Key Enabling Technologies in HORIZON 2020

A view on Advanced Materials and Nanotechnologies

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Key Enabling Technologies
Advanced Materials and Nanotechnologies

PSE2014
Garmisch-Partenkirchen, 15. September 2014
Key Enabling Technologies in H2020

Outline:

- Role of Key Enabling Technologies
- Horizon 2020
- Advanced Materials and Nanotechnologies
  - First Horizon 2020 calls and outlook 2015-2017
Key Enabling Technologies
Mastering and industrial deployment of Key Enabling Technologies (KETs)

What are KETs?

- Six strategic technologies
- Driving competitiveness and growth opportunities
- Contributions to solving societal challenges
- Knowledge- and Capital-intensive
- Cut across many sectors

- Nanotechnologies
- Advanced Materials
- Micro- and nano-electronics
- Photonics
- Biotechnology
- Advanced Manufacturing

European KET Strategy:
- KET High-level Group
Case example: the electric vehicle

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

**Car industry**
- Material: Biomass
- Equipment: Biolsoprene
- Component: Synthesis rubber, Adhesives, elastomers
- Product: Car tyres
- Solutions & services: CO2 reduction
- Societal challenges: Energy efficiency (Climate change)

**Lighting**
- Material: GaN
- Equipment: MOCVD reactor
- Component: LED
- Product: Lamp
- Solutions & services: Energy efficiency
- Societal challenges: Knowledge society

**Nanoelectronics**
- Material: SOI material
- Equipment: Litho scanner
- Component: Nano component (Low power)
- Product: Mobile phone
- Solutions & services: Nomadic communication
- Societal challenges: Knowledge society

**KETs:**
- Advanced materials
- Nanotechnologies
- Biotechnologies
- Advanced manufacturing Systems
- Biotechnology
- Nanoelectronics
- Photonics
Significance of Advanced Materials and Nanotechnologies

• Essential for new and existing production of high added value products and their production processes

• Source of High Innovation Potential

• Important market volumes

• Cross cutting through various disciplines and various industrial applications

significant synergies with Plasma and Surface Technologies!
The issues regarding Advanced Materials and Nanotechnologies as KETs

- *Europe has strong position in science and in patenting activity*
- *EU actors are at top of patent ranking in each KET*
- *But there is a gap between the technology base and the manufacturing base*
- *We need to add demonstrators, competitive manufacturing and product development*

**From Lab to Industry to Market**

*but...*
Case Study: Li-ion batteries

Advanced Material Patent Share

- USA: 12%
- Europe: 31%
- Asia: 87%
- Others: 4%

Li-ion battery cell production share in 2008

- USA: 30%
- Europe: 0%
- Asia: 35%

Horizon 2020 as an integrator
Three priorities

- Excellent science
- Industrial leadership
- Societal challenges
Horizon 2020
Total indicative budget: 77.0 billion €*

**Excellent science**
- European Research Council
- Future and Emerging Technologies
- Marie Curie actions
- Research infrastructures

Indicative Budget: 24.4 billion €*

**Industrial leadership**
- Leadership in enabling and industrial technologies
  - Access to risk finance
  - Innovation in SMEs

Indicative Budget: 17.0 billion €*

**Societal challenges**
- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research and the bioeconomy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, resource efficiency and raw materials
- Inclusive, innovative and reflective societies
- Secure societies

Indicative Budget: 29.7 billion €*

* 2014-20, actual budget (indicative)
Includes 5.9 billion € for "widening participation", "science with and for society", JRC and EIT – not shown in three priorities above
Industrial Leadership

- To be achieved through development of European Key Enabling Technologies (KETs) and support to industry

- Strong focus on the contribution of Key Enabling Technologies to societal challenges
  - Transport
  - Healthy aging
  - Energy
  - Environment
  - etc.

- Emphasis on R&D and innovation with strong industrial dimension
Leadership in enabling and industrial technologies (LEIT)

Priority 1: Excellent Science

Priority 2: Industrial Leadership

Leadership in enabling and industrial technologies (LEIT)

(i) ICT including micro- and nano-electronics and photonics
(ii) Nanotechnologies
(iii) Advanced Materials
(iv) Biotechnology
(v) Advanced Manufacturing & Processing
(vi) Space

Access to risk finance
Leveraging private finance and venture capital for R&I

Innovation in SMEs
Fostering all forms of innovation in all types of SMEs

Priority 3: Societal Challenges
Industrial Leadership (in H2020)

• Activities primarily developed through relevant *industrial research agendas*, roadmaps and value chains (ETPs, PPPs)

• Contractual **Public-Private Partnerships** (cPPPs) will be used extensively for the implementation and deployment of the KETs

• They will allow industry to directly participate in the definition and implementation of *research and innovation priorities*

• Involvement of industrial participants and SMEs to maximise expected impact → key aspect of proposal evaluation

• Funded projects will be **outcome oriented**, developing key technology building blocks and bringing them closer to the market (e.g. pilots and demonstrators)
Public Private Partnerships (PPPs) in H2020

- **Industry plays leading role** in defining research priorities
- **Pre-defined budget** ensures continuity and commitment
- Focused on **enabling industrial technologies**
- Increased use of **SME-friendly** instruments and **demonstration**
- Roadmaps prepared with large stakeholder involvement and public consultation
- Concrete technological and sector related objectives – commitment from industry to reach them and to provide the necessary R&D+I investments
- **Fully open H2020 calls**
PPPs in H2020

- "Contractual PPPs" cPPPs (H2020 mechanism) and "Institutional PPPs" (JTIs)

- cPPPs (implemented within H2020 WP)
  - Robotics
  - Photonics
  - Advanced 5G Network Infrastructures
  - Factories of the Future (FoF)
  - Energy-efficient Buildings (EeB) programme
  - Sustainable Process Industry (SPIRE)
  - European Green Vehicles Initiative
  - High-performance Computing

NMP
Linked Initiatives

- ERA-NETs (co-funding and networking)
- Structural Funds (support to develop smart specialisation)
- ETPs (Strategic Research Agendas considered for priority setting)
- EIT: new KIC on Added-value Manufacturing
- JTIs: Electronic components and systems, Bio-based Industries
- EIPs (Smart Cities, Raw Materials)
H2020: Strong participation of SMEs

- **Integrated approach** - around 20% of the total budget for societal challenges and LEITs to go to SMEs
- **Simplification** of particular benefit to SMEs (e.g. single entry point)
- A **new SME instrument** will be used across all societal challenges as well as for the LEITs
- A dedicated activity for research-intensive SMEs in 'Innovation in SMEs'
- 'Access to risk finance' will have a strong SME focus (debt and equity facility)
Where to find Plasma and Surface Technologies in H2020?

ERC
FET
Marie Curie
Research Infrastructures (e.g. SPIRIT)
LEIT
The Challenges
EIT/KIC
How about synergies with Horizon 2020?

**Horizon 2020**

- Frontier research (ERC, FET)
- Excellent R&I Demonstration Pilots
- ERA-Net, JP, EUREKA Marie S. Curie
- SME instrument, "Fast track"
- KICs
- KETs
- PPPs
- Business innovation (IP1+3)
- ESFRI
- Skills
- Business Advisory services
- R&I Infrastructures and Equipment (IP1)
- ESI Funds

**Upstream**

- Excellent R&I Demonstration Pilots
- KICs
- ESI Funds
- R&I Infrastructures and Equipment (IP1)
- ESFRI
- Skills
- Business Advisory services

**Downstream**

- ESI Funds
- R&I Infrastructures and Equipment (IP1)
- ESFRI
- Skills
- Business Advisory services

**"Stairway to Excellence"**

- National/Regional R&I systems

**"Research Excellence"**

- R&D
- IP: Investment Priorities under the R&I thematic objective of the ERDF Regulation

**Innovation Excellence**

- Hopefully also excellence, but "Innovation Excellence"
But: Horizon 2020 is different

- A strong challenge-based approach, allowing applicants to have considerable freedom to come up with innovative solutions; less prescriptive topics;
- Strong emphasis on expected impact
- Emphasis on innovation, with continuing support for R&D
- A strategic approach, with two-year work programmes
- Focus areas bring together different technologies, along entire innovation chain
- Cross-cutting issues mainstreamed (e.g. social sciences, gender, international cooperation)
Nanotechnologies and Advance Materials related calls 2014-15 and outlook for 2016-17

(with reference to PSE related calls)
Covering the innovation cycle "research to market"

From R&D to close-to-market activities

Use of Technology Readiness Levels (TRLs from 3-4 to 8)

Funding rates
- 100% (~60% of budget)
- and 70% (for pilots and demonstrators)

Ground prepared in last two years of FP7 ('bridging')

