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 Transport and Mobility 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.

T.3.2: Integrated electric transport systems and infrastructures

Scope:

To adapt transport systems, and especially road transport, re-thought holistically to take into account the shift towards electric mobility, considering not only the electric vehicles but also the charging infrastructure and related power grid management able to provide efficient services (as relatively fast vehicle charging) whilst keeping resilient against use peaks typical of transport systems (daily peak times, holyday periods, etc.) and constraints of the power grid (use of renewables, pace of production ramp up, etc.).

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

- Tackle the "Smart, green and integrated transport" societal challenge
- Contribute to the achievement of the EU Transport 2050 strategy (COM/2011/0144 final) objectives of a 60% reduction of CO_2 emissions from transport and no more conventionally-fuelled cars in cities
- Achieve levels of renewable energy consumption within the European Union of 20% (as mandated by the Renewable Energy Directive (2009/28/EC)), considering use of renewable electricity in electric vehicles
- Ensure sufficient critical resource efficiency and recyclability so as to enable large scale deployment of e-Mobility without creating shortages, dependencies or environmental issues (as per the Raw Materials Initiative (COM(2008)699))
- Bring a mobility and transport contribution to the smart grids and smart cities projects

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

- Support development of innovative, green, fluid, resilient and efficient end-to-end urban mobility solutions
- Enable new transportation services dealing with changing mobility and transportation needs, including ageing and citizen ability for making informed real-time mobility choices
- Make sure energy grids are able to deal with a shift towards e-Mobility, or even that transports are an active support of smart grids deployment
- Enable e-Mobility to act as a growth driver for the European transport industry in the global competition

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

- Preparation of the power grid infrastructure to the large scale deployment of integrated transport systems based on electric vehicles
- Development of electric vehicles and electric powertrains with sufficient performance to enable reaching the threshold volume for operation deployment of electric transport systems on transport modes where they do not yet exist
- Development of embedded systems for energy monitoring and recording in order to have a clear picture of the energy production, cost of primary energy consumed and amounts of GHG emitted
- Development of new processing algorithms to supervise the complete system (adaptive control, learning process, etc.) while maintaining a high degree of comfort and a low consumption of auxiliary electricity
- Development of automation, control and solutions for long term reliability assessment for the network control

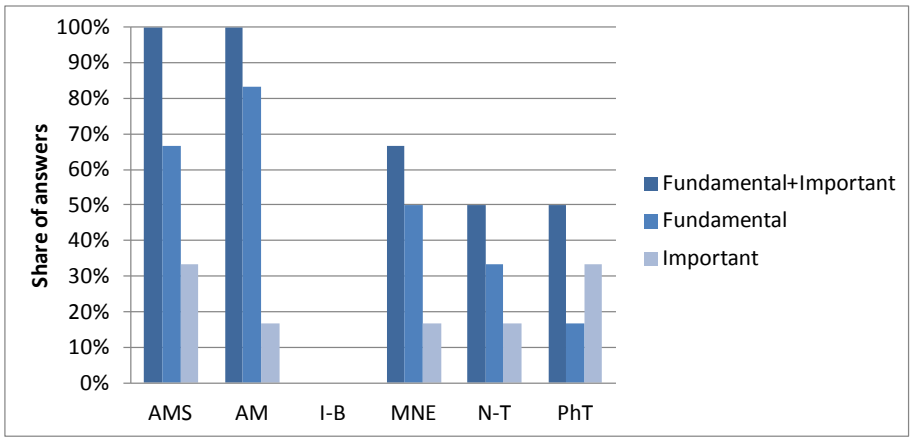
Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the adaptation of transport systems, also considering the charging infrastructure and related power grid management and to the development of automation, control and monitoring solutions for the long-term reliability assessment of the network.

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

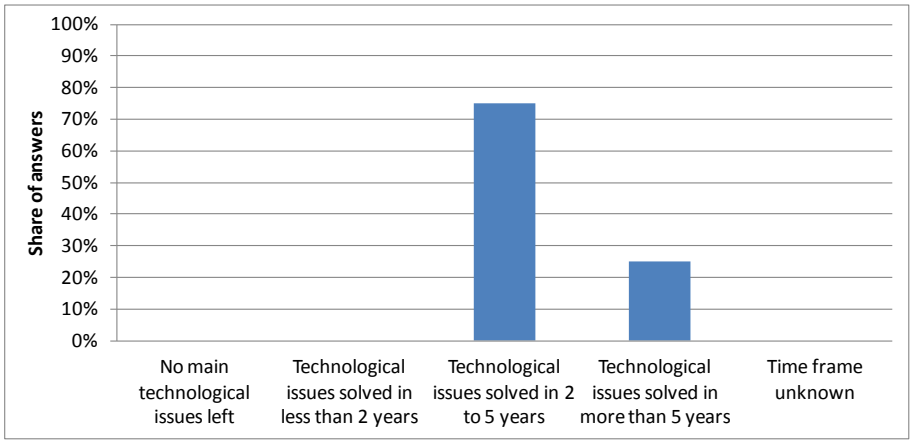
respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)
- Micro- and Nano-Electronics (MNE)
- 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:



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:

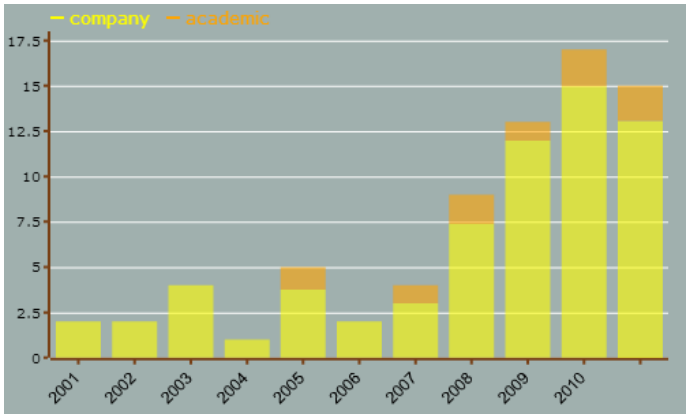
➢ ***Impact assessment:***

- Transport account for 13% of global greenhouse effect gas emissions (Source: IEA 2009). Except for trains and urban transports where it is already widely applied, electric mobility is considered a mandatory enabler for Europe to meet its CO_2 reduction target.
- Deploying electric mobility requires adaptation of many sectors including electricity production, distribution, and storage, but also requires a sufficient quality of service and allows the deployment of new transport, logistics, on board vehicle and fleet based services.

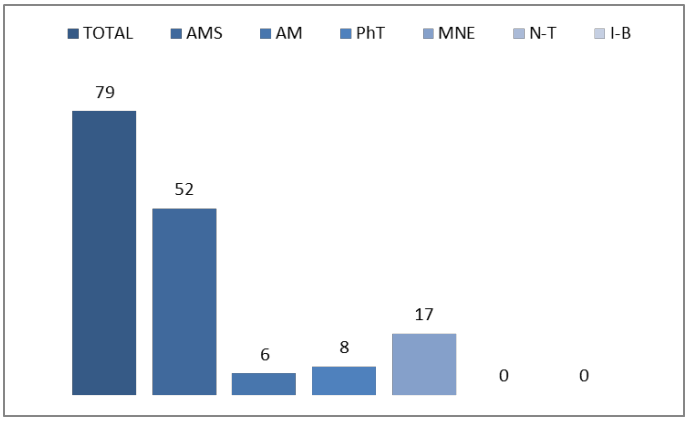
- Based on development in this field, new industrial links have to be built between up to now isolated value-chains (as automotive and power generation industries), giving room to new potentials.

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

- 79 exclusively KETs-related patents identified in the period 2001-2011 for this highly application-related Innovation Field
- Quickly increasing trend curve (number of patents per year) in the recent years, illustrating the fact e-mobility seen from the integrated system point of view is about to reach industrial maturity:



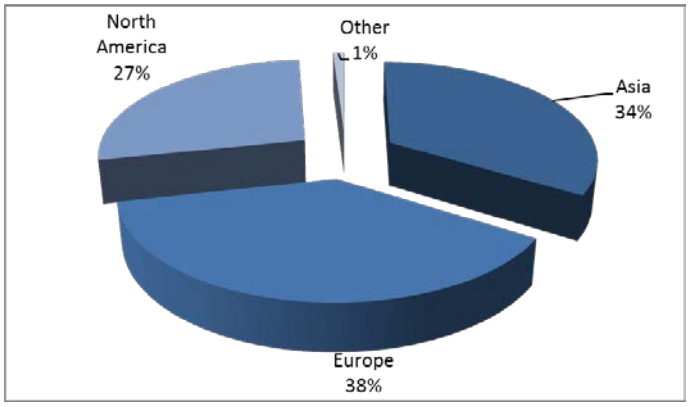
- Patents by KET(s):



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

KET(s)	*Number of patents*
AM	6
AM / MNE	1
AM / MNE / PhT	1
AM / PhT	1
AMS	52
AMS / PhT	1
MNE	17
MNE / PhT	7
PhT	8

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection: