A European Strategy for Key Enabling Technologies – A bridge to growth and jobs

EWI Focus – Key Enabling Technologies
14 November 2012 – Brussels

Heidi Moens, Policy Officer
DG Enterprise & Industry
Unit E4 Key Enabling Technologies and ICT
Agenda

1. KETs are of systemic relevance to our economies
2. Europe is still in the KETs race (strengths)
3. We have difficulties to exploit our know-how (challenges)
4. Commission's contribution to build the bridge from knowledge to market
5. Horizon 2020
6. Member States and regions are invited to exploit strategies for smart specialisation (structural funds)
1. KETs are of systemic relevance
Key Enabling Technologies The basis for product solutions to address societal challenges

European Commission

5 KETs under the remit of HLG

Advanced Manufacturing Technologies

Biotechnology

Photonics

Nano-technology / Micro and nanoelectronics

Advanced Materials
KETs - Similarities

• Enable product solutions to address **societal challenges**

• **Economic potential** (Potential for employment & market potential)

• **Technology intensity** (very knowledge intensive and associated with highly-skilled employment)

• **Capital intensity** (high capital expenditure for initial investments)

• **Multi-disciplinary, cut accross many technology areas**
KETs – generic building blocks for societal challenges applications

Societal Challenge
Health

Real-time Avian flu test

Effective timely detection and diagnostic systems

Advanced materials
Microelectronics
Nanotechnologies
Photonics
Biotechnologies

European Commission
Enterprise and Industry
Case example: the electric car

Transdisciplinarity: Combining several KETs for advanced products
→ Case study: electric vehicle
KETs are strategic along the value chain

**Car industry**
- Biomass
- Biolsoprene
- Car tyres
- Bio-based tyres
- CO2 reduction

**Lighting**
- GaN
- MOCVD reactor
- LED
- Lamp
- Energy efficiency

**Nanoelectronics**
- SOI material
- Litho scanner
- Nano component
- Mobile phone
- Nomadic communication

**KETs:**
- Advanced materials
- Nanotechnologies
- Biotechnologies
- Advanced manufacturing systems
- Biotechnology
- Nanoelectronics
- Photonics
Importance of KETs on the EU policy agenda

*Europe 2020 and its flagship initiatives*

**Key Enabling Technologies**

- Nanotechnology
- Micro- & Nano-electronics
- Photonics
- Advanced Materials
- Biotechnology
- Advanced Manufacturing Systems
2. Europe is still in the KETs race (strengths)
Europe is still in the KETs’ race: patent activity

Shares of EPO/PCT patents by regions (percent)
All KETs cumulated

2008 priority patents published
EU actors at the top of KETs’ patent ranking

Global TOP 10 per KET (1/2)

Nanotechnologies
- CEA
- Univ. of California
- JSTA
- CNRS
- MIT
- US DoE
- AIST
- NI of Health
- Univ. Texas
- FhG

Micro and nanoelectronics
- CEA
- Univ. of California
- IMEC
- FhG
- AIST
- CNRS
- MIT
- JSTA
- IKETR
- Univ. Tohoku

Photonics
- CEA
- FhG
- MIT
- Univ. of California
- US DoE
- CNRS
- AIST
- JSTA
- US gvtmt.
- ETRI

R&D actors
- Samsung
- HP
- Univ. of California
- Canon
- 3M
- Agilent
- JSTA
- Hitachi
- Sony
- Matsushita

All actors
- Infineon
- Tokyo Electron
- Matsushita
- Samsung
- Applied Materials
- Fujitsu
- Nikon
- ST Microelectronics
- NEC
- IBM
- Samsung
- Matsushita
- 3M
- Corning
- Fuji Film
- Osram
- Sumitomo
- Sharp
- Kodak
- Sony

EU actors at the top of KETs’ patent ranking

Global TOP 10 per KET (2/2)

R&D actors

All actors

Biotechnology

Advanced Materials

Advanced Manuf. systems

Univ. of California
CSIC
CNRS
JSTA
Univ. of Wisconsin
FhG
North Carolina Univ.
AIST
MPI
John Hopkins

CNRS
Univ. of California
CEA
US DoE
FhG
AIST
JSTA
MIT
US gymt.
NI of Health

FhG
CEA
US DoE
Univ. of California
JSTA
CNRS
AIST
DLR
NI of Health
TNO

BASF
Novozymes
Evonik
Du Pont
Univ. of California
Bayer
Danisco
Matsushita
Mitsubishi
Applera

