

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.3.4: Energy-efficient and smart household appliances

### Scope:

To develop more energy-efficient and smart household appliances, i.e. auto-balancing or active appliances with built-in sensors [smart-grid ready], interoperable, internet-linked, enabling smart home and home automation concepts.

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

- Contribute to achieving competitive, sustainable and secure energy
- Cope with the various European efforts (directives, policies as well as initiatives) aimed at deploying Smart Grids
- Cope with the various European efforts (directives, policies as well as initiatives) aimed at developing a single energy market for Europe
- Cope with the increasing levels of renewable energy deployment within the European Union (the Renewable Energy Directive (2009/28/EC) mandating to achieve levels of renewable energy consumption of 20% by 2020)

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

- Reduce energy consumption (resulting in savings over the conventional energy purchase for private as well as industrial end-users and in the overall reduction of the energy demand on a global scale)
- Provide for easier integration of renewables in general with existing energy distribution networks and with other energy generation systems
- Increase use of effective energy storage systems into existing energy distribution networks (to resolve the mismatch issue between energy generation and demand)
- Increase electricity usage flexibility in order to cope with today's lifestyles

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

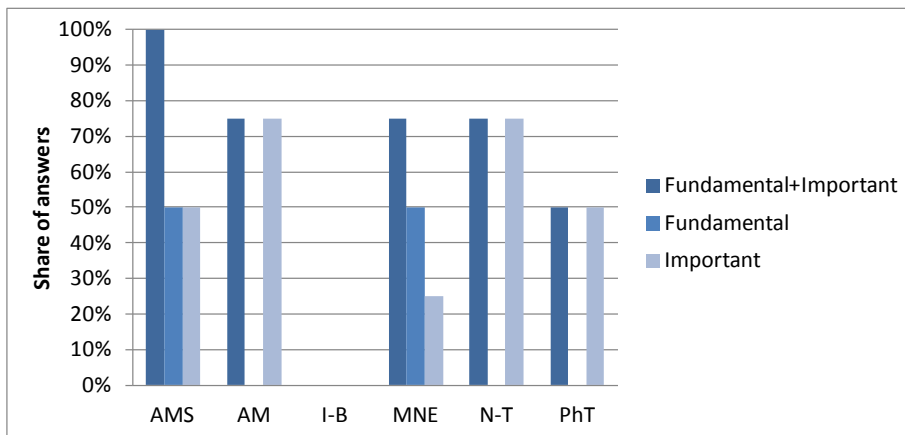
- Development and, most importantly, integration (including thanks to making them interoperable and easy to use) of smart (home) appliances, home automation, and systems for the "smart home"
- Development of low power embedded modules (including power modules) and/or embedded computation mechanisms
- Integration of more, and more embedded, sensing capabilities to allow more situational awareness
- Development of novel materials for better design with better properties (e.g. more wear resistant, lightweight), etc.

### Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of more energy-efficient and auto-balancing or active smart-grid ready appliances, thanks to optimized power consumption approaches (including context-dependent system adaptation), the improvement of human-machine-cooperation, the development of usable, scalable and built-in security, trust, dependability and privacy for mobile- or other device-enabled communications.

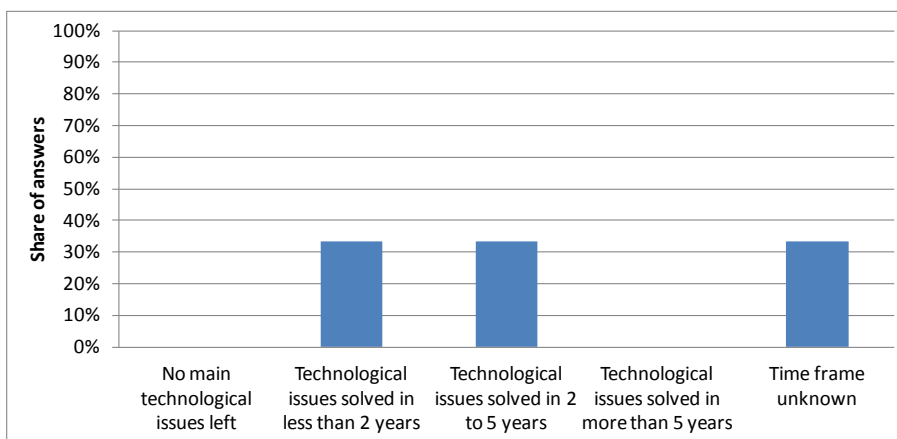
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong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

- Micro- and Nano-Electronics (MNE)
- 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 or shorter (less than 2 years):



Considering 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 mainly in order to support the deployment of product-like prototype equipment to demonstrate the benefit of the technology on a sufficiently large demonstration scale.