Contractual PPPs and JTIs (Electronic components and systems, Bio-based Industries)

Cross-cutting KETs (combinations of KETs)

Pre-commercial procurement and prizes (to be developed further after 2015)
MAIN CALL PRIORITIES

- Focus on technology development with industrial deployment of Key Enabling Technologies (KETs)
- Based on strategic research agendas, roadmaps and value chains (with applications in several sectors and societal challenges)
- Support for further innovation, through e.g. project clusters and links to other funding (e.g. smart specialisation)
- Contributions to objectives of selected focus areas, within LEIT calls - with enabling character: personalising health care, decarbonising energy, waste as a resource
Setting the materials Research Priorities

- Apart from the EAG and Materials Summit paper

- MAT4health: relevant COM, epidemiological data (roadmap under preparation)
- MAT4ICT: consultation with DG CNECT
- MAT4energy: roadmap and consultation with DG ENR and RTG/K
- MAT4transport: cPPP GV
- MAT4environment: relevant COM, text of Horizon2020
- Cross-CuttingMATtechnologies: mostly from the Materials Summit
Setting the nanotechnology research priorities
Calls for Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing

*New WP structure!*

- **One call** for Nanotechnologies, Advanced materials and KET support actions
- **One call** for Biotechnology
- **Three cross-cutting calls** implementing Factories of the Future (FoF), Energy-efficient buildings (EeB) and Sustainable Process Industries (SPIRE)
Calls published in OJ and on Participant Portal.
Some current H2020-NMPB calls (2014) of potential interest for PSE stakeholders:

NMP 4 – 2014: High definition printing of multifunctional materials

NMP 26 – 2014: Joint EU & MS activity on the next phase of research in support of regulation "NANOREG II"

EeB 1 – 2014: Materials for building envelope evaluation running – 2nd phase
Some upcoming H2020-NMPB calls (2015) with potential of interest for PSE stakeholders:

NMP 3 – 2015:
Manufacturing and control of nanoporous materials; call closure 26.3.2015

NMP 16 – 2015:
Extended in-service life of advanced functional materials in energy technologies (capture, conversion, storage and/or transmission of energy); call closure 26.3.2015

FoF 12 – 2015:
Industrial technologies for advanced joining and assembly processes of multi-materials; call closure 4.2.2015
Call for Nanotechnology, Advanced Materials and KET support actions

**Bridging the gap between nanotechnology research and markets**

<table>
<thead>
<tr>
<th>Topic code</th>
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<th>Type of Action</th>
</tr>
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<tbody>
<tr>
<td>NMP 1 - 2014</td>
<td>Open access pilot lines for cost-effective nanocomposites</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 2 - 2015</td>
<td>Integration of novel nano materials into existing</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 3 - 2015</td>
<td>Manufacturing and control of nanoporous materials</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 4 - 2014</td>
<td>High-definition printing of multifunctional materials</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 5 - 2014</td>
<td>Industrial-scale production of nanomaterials for printing</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 6 - 2015</td>
<td>Novel nanomatrices and nanocapsules</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 7 - 2015</td>
<td>Additive manufacturing for table-top nanofactories</td>
<td>RIA</td>
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**One stage evaluation and submission!**

Above topics implemented as cross-KET activities
## Call for Nanotechnology, Advanced Materials and KET support actions

### Nanotechnology and Advanced Materials for more effective Healthcare

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<td>NMP 8 - 2014</td>
<td>Scale-up of nanopharmaceuticals production</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 9 - 2014</td>
<td>Networking of SMEs in the nano-biomedical sector</td>
<td>CSA (max 1)</td>
</tr>
<tr>
<td>NMP 10 - 2014</td>
<td>Biomaterials for the treatment of Diabetes Mellitus</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 11 - 2015</td>
<td>Nanomedicine therapy for cancer</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 12 - 2015</td>
<td>Biomaterials for treatment and prevention of Alzheimer's disease</td>
<td>RIA</td>
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One stage evaluation and submission for topic NMP 8!
### Call for Nanotechnology, Advanced Materials and KET support