BASF
Du Pont
Dow
3M
Evonik
Arkema
Bayer
Fujii
GE
Esso

Siemens
Bosch
Continental
Endress&Hauser
Fanuc
Honeywell
ABB
GE
Honda
Hitachi

1. EPO/PCT patents, 2000-2007
3. We have difficulties to exploit our know-how (challenges)
Disconnection between patents share and manufacturing share

Case Study: Li-ion battery production

Li-ion battery cell production share in 2008

Advanced Material Patent Share

PV cell production share in 2009

Photonics Patent Share

Europe = 77% of global market

- First Solar: 12% in China/Taiwan, 27% globally
- Europe: 13%
- Japan: 15%
- China/Taiwan: 29%
- Asia: 42%
- Others: 18%
- Others: 2%

Problem analysis: the “valley of death”
Korean, Chinese and US federal R&D funds mainly go to applied “Development” whereas Europe has the highest share of Basic Research Funding.

4. Commission's response
KETs’ policy concerns not only the mastering of technology but also the deployment of these technologies into KETs-based products within the EU.
An Action Plan (Communication 2012)

A - **Adaptation** of EU instruments & policies in support of KETs deployment

B – Ensure **coordination** of EU and national activities to achieve synergies

C – Dedicated **governance** structures to ensure smooth implementation of the KETs strategy

D – Mobilising existing **trade** instruments to ensure fair competition and an international level playing field
An Action Plan (Communication 2012)

A - Adaptation of EU instruments & policies in support of KETs deployment

- Horizon 2020
  - Allocation of € 6.7 bio
  - Rebalancing towards pilot-lines / demonstrator projects
  - Cross-cutting projects
  - Selection Criteria
An integrated approach to Key Enabling Technologies

A major component of Leadership in Enabling and Industrial Technologies (KETs), defined as micro- and nanoelectronics, photonics, nanotechnology, biotechnology, advanced materials and advanced manufacturing systems. Many innovative products incorporate several of these technologies simultaneously, as single or integrated parts. While each technology offers technological innovation, the accumulated benefit from combining a number of enabling technologies can also lead to technological leaps. Tapping into cross-cutting key enabling technologies will enhance product competitiveness and impact. The numerous interactions of these technologies will therefore be exploited. Dedicated support will be provided for larger-scale pilot line and demonstrator projects.

This will include cross-cutting activities that bring together and integrate various individual technologies, resulting in technology validation in an industrial environment to a complete and qualified system, ready for the market. Strong private sector involvement in such activities will be a prerequisite and implementation will therefore notably be through public private partnerships. To this extent and through a dedicated governance structure, a joint work programme for cross-cutting KETs activities will be developed. Taking into account market needs and the requirements of the societal challenges, it will aim at providing generic KETs building blocks for different application areas, including societal challenges.
An Action Plan (Communication 2012)

A - Adaptation of EU instruments & policies

• Horizon 2020
  - Allocation of € 6.7 bn to KETs
  - Rebalancing towards pilot-lines / demonstrator projects
  - Cross-cutting projects
  - Selection Criteria

• European Regional Development Funds
  - KETs as priority investment area
  - Financing up till first production
  - Combined financing
Implemented actions: European Regional Development Fund (ERDF)

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on specific provisions concerning the European Regional Development Fund and the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006

Article 5

Investment priorities

The ERDF shall support the following investment priorities within the thematic objectives set out in Article 9 of Regulation (EU) No […]/2012 [CPR]:

(c) supporting technological and applied research, pilot lines, early product validation actions, advanced manufacturing capabilities and first production in Key Enabling Technologies and diffusion of general purpose technologies;
Combined Financing

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund covered by the Common Strategic Framework and laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund and repealing Regulation (EC) No 1083/2006

Eligibility of expenditure and durability

Article 55

Eligibility

8. An operation may receive support from one or more CSF Funds and from other Union instruments, provided that the expenditure item included in a request for payment for reimbursement by one of the CSF Funds does not receive support from another Fund or Union instrument, or support from the same Fund under another programme.
An Action Plan (Communication 2012)

A - Adaptation of EU instruments & policies

- Horizon 2020
  - Allocation of € 6.7 bio
  - Rebalancing towards pilot-lines / demonstrator projects
  - Cross-cutting projects
  - Selection Criteria

- European Regional Development Funds
  - KETs as priority investment area
  - Financing up till first production
  - Combined financing
  - Smart specialisation
  - Cluster specific actions
An Action Plan (Communication 2012)

A - Adaptation of EU instruments & policies

- Horizon 2020
- Structural Funds
- An agreement with the European Investment Bank
KETs on the EU Agenda

Horizon 2020, Structural Funds and EIB

Pillar 1: Technological research
Pillar 2: Product demonstration
Pillar 3: Competitive Manufacturing

- **Horizon 2020 (TRL 1 – 8)**
- **European Regional Development Fund (TRL 2 – 9)**
- **European Investment Bank (TRL 2 – 9)**
Leveraging public & private investments

Combination of funding

Member States + Regions
EU
DG ...
Combination of funding

Combination of funding
Public driven

Private driven
Manufacturing capacity competitiveness

Technology competitiveness

Knowledge

Pillar 1
Pillar 2
Pillar 3

Technical research
Product development
Competitive manufacturing

Market

The valley of death

European Enterprise and Industry
An Action Plan (Communication 2012)

A - Adaptation of EU instruments & policies

- Horizon 2020
- Structural Funds
- An agreement with the European Investment Bank
- Modernise State aid rules
- Promotion of required multidisciplinary skills and training (through KICs, Marie Curie Actions and the Knowledge Alliances)
An Action Plan

B – Coordination (to achieve synergies)
  • Synergies with national industrial innovation policies
  • Memorandum of Understanding by industrial stakeholders

C – Governance (to ensure smooth implementation)
  • Coordination Group on KETs within Horizon 2020
  • An external KETs Issues Group

D – Trade
  • Strive to ensure a global level playing field
5. HORIZON 2020
Horizon 2020

- Commission proposal for a **80 billion euro** research and innovation funding programme (**2014-2020**) (part of proposals for next EU budget, complementing Structural Funds, education, etc)

- A **single programme** bringing together three separate programmes/initiatives:
  - The Framework Programme for Research and Technological Development (FP)
  - Innovation aspects of Competitiveness and Innovation Framework Programme (CIP)
  - EU contribution to the European Institute of Innovation and Technology (EIT)

- **Coupling research to innovation** – from research to retail, all forms of innovation

- **Simplified access**, for all companies, universities, institutes in all EU countries and beyond.
Three priorities:

1. Excellent science
2. Industrial leadership
3. Societal challenges
## Priority 1: Excellent Science

**Proposed funding (million euro, 2014-2020)**

<table>
<thead>
<tr>
<th>Programme</th>
<th>Funded Amount (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>European Research Council</strong></td>
<td>13 268</td>
</tr>
<tr>
<td>Frontier research by the best individual teams</td>
<td></td>
</tr>
<tr>
<td><strong>Future and Emerging Technologies</strong></td>
<td>3 100</td>
</tr>
<tr>
<td>Collaborative research to open new fields of innovation</td>
<td></td>
</tr>
<tr>
<td><strong>Marie Curie actions</strong></td>
<td>5 572</td>
</tr>
<tr>
<td>Opportunities for training and career development</td>
<td></td>
</tr>
<tr>
<td><strong>Research infrastructures</strong></td>
<td>2 478</td>
</tr>
<tr>
<td>(including e-infrastructure)</td>
<td></td>
</tr>
<tr>
<td>Ensuring access to world-class facilities</td>
<td></td>
</tr>
</tbody>
</table>
## Priority 2: Industrial Leadership

**Proposed funding (million euro, 2014-2020)**

<table>
<thead>
<tr>
<th>Leadership in enabling and industrial technologies</th>
<th>13 781</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) ICT</td>
<td></td>
</tr>
<tr>
<td><em>including micro- and nano-electronics and photonics</em></td>
<td></td>
</tr>
<tr>
<td>(ii) Nanotechnologies</td>
<td>6 663</td>
</tr>
<tr>
<td>(iii) Advanced Materials</td>
<td></td>
</tr>
<tr>
<td>(iv) Biotechnology</td>
<td></td>
</tr>
<tr>
<td>(v) Advanced Manufacturing and Processing</td>
<td></td>
</tr>
<tr>
<td>(vi) Space</td>
<td></td>
</tr>
</tbody>
</table>

**Access to risk finance**

Leveraging private finance and venture capital for R&I  

3 538

**Innovation in SMEs**

Fostering all forms of innovation in all types of SMEs  

619
## Priority 3: Societal Challenges
Proposed funding (million euro, 2014-2020)