### Additional information according to results of assessment:

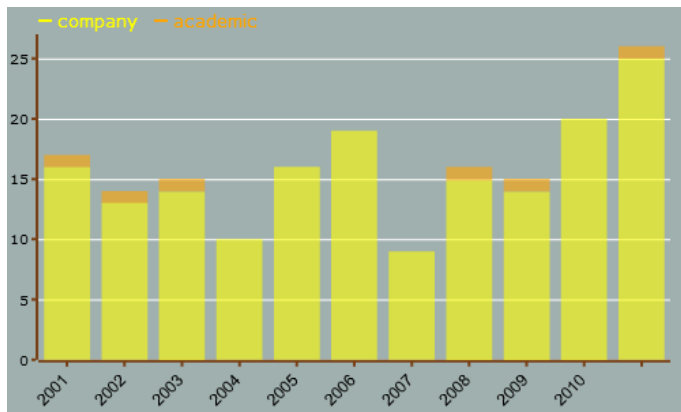
#### ➤ **Impact assessment:**

- As utilities increasingly deploy smart meters, smart household appliances (which use advanced control combined with intelligent power management strategies and networking technologies to optimize the load on the power distribution grid) will have an increasingly significant role to play within smart grids.
- Currently, there is already a very limited commercial availability of such appliances, which will start to represent an increasing share of the total appliance market after 2015. According to analysts of Pike Research, the annual value of the smart household appliances market will grow from around 450 million Euro in 2012 to more than 25 billion Euro in 2020.
- Key industrial appliance manufacturers are Bosch, Electrolux, GE Appliances, Indesit, LG Electronics, Miele, Samsung Electronics and Whirlpool, most of them established in Europe with manufacturing facilities in Europe and elsewhere.
- Source: Pike Research, Smart Appliances, February 2013, [www.navigantresearch.com](http://www.navigantresearch.com)

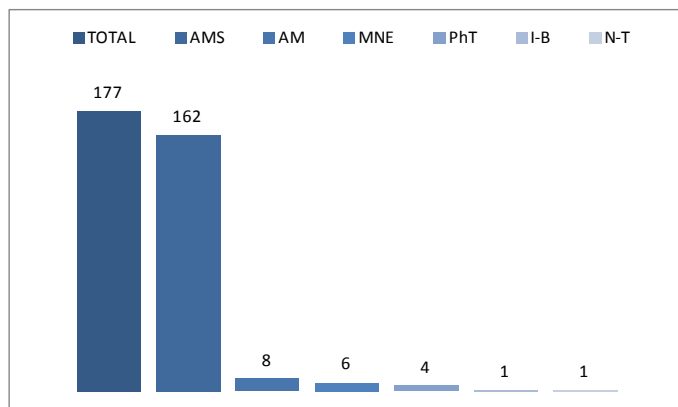
#### ➤ **Results of patents scenario analysis:**

- 177 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field

- Increasing trend curve (number of patents per year)
- Highest almost exclusive share of industrial applicants:



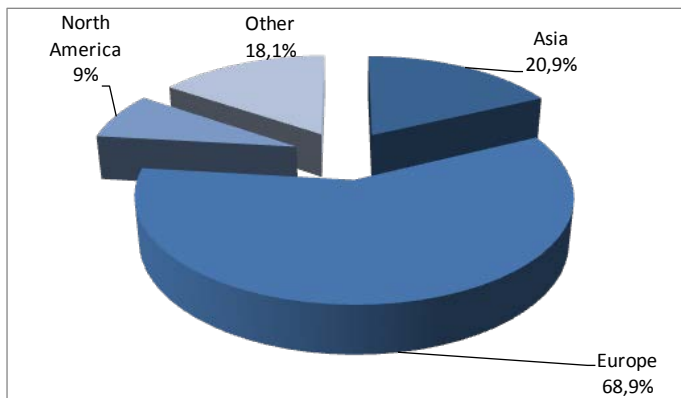
- Patents by KET(s):



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

KET(s)	Number of patents
AM	8
AM / N-T	1
AMS	162
AMS / AM	1
AMS / IBT	1
AMS / MNE	1
IBT	1
MNE	6
MNE / PhT	1
N-T	1
PhT	4

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

