

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.1.2: Concentrated Photovoltaics (CPV) for large scale electricity production

Scope:

To develop concentrated photovoltaic (CPV) systems utilizing improved materials and components - such as optical systems (i.e. lenses or curved mirrors), tracking systems, etc. - for enhanced reliability and stability, and in which cost is reduced thanks to optimization of materials' consumption as well as improvements at the manufacturing level.

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):

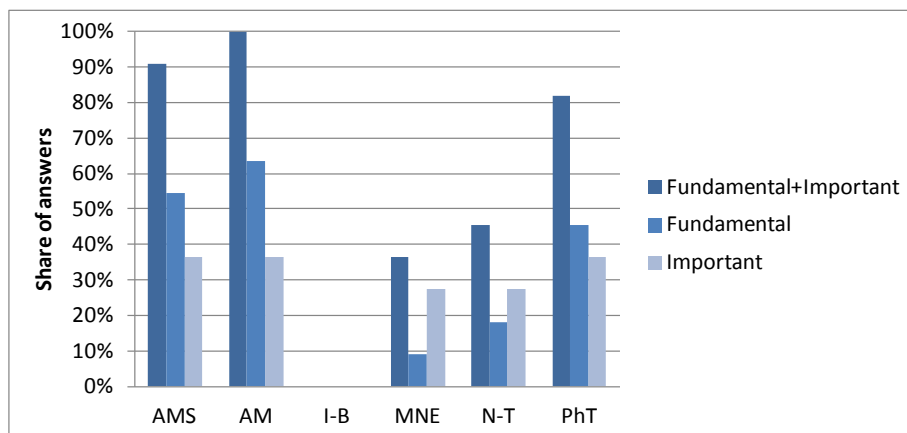
- Identification of alternatives for scarce chemical elements applied in concentrated photovoltaic (CPV) technology
- Development of materials and components for concentrator photovoltaic systems (optical systems, module assembly, tracking) to improve reliability, stability, cost-effectiveness, stiffness, material consumption, etc.
- Development of improved devices and production technologies for high efficiency concentrated photovoltaics (CPV) (Si-cells, multijunction III-V-compound cells)
- Optimization and scaling up of manufacturing as well as installation procedures (system integration, automated production, installing, testing and cost evaluation)

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the improvement of materials and components - e.g. optical systems, tracking systems, etc. - for enhanced reliability and stability. Moreover they could contribute to reduce costs thanks to optimization of material consumption as well as improvements at the manufacturing level.

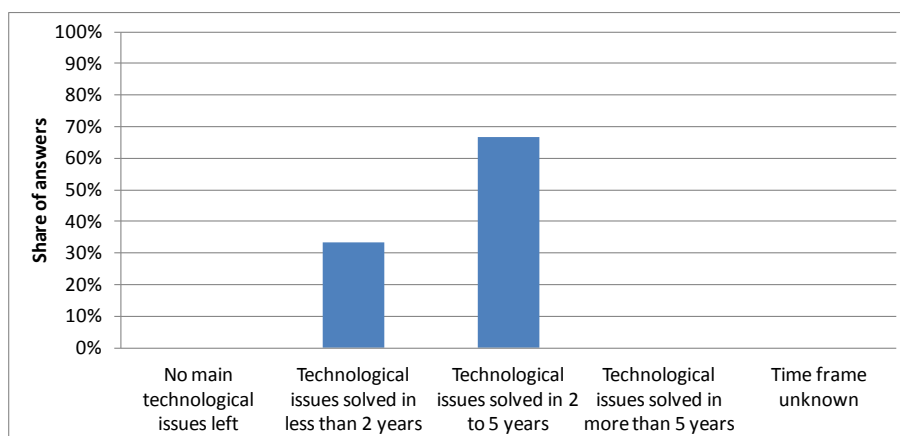
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong 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)



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:

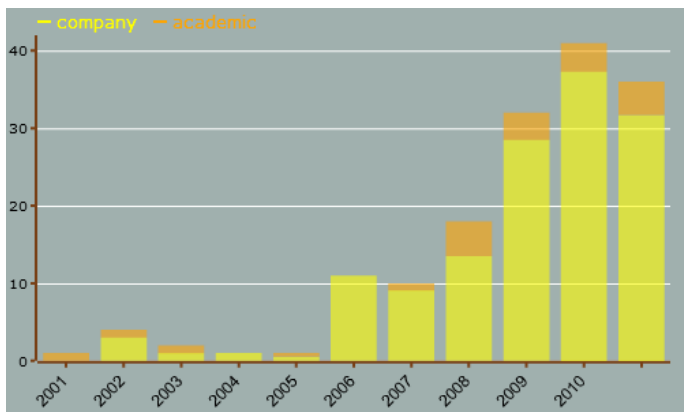
➤ **Impact assessment:**

- Concentrated photovoltaics (CPV) is an emerging market that will start to represent a sustainable market niche in the coming years, promising to provide cost-effective power generation at high levels of efficiency. Potential markets for CPV in Europe are represented by the Mediterranean countries.
- The cumulative installed capacity for CPV systems was around 23 MW in 2010. Spain dominated the global CPV market with 70% of the global concentrated photovoltaics (CPV) installed base, amounting to around 16 MW.
- As the technology is still in a development stage, most of the CPV projects are today in the pilot or prototype stage, with large-scale concentrated photovoltaics (CPV) global installations already planned.
- The emerging CPV market offers many investment opportunities across the value chain. With the planned large-scale CPV global installations, the market will create an increase in demand for concentrated photovoltaic (CPV) systems and their respective components, such as trackers, inverters, multijunction cells, Si-cells, and optics. As a result, the companies that manufacture these components are planning investments to increase their respective production capacities and thus diversify into upcoming concentrated photovoltaics (CPV) market regions such as Italy, China, Australia, and India.

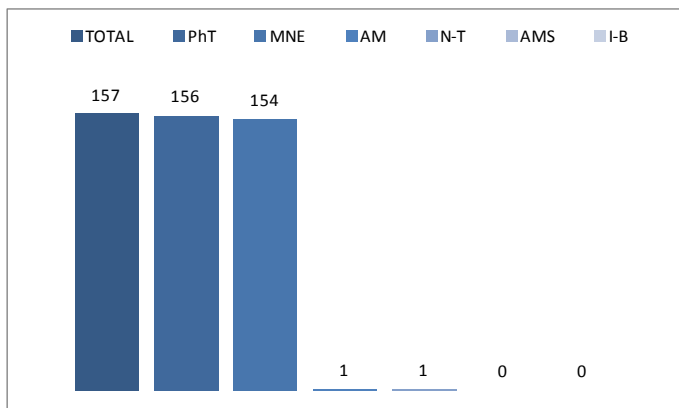
- The governments of these countries have initiated investment support programmes for the concentrated photovoltaics (CPV) market players in the form of Feed-In Tariffs (FIT) schemes, loan guarantees, grants, and funding through their respective solar initiative programmes.
- Sources: www.renewableenergyworld.com; EPIA, Global Market Outlook for Photovoltaics 2013-2017, May 2013.

➤ **Results of patents scenario analysis:**

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



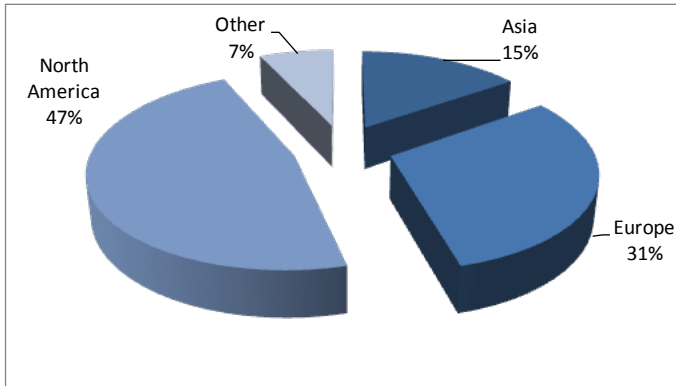
- Patents by KET(s):



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

KET(s)	Number of patents
AM	1
AM / PhT	1
MNE	154
MNE / N-T	1
MNE / N-T / PhT	1
MNE / PhT	153
N-T	1
N-T / PhT	1
PhT	156

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