<table>
<thead>
<tr>
<th>Area</th>
<th>Funding (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health, demographic change and wellbeing</td>
<td>8 033</td>
</tr>
<tr>
<td>Food security, sustainable agriculture, marine and maritime research &amp; the bio-economy</td>
<td>4 152</td>
</tr>
<tr>
<td>Secure, clean and efficient energy*</td>
<td>5 782</td>
</tr>
<tr>
<td>Smart, green and integrated transport</td>
<td>6 802</td>
</tr>
<tr>
<td>Climate action, resource efficiency and raw materials</td>
<td>3 160</td>
</tr>
<tr>
<td>Inclusive, innovative and secure societies</td>
<td>3 819</td>
</tr>
</tbody>
</table>

*Additional €1 788m for nuclear safety and security from the Euratom Treaty activities (2014-2018). Does not include ITER.
Horizon 2020 time line

**Ongoing:** Parliament and Council negotiations on EU budget 2014-20 (including overall budget for Horizon 2020)

**By end 2013:** Adoption of legislative acts by Parliament and Council on Horizon 2020

**1/1/2014:** Horizon 2020 starts; launch of first calls
Links to COSME

*Horizon 2020 and COSME are complementary programmes to generate growth and jobs*

Different focus:

- Horizon 2020 = innovation driven growth
- COSME (*) = support to create favourable business environment and competitiveness

(*) new Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) will run from 2014 to 2020, with a planned budget of €2.5bn
6. Smart specialisation
Concept

- KETs are pervasive and not sector-specific
- Any region can find its particular niche
- Building upon existing assets & linking into European value chains
- Analysing the whole value chain – upstream and downstream including all its actors
- Enhancing regional eco-systems (clusters)
Study - Exchange of good policy practices promoting the industrial uptake and deployment of KETs (June 2012)

Performance profile Belgium

Patent and trade performance: Belgium performs well (strong patent and trade performance) in nanotechnology, industrial biotechnology and advanced materials

Important actors Belgium

<table>
<thead>
<tr>
<th>Important Actors</th>
<th>Photonics</th>
<th>Nanotechnology</th>
<th>Industrial Biotechnology</th>
<th>Advanced Materials</th>
<th>Micro-/Nanoelectronics</th>
<th>Advanced Manufacturing</th>
</tr>
</thead>
</table>
| Largest Patent Applicants: Ten largest patent applicants (excluding private individuals)

Tyco Electronics Raychem Bvba
IMEC
Solvay (Societe Anonyme)
AGC Flat Glass Europe SA
Barco NV
Ghaverel
Interuniversitat Microeletronica
Universiteit Libre de Bruxelles
NV Bekaert SA
Universiteit Gent

AGFA Graphics NV
Solvay (Societe Anonyme)
Janssen Pharmaceuticals N.V.
Cytos Surface Specialties, S.A.
Universiteit Gent

TOTAL Petrochemicals Research FEL
IMEC
INEOS Manufacturing Belgium NV
Cytos Surface Specialties S.A./N.V.
Ghaverel
AGC Flat Glass Europe SA
AGFA Graphics N.V.
Katholieke Universiteit Leuven, K.U.
NV Bekaert SA

Electrolux Home Products Corpora
Solar Energy Automotive Systems Research
TOTAL Petrochemicals Research FEL
The European Atomic Energy Comm
Heraeus Electro-Nite International
Visys NV
Agfa HealthCare NV
Techspace Aero SA
Janssen Pharmaceutica N.V.
Layertec N.V.

Source: EPO: PATSTAT / ZEW calculation.
Mapping of good policy practice cases on TRL scale
How to develop « Smart Specialisation Strategies » S3

- Designed to assist regions and Member States in developing S3 strategies
- Managed by a team established at JRC-IPTS in Seville
- Input from a Mirror Group of European high-level experts and network representatives
- First product will be a methodological and practical guide on “Innovation Strategies for Smart Specialisation”
- Regions should register at:
  
Thank you!
European Commission  
DG Enterprise and Industry  
Unit E4: Key Enabling Technologies and ICT  
B-1049 Brussels  

E-mail: ENTR-KET-AND-ICT@ec.europa.eu  

Website:  
http://ec.europa.eu/enterprise/sectors/ict/key_technologies/index_en.htm  

HLG website:  
http://ec.europa.eu/enterprise/hlg_kets.htm