European Commission

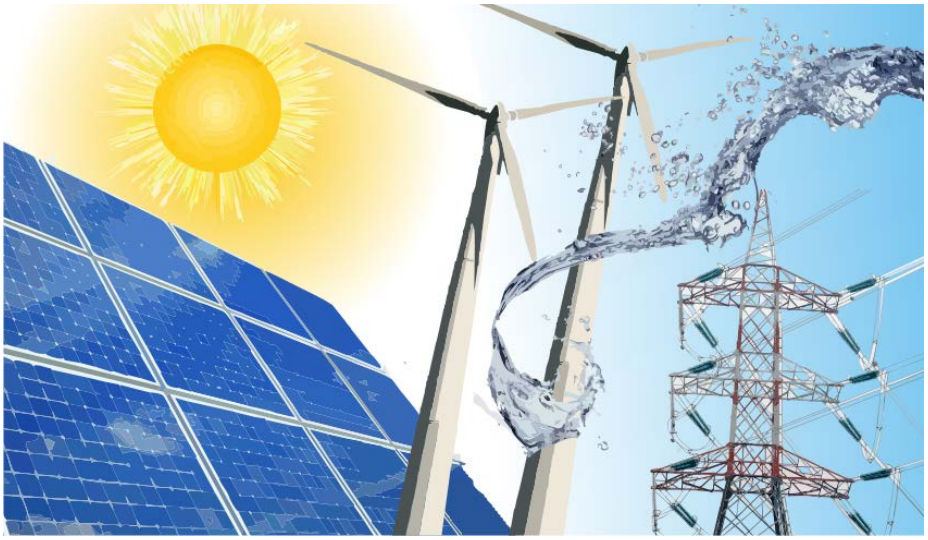
This fiche is part of the wider roadmap for cross-cutting KETs activities

'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.1.3: Concentrated Solar Power (CSP) collectors for large scale electricity production

Scope:

To develop advanced concentrating solar power (CSP) collectors (whether for parabolic trough, power tower, or dish systems) whose components are improved to operate at the high temperatures needed to significantly increase conversion efficiency and whose cost is reduced by improved collector designs and advanced optical materials that have lower cost, higher performance, and better durability.

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):

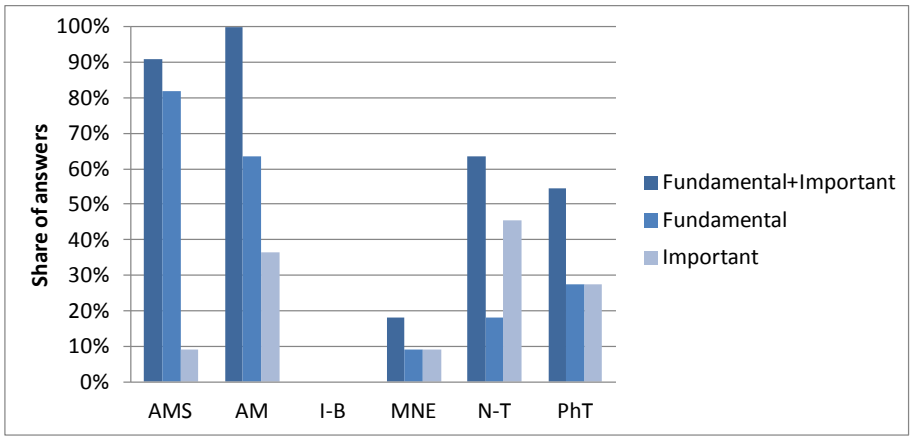
- Identification of alternatives for scarce chemical elements applied in concentrating solar power (CSP) technologies
- Development and testing of the next generation of concentrating solar power (CSP) collectors (whether for parabolic trough, power tower, or dish systems) through improved reflectors development
- Reducing the cost of concentrating solar power (CSP) systems by improved collector designs and advanced optical materials that have lower cost, higher performance, and improved durability
- Development of advanced concentrating solar power (CSP) system components that operate at the high temperatures needed to significantly increase conversion efficiency
- Development of concentrating collectors using lightweight, stable, highly performing and dirt-proof or self-cleaning reflectors which are resistant to degradation due to mechanical cleaning and weathering
- Development and validation of advanced thermal receiver technologies
- Characterization and improvement of selective coatings for both line-focus and power tower receivers as well as advanced cleaning methods that ensure high performance and durability of concentrating solar power (CSP) systems

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the improvement of components of concentrating solar power (CSP) collectors allowing them to operate at the high temperatures needed to significantly increase conversion efficiency. Moreover, the integration of KETs could contribute to achieve reduced costs by improved collector design combined with advanced optical materials with lower cost, higher performance and better durability.

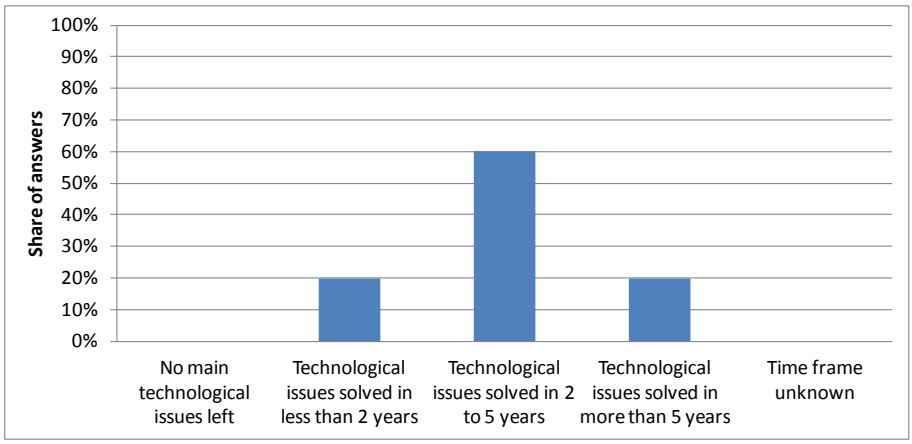
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong 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)
- Photonics (PhT)
- Nanotechnologies (N-T)
- Micro- and Nano-Electronics (MNE) to a lesser extent



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:



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:***

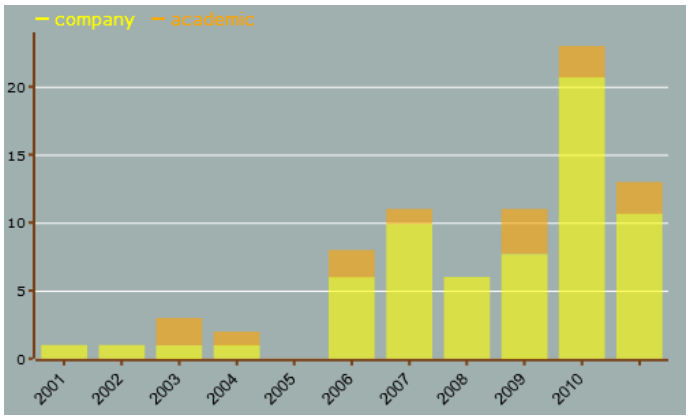
- Europe's concentrating solar power (CSP) plants had a total installed capacity of 1957.7 MWe at end-2012. After an excellent 2012, when 17 new plants totalling 802.5 MW of capacity were installed in Europe, the number of projects under construction is however significantly smaller today, as a result of the moratorium on renewable energy power plants introduced by Spain, coupled with its subsidy cut for new projects and 7% tax on energy generation, and pressure from the photovoltaics (PVs) sector.
- As a result of these events, analysts such as the International Energy Agency (IEA) had to downgrade their initial very promising sector growth forecasts, currently predicting 1.5 GW of global annual growth to 2017, for a global total of 8 GW in 2015 and 11 GW in 2017 – as opposed to their previous (2010)

forecast of 148 GW in 2020. Despite the downscaled forecasts, however, the sector is growing, though lower than initially forecast.

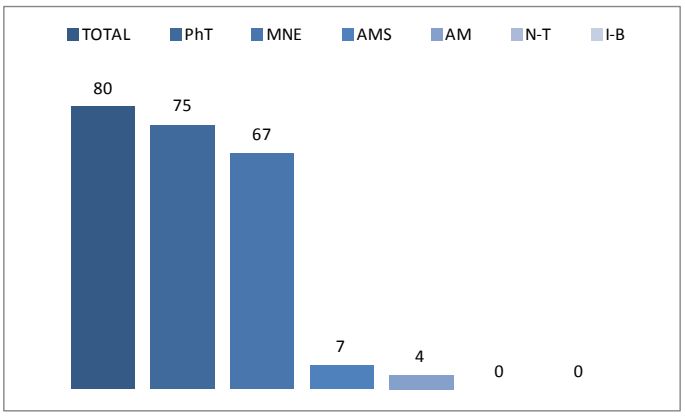
- In terms of production, several European manufacturers had to revise their original business plans, foreseeing to consolidate their technological skills in the European domestic market, because of the above, favouring instead an earlier entry into the global market. Several are the European players enjoying good business today from the international concentrating solar power (CSP) market growth.
- Source: EurObserv'ER's, Solar Thermal and Concentrated Solar Power Barometer, May 2013.

➢ ***Results of patents scenario analysis:***

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



- Patents by KET(s):

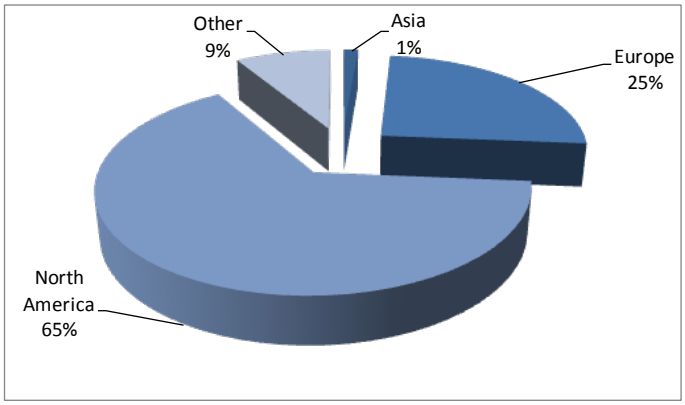


- Patents by KET(s) and relevant combinations of KETs:

KET(s)	*Number of patents*
AM	4
AM / MNE	3
AM / MNE / PhT	3
AM / PhT	3
AMS	7
AMS / MNE	2
AMS / MNE / PhT	2
AMS / PhT	3
MNE	67
MNE / PhT	67

KET(s)	*Number of patents*
PhT	75

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection: