emission coatings and optimized heat transfer; temperature-resistant and switchable super insulating materials and alternative medium and high temperature materials like polymers or rubbers for collector parts)
- Development and demonstration of medium and high temperature (100-400°C) collectors for industrial applications through the development of new, high temperature-resistant materials, as well as new collector designs
- Adaptation and improvement of collector technology (flat-plate and evacuated tube) which is currently used in low-temperature applications (e.g. either through better insulation or noble gas atmospheres)
- Optimization of large-scale solar collector arrays for uniform flow distribution and low pumping power
- Development of advanced solutions for the integration of large solar thermal systems into smart thermal/electrical grids
- Development of higher performing controllers to optimally manage heat flows
- Development of new design concepts for the integration of solar thermal collectors area and storage volume into buildings

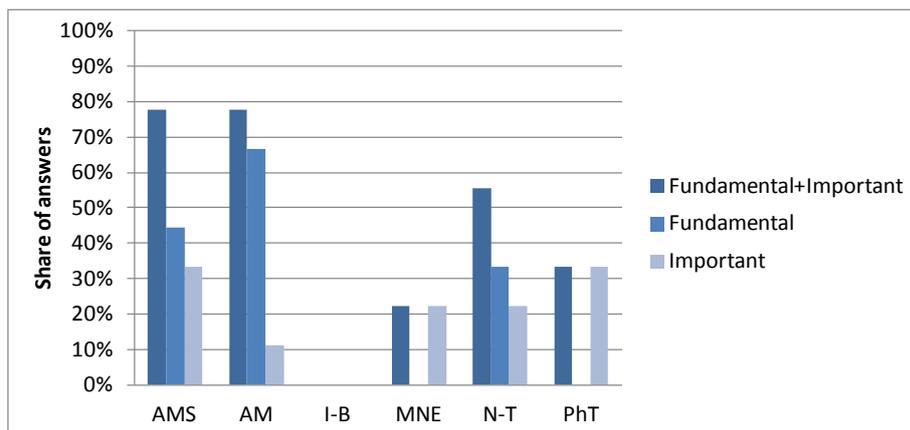
Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of solar thermal collector systems for low temperature application whose efficiency is improved thanks to higher performing new surfaces, coatings and materials, and whose integrability is enhanced thanks to new design concepts, as well as solar thermal collector systems for medium and high temperature (100–400°C) application benefitting of high temperature-resistant materials as combined with advanced manufacturing technologies providing for lower cost production.

To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this

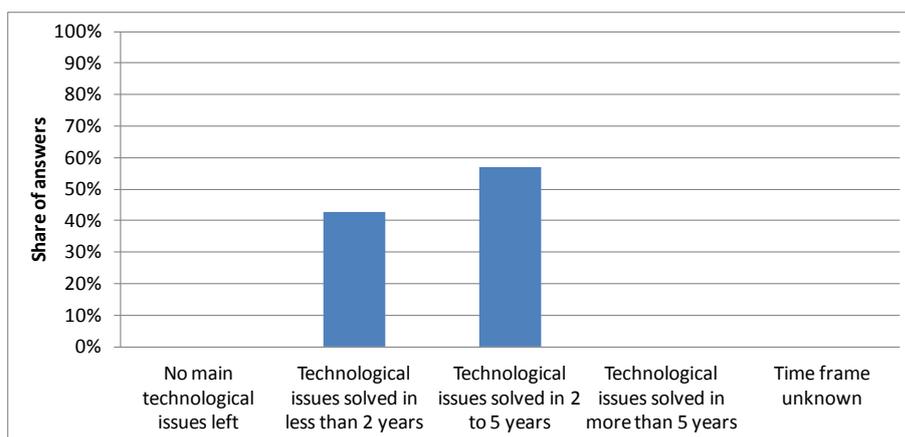
Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)
- Nanotechnologies (N-T)
- Photonics (PhT)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of 2 to 5 years, yet significant consensus by experts indicates also shorter periods being necessary:



Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the short term should be taken into consideration within this framework.

Additional information according to results of assessment:

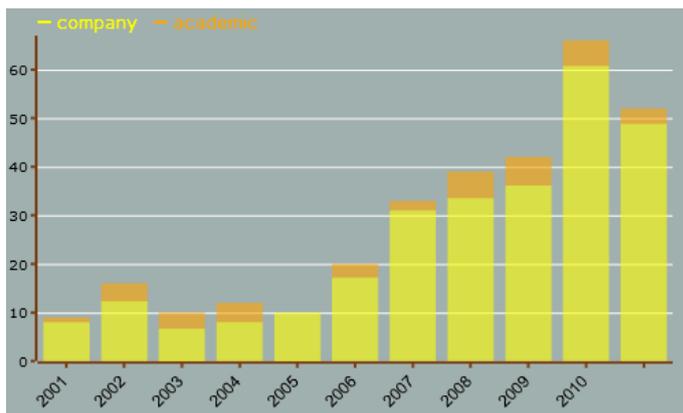
➤ Impact assessment:

- The European solar thermal market, which experienced a peak year in 2008 after a continuous uptrend in its growth rate over the past ten years, contracted for the fourth consecutive year in 2012, suffering from the constraints imposed by the financial and economic crises, which resulted in a suffering construction sector and reduction of public support schemes for solar thermal.
- The 2.41 GWth sold in 2012 are well above the 2007 sales (2 GWth) but are a far from the 3.36 GWth reached in 2008. However, the steep decline of 2009 and 2010 has flattened out in 2011 and 2012.

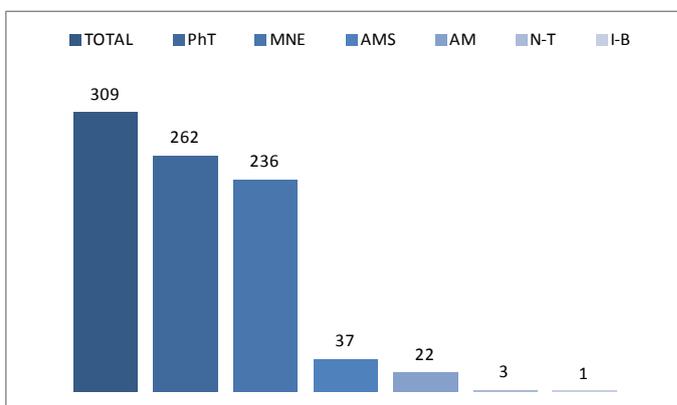
- In spite of the decrease recorded over the last four years, the annual market size has doubled, over the past decade at an average annual growth rate of 10%. Over the last five years (2007-2012), an absolute growth can be observed in the annual sales of 20% and an average annual growth rate of 3.6%.
- While the market in Germany, which is the only country to install more than 1 million m² per year of solar thermal systems, and in the high-potential area of Spain, Italy and Portugal as well as in Austria and the UK, has contracted, the French market held steady thanks to development of the multi-occupancy sector, and Greece, Poland, Hungary and Denmark are coming up due to an increase in gas and heating oil prices. Markets in the Benelux countries are also emerging, though not quickly or strongly enough to reverse Europe's overall downward trend.
- Residential applications still represent the bulk of the solar thermal market. Nevertheless, large installations are increasing apace. Large size systems above 35 kWth (50 m²) for commercial heating and cooling applications have shown a positive development, while for very large systems (above 350 kWth / 500 m²) the market has been moving rapidly.
- Sources: ESTIF, Solar Thermal Markets in Europe - Trends and Market Statistics 2012, June 2013; EurObserv'ER's, Solar Thermal and Concentrated Solar Power Barometer, May 2013.

➤ **Results of patents scenario analysis:**

- 309 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Increasing trend curve (number of patents per year) with slight downturn in 2011
- Highest share of industrial applicants:



- Patents by KET(s):

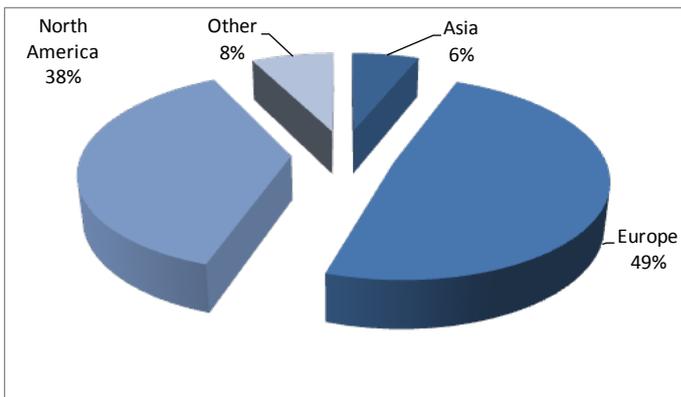


- Patents by KET(s) and relevant combinations of KETs:

KET(s)	Number of patents
AM	22
AM / MNE	7
AM / MNE / PhT	7

<i>KET(s)</i>	<i>Number of patents</i>
AM / PhT	12
AMS	37
AMS / MNE	9
AMS / MNE / PhT	9
AMS / PhT	10
IBT	1
IBT / PhT	1
MNE	236
MNE / N-T	1
MNE / N-T / PhT	1
MNE / PhT	228
N-T	3
N-T / PhT	1
PhT	262

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