#### Nanotechnology and Advanced Materials for low carbon energy technologies and Energy Efficiency

<table>
<thead>
<tr>
<th>NMP 13 - 2014</th>
<th>Storage of energy produced by decentralised sources</th>
<th>RIA</th>
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<tr>
<td>NMP 14 - 2015</td>
<td>ERANET on &quot;materials&quot; including those for energy</td>
<td>Era-Net (Cofund)</td>
</tr>
<tr>
<td>NMP 15 - 2015</td>
<td>Materials innovations for optimisation of cooling in power plants</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 16 - 2015</td>
<td>Extended in-service service of advanced functional materials in energy technologies (capture, conversion, storage and/or transmission of energy)</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 17 - 2014</td>
<td>Post-Lithium batteries for electric automotive applications</td>
<td>R/I</td>
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## Call for Nanotechnology, Advanced Materials and KET support

**Exploiting the cross-sector potential of Nanotechnologies and Advanced materials to drive competitiveness and sustainability**

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<th>Project type</th>
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<tr>
<td>NMP 18 - 2014</td>
<td>Materials solutions for use in the creative industry sector</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 19 - 2015</td>
<td>Materials for severe operating conditions, including added-value functionalities</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 20 - 2014</td>
<td>Widening materials models</td>
<td>RIA</td>
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<tr>
<td>NMP 21 - 2014</td>
<td>Materials-based solutions for the protection or preservation of European cultural heritage</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 22 - 2015</td>
<td>Fibre-based materials for non-clothing applications</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 23 - 2015</td>
<td>Novel materials by design for substituting critical elements</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 24 - 2015</td>
<td>Low-energy solutions for drinking water production</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 25 - 2014/15</td>
<td>Accelerating the industrial uptake of nanotechnologies, advanced materials or advanced manufacturing and processing technologies by SMEs</td>
<td>SME *</td>
</tr>
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* 3 separate phases / 70% funding for phase I in form of lump sum of €50,000
Call for Nanotechnology, Advanced Materials and KET support

Safety of nanotechnology-based applications and support for the development of regulation

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<td>NMP 26 - 2014</td>
<td>Joint EU &amp; MS activity on the next phase of research in support of regulation “NANOREG II&quot;</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 27 - 2014</td>
<td>Coordination of EU and international efforts in safety of nanotechnology</td>
<td>CSA</td>
</tr>
<tr>
<td>NMP 28 - 2014</td>
<td>Assessment of environmental impact of nanomaterials</td>
<td>RIA</td>
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<tr>
<td>NMP 29 - 2015</td>
<td>Increasing the capacity to perform nano-safety assessment</td>
<td>RIA</td>
</tr>
<tr>
<td>NMP 30 - 2015</td>
<td>Next generation tools for risk governance of nanomaterials</td>
<td>RIA</td>
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Call for Nanotechnology, Advanced Materials and KET support

**Addressing generic needs in support of governance, standards, models, and structuring in nanotechnology, advanced materials and advanced manufacturing and processing**

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<td>NMP 31 - 2014</td>
<td>Novel visualization tools for enhanced nanotechnology</td>
<td>CSA</td>
</tr>
<tr>
<td><strong>NMP 32 - 2015</strong></td>
<td><strong>Societal engagement on responsible nanotechnology</strong></td>
<td>CSA</td>
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<tr>
<td>NMP 33 - 2014</td>
<td>The materials &quot;common house&quot;</td>
<td>CSA</td>
</tr>
<tr>
<td>NMP 34 - 2014</td>
<td>Networking and sharing of best practises in management of new advanced materials via eco-design of products, eco-innovation, and product life cycle management</td>
<td>CSA</td>
</tr>
<tr>
<td>NMP 35 - 2014</td>
<td>Business models with new supply chains for sustainable customer-driven small series production</td>
<td>IA</td>
</tr>
<tr>
<td>NMP 36 - 2014</td>
<td>Facilitating knowledge management, networking and coordination in NMP</td>
<td>CSA</td>
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<tr>
<td>NMP 37 - 2014</td>
<td>Practical experience and facilitating combined funding for large-scale RDI initiatives</td>
<td>CSA</td>
</tr>
<tr>
<td>NMP 38 - 2014/2015</td>
<td>Presidency events</td>
<td>CSA</td>
</tr>
<tr>
<td>NMP 39- 2014</td>
<td>Support for NCPs</td>
<td>CSA</td>
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</table>
New NMPB Work programmes:

WP 2016/2017

to be defined presumably by summer 2015
Find out more on Horizon 2020: 
http://www.ec.europa.eu/research/horizon2020
KET: 
http://ec.europa.eu/research/industrial_technologies/index_en.cfm
Participant Portal: 
https://ec.europa.eu/research/participants/portal/page/home

Thank you for your attention
Contact:

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