

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.1.6: Offshore power generation systems' deployment and operation

### Scope:

To develop solutions for offshore power generation systems' (such as wind farms, tidal power plants, wave power plants) deployment and operation, comprising solutions for substructure manufacturing and maintenance, large scale systems assembly, installation, and decommissioning.

### 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:

- 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):

- Improvement of offshore substructures design along with improvement of materials and manufacturing methods (e.g. welding, casting, concreting) including through automation and robotics
- Development of improved and reliable methods, facilities, equipment for the assembly, installation, and decommissioning of large-scale offshore wind farms
- Optimization of electrical infrastructures (cabling and integration of offshore wind into the grid), including by design tools and life-cycle approaches in order to reduce costs, increase reliability and lifetime of facilities
- Optimization of offshore turbines design (including through modelling and simulation) to increase reliability and reduce costs as well as ease turbines manufacturing thus increasing manufacturing capacity to address EU market demand
- Further development of offshore operation and maintenance (O&M) strategies, such as advanced condition and risk-based maintenance techniques, management systems (control, monitoring), improved systems and vessels for operation and access, systems to reduce human intervention
- Development of models and solutions for platforms, anchorages and wind turbines to increase reliability and reduce costs in deep sea installations

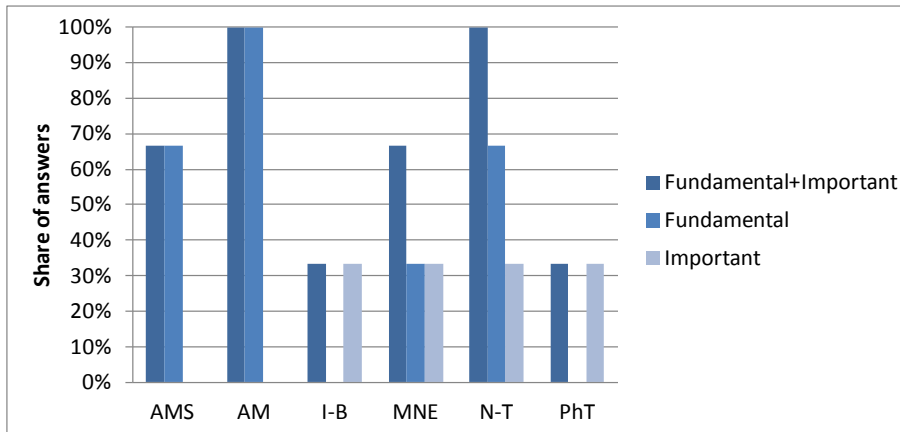
### Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of more advanced solutions for cost-effective substructure manufacturing and maintenance and for large scale system assembly, installation and decommissioning, thanks to the improvement of materials and manufacturing/assembly methods, including through automation and robotics. It could moreover contribute to the further development of offshore operation and maintenance (O&M) strategies, such as advanced condition and risk-based maintenance techniques, management systems (control, monitoring), improved systems for operation and access, systems to reduce human intervention, etc.

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:

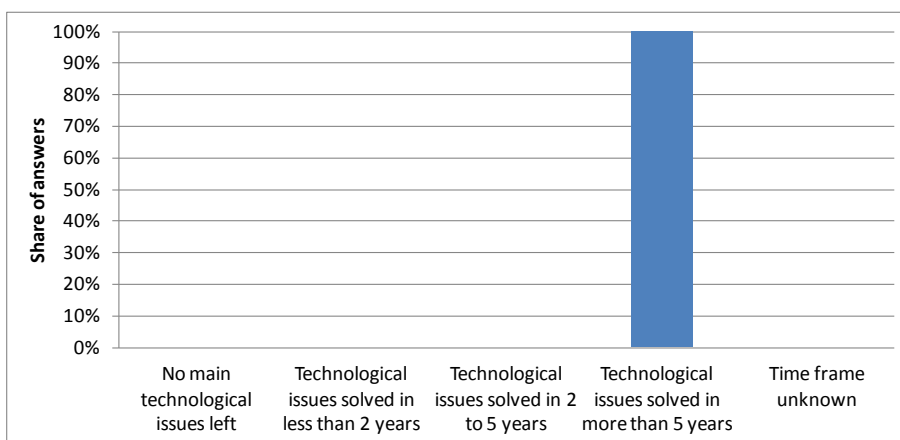
- Advanced Materials (AM)
- Advanced Manufacturing Systems (AMS)

- 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 more than 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 medium term should be taken into consideration within this framework.

#### Additional information according to results of assessment:

##### ➤ Impact assessment:

- Strictly connected to the offshore wind energy market, there is an urgent need to cut costs associated to wind turbines commissioning. Today costs for commissioning wind farms amount to around 0.16 Euro/kWh. Both constructors and developers are looking however to cut those costs to less than 0.10 Euro/kWh by 2020. One of the conventional solutions to achieve this objective is to increase the unit capacity of the wind turbines so that installation costs per kWh would be cut. Accordingly, the size of wind turbines for offshore wind farms has increased from 450 kW (which was the size of the first offshore turbine installed in 1991) to 8 MW (which is currently the size of the largest offshore turbine being tested). This calls not only for improved manufacturing processes but also for innovative methods and processes for the deployment of the wind turbines among the solutions that can be exploited for the purpose of reducing costs.
- Within this framework, contracts signed by wind turbines manufacturers with players such as contractors and developers that can provide for installation and maintenance with the idea of offering developers a one-stop shop for all the procedures required are increasing.

- Within this framework, opportunities for growth and jobs creation will not only be linked to wind turbines manufacture, but also to their deployment, operation and maintenance, thus having an impact at the whole value chain level.
- Source: EurObserv'ER's, Wind Energy Barometer, February 2014.

➤ **Results of patents scenario analysis:**

- No exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- No significant patent-related figures can be reported in this field